European Monitoring Centre
for Drugs and Drug Addiction

INSIGHTS

ISSN 2314-9264

Drug treatment expenditure: a methodological overview

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Luxembourg, Publications Office of the European Union, 2017

Print ISBN 978-92-9497-213-2 ISSN 1606 1683 doi:10.2810/812985 TD-XD-17-001-EN-C
PDF ISBN 978-92-9497-214-9 ISSN 2314-9264 doi:10.2810/052028 TD-XD-17-001-EN-N

This publication should be referenced as:
European Monitoring Centre for Drugs and Drug Addiction (2017), Drug treatment expenditure: a methodological overview, EMCDDA Insights 24, Publications Office of the European Union, Luxembourg.

Printed by Bietlot in Belgium

PRINTED ON ELEMENTAL CHLORINE-FREE BLEACHED PAPER (ECF)

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Foreword

It is estimated that around 1.2 million people receive treatment for drug-related problems in the European Union (EU) per year. This is a result of the expansion in the provision of drug abuse treatment across Europe since the mid-1990s, which has helped to increase the availability of and access to treatment. While treatment systems are under increasing pressure to respond in a timely, effective and flexible manner to clients' needs, the change in the drugs used, the higher prevalence of polydrug use and the provision of ongoing care for chronic cases have increased pressure on health providers. However, simultaneously, budgets have tended to shrink in many European countries as a consequence of austerity measures implemented in the health sector following the 2008 recession. In this economic climate, more than ever, policymakers and service planners require data and information on the capacity, performance and costs of national treatment systems in order to support investment decisions and to make sound policy choices.

Evaluating drug policy has been an EU priority since the publication of the EU drugs strategy (2000-04). Subsequently, implementing cost-effective actions in drug policy was addressed both in the EU drugs strategy (2005-12) and in the EU drugs action plan (2009-12). More recently, the EU drugs strategy for 2013-20 confirms the objective of contributing to better dissemination of evaluation results, and the EU action plan on drugs (2017-20) identifies developments in national evaluations and public expenditure estimates of Member States as an overarching indicator for measuring the EU action plan achievements.

The European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) has been given the objective of developing analytical instruments to better assess the effectiveness and impact of drug policy using a number of tools including the analysis of public expenditure. Therefore, the EMCDDA aims to contribute to developing estimates of public expenditure in EU Member States. The need to develop means of estimating public expenditure reflects the importance of making data and models available, as a first step in the economic evaluation of policies and interventions. In fact, the resolute political will to address the drugs problem in Europe lies not only in the development of appropriate policies, but also in the amount of public funds assigned to implement cost-effective policies. Limited data and/or insufficient comprehension of the financing of drug treatment will inevitably hinder the efficient allocation of resources.

Data collection and research on treatment activity and outcomes are well established in Europe, but there is limited information available on the costs of, and expenditure on, drug treatment. Analysing public expenditure on drug treatment is still difficult. Information and data are sparse and national estimates tend to use neither comparable definitions nor agreed methodologies. In the absence of systematic discussion of these issues, there has been little opportunity for policymakers, practitioners and researchers to take advantage of existing knowledge and experience.

As a first step in addressing this gap, this EMCDDA Insights report has brought together a set of diverse studies, encompassing much of the recent work on drug treatment expenditure in different parts of the world, thereby providing a unique overview of the methodologies used. The very existence of these studies is testament to the growing importance of this field of enquiry. Despite an increase in the number of studies over the past decade, there is still much to be done in terms of methodological development. The topic remains in its infancy. Issues that act as barriers to the rapid development of this field include the absence of commonly agreed definitions and approaches; the lack of harmonised or complete datasets on drug-related public spending and/or on the activity of drug-related health providers; and uncertainty about the most appropriate economic models to use.

The analysis contained within this report will be of interest to both those commissioning — or thinking of commissioning — expenditure/cost studies and those carrying out the studies, including accounting authorities; entities seeking funds to finance their service provision; researchers; officials looking to evaluate drug policy priorities and develop drug policy strategies and action plans; and those involved in the economic evaluation of drug policy.

Although this edition of the EMCDDA Insights series does not intend to be definitive, I am pleased to present what I hope will be seen as an important marker in the development of better estimates for public expenditure on drug treatment and a contribution to defining good practice in drug policy evaluation, leading, ultimately, to a more cost-effective allocation of resources in future.

Alexis Goosdeel
Director, EMCDDA

Executive summary

Each year, around 1.2 million people in the European Union (EU) undergo treatment for problems related to drug abuse. There are associated requirements for policymakers and planners to determine the capacity and performance of national treatment systems and evaluate their costs. Responses are required to central policy questions such as 'What treatments are offered?', 'Are they effective?' and 'How much does treatment cost?'. However, despite the collection of data on treatment activity being relatively well established in Europe, there has been limited focus on the costs of, and expenditure on, drug treatment. Limited data and/or insufficient insight into the financing of drug treatment will inevitably hinder the efficient allocation of resources.

This European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) Insights report gathers together studies from a wide range of experts, providing a unique overview of the methodologies currently used for estimating drug treatment expenditure. In the absence of a systematic discussion of these issues, there has been little opportunity for policymakers, practitioners and researchers to take advantage of existing knowledge and experience. With the goal of taking the first step towards closing this gap, this report brings together a set of diverse studies encompassing much of the recent work on drug treatment expenditure in different parts of the world. It therefore reflects the current state of the art in this field and, by focusing on methods, it will facilitate analysis of the main methodological commonalities and considerations arising from these estimates.

Section I describes a step-by-step approach to the estimate of costs, applied to the Australian health system, where the objective was to estimate public expenditure on drug treatment, analysing the potential use of international datasets and attempting to apply international standards for health expenditure accounting. This analysis shows the difficulties faced at the different stages of the estimation process and presents the solutions adopted. Starting with discussing an adequate definition of drug treatment, it stresses the importance of establishing clear definitions and boundaries for the types of treatment included; mapping the corresponding funding systems concerned; and suggesting suitable methods for estimates. Additionally, the authors discuss the feasibility of using international datasets and the adequacy of considering national databases. Last but not least, the transparency of the models used is analysed and consistency across various estimates investigated. The study concludes by stressing the need to discuss the limitations of estimates, and by highlighting that estimates for the costs of drug treatment still require a series of compromises, because the datasets require further improvement.

Section II comprises a set of studies focusing primarily on data on public expenditure on drug treatment that is identified as drug-related either in public accountancy documents or by experts, i.e. this section focuses on 'labelled expenditure' on drug treatment. These studies exemplify and discuss how to collect and use these data. Chapter 2 concerns the costs of drug treatment in Croatia. The authors systematically describe the data collection exercise, which aimed to identify and estimate labelled public expenditure on drug treatment. Chapter 3 concerns the routine data collection exercise that takes place in the Czech Republic annually, and the data for labelled expenditure on drug treatment are contextualised as a proportion of the total public expenditure on drug treatment. Finally, in Chapter 4, an example from Hungary describes a sporadic data collection exercise, in which interviews with experts were used as a complementary method to collect data. These studies show that in most cases 'labelled expenditure' does not account for total expenditure on drug treatment and, therefore, that additional methods are required to estimate public expenditure on drug treatment.

Section III puts the spotlight on methods applied to estimate the public expenditure on drug treatment that is not identified as drug related in public accountancy documents, i.e. 'unlabelled expenditure'. Chapter 5 describes the method that has been used annually in Luxembourg since 2002 to estimate public expenditure on drug-related hospital episodes, inpatient drug treatment episodes, opioid substitution treatment, and treatment of HIV (human immunodeficiency virus) infections and AIDS (acquired immune deficiency syndrome) associated with drug use. Chapter 6 describes the method used to estimate public spending on drug treatment and on associated comorbidities in hospitals in the United Kingdom, accounting for inpatient stays, which covers both emergency services for acute problems (overdoses and psychosis) and planned treatment for chronic associated infectious diseases. Chapter 7 presents a method applied in an Italian region to estimate public expenditure on drug treatment, taking into account drug-related pathologies and associated comorbidities, that was provided in hospital and outpatient specialist care. In this study, spending on pharmaceutical prescriptions and specialised services provided by addiction treatment services was also included. In Chapter 8, a different approach was adopted for estimating the costs of Italy's provision of opioid substitution treatment. This study disentangles spending on drug treatment from spending on treating other addictions. Chapter 9 presents a methodology to estimate public expenditure on drug treatment in hospitals, for most European countries, based on international datasets.

While the objective of the studies described in Sections I, II and III is to estimate spending either on a specific type of drug treatment or on several types, depending on the data available and methods, the studies presented in Section IV provide tools to account for costs with different aims. Chapter 10 presents a tool — a calculator — developed by Public Health England to support local authorities in estimating their spending on drug-related specific interventions. This tool may be used by treatment providers to make their own estimates of costs and will increase drug treatment providers' capacity to evaluate costs and analyse cost-effectiveness. Chapter 11 describes a method to estimate changes in spending caused by changes in the level of services provided, according to the different types of drug services available (such as treatment, harm reduction, prevention and social reintegration). From a policy point of view, these results may support future decision-making when planning drug-related health budgets.

The studies comprising Section V highlight the fact that public spending is only part of the picture, and they also raise new questions. Do the methods used to estimate spending on drug treatment vary if the private sector pays a significant part of the bill? What are the socioeconomic factors required to contextualise the size and meaning of public spending on drug-related health? What other costs does society bear besides the drug-related health bill?

Chapter 12 shows how the costs of drug treatment varies in the United States, according to the payer (public versus private payers), type of treatment (inpatient and outpatient providers) and type of pharmacological treatment adopted (pharmacological versus behavioural therapies). Since treatment options for any given client vary based on a whole host of factors, including the setting in which treatment is offered, the credentials or certification of the provider, geographic variation in access to therapies, and differences in what is covered by health insurers, these complicating factors, coupled with the lack of price transparency for most services, make calculation of the average cost of treatment a challenging task. In this framework, this study exemplifies how these factors impact the costs of pharmaceuticals and, therefore, sharply modify the costs of drug treatment for opioid use in outpatient settings. Chapter 13 describes a methodological framework to explain and contextualise the size of spending on drug treatment. The main factors influencing drug treatment expenditure are analysed. Here, three classes of factors explain public spending: type of healthcare policy, type of drug treatment policy and socioeconomic

context. By tackling these factors, this report moves the discussion forward from a pure analysis of public expenditure methods to a broader framework, more useful in a complete evaluation of drug policy. Chapter 14 presents a method to compute the social costs of illicit drugs. The authors show that drug-related public expenditure accounts for only part of the total costs incurred by society as a result of the illicit drug phenomenon, using the example of estimates for social costs of illicit drugs France in 2010.

This EMCDDA Insights report concludes by identifying a set of desirable first steps that may be taken to develop estimates of spending on drug treatment. While recognising the limitations imposed by currently available datasets, the report sheds light on current practice and, in doing so, suggests areas for future methodological development. In addition, it may also help users of these estimates to better understand their meaning and to contextualise results. This way, the EMCDDA hopes that the evaluation of drug policy and the methods used to estimate public expenditure on drug treatment in Europe will become more scientific, widely accepted and integrated with good practice.

Acknowledgements

The EMCDDA would like to thank the following expert contributors, who provided the content for this publication: Alessandra Andreotti, Elvira Beato, Elisa Benedetti, Lynda Berends, Jenny Chalmers, Charlotte Davies, Domingos Duran, Daniele Fassinato, Michela Franchini, Bruno Genetti, Ricardo Gonçalves, György Hajnal, Iga Kender-Jeziorska, Pierre Kopp, Rosalie Liccardo Pacula, Delfine Lievens, Ervant Maksabedian, Sanja Mikulić, Sabrina Molinaro, Virginia Musto, Sofia Nogueira da Silva, Marysia Ogrodnik, Alain Origer, Stefania Pieroni, Roberta Potente, Marco Riglietta, Alison Ritter, Carla Rossi, Elisabetta Simeoni, Bradley Stein, Fatima Trigueiros, Freya Vander Laenen and Jiri Vopravil.

We are also grateful to all of the experts who attended the sessions on costs of drug treatment in the 10th and 11th annual conferences of the International Society for the Study of Drug Policy (ISSDP) for their suggestions and contributions.

EMCDDA contributors (in alphabetical order): Vaughan Birbeck, Cláudia Costa Storti, Marica Ferri, Paul Griffiths, Dagmar Hedrich, Renate Hochwieser, Linda Montanari, Jane Mounteney, Alessandro Pirona, Roland Simon, Julian Vincent. We particularly appreciate the input of EMCDDA Scientific Committee members Anne-Line Bretteville Jensen and Brice De Ruyver. Editing and production of the final report: Marie-Christine Ashby.

INTRODUCTION

Drug treatment expenditure: a methodological overview

Cláudia Costa Storti

Preamble

According to the most recent *European Drug Report* (EMCDDA, 2016), each year approximately 1.2 million people in the European Union (EU) are treated for drug abuse-related problems. This can be attributed to the increased provision of drug treatment that has taken place across Europe since the mid-1990s, as the involvement of a more diverse range of treatment providers has helped to increase the availability of and access to treatment. Treatment systems are increasingly required to be sufficiently flexible and responsive to meet clients' needs resulting from changing drug use patterns and polydrug use, and to provide ongoing care for chronic cases. However, many European countries have in recent years seen health budgets cut in real terms (EMCDDA, 2014). As a result, it is more important than ever for policymakers and service planners to have access to data and information on the capacity and performance of national treatment systems to justify investment decisions and to make robust policy choices.

Data collection and research on treatment activity and outcomes are well established in Europe, but there has been limited information on the costs of, and expenditure on, drug treatment. Limited data and/or insufficient insight into the financing of drug treatment will inevitably hinder the efficient allocation of resources. Service providers need accurate information on the costs in order to plan the allocation of resources. Decision-makers and funders can use such information as a means of cost control, for example, by comparing costs of similar services or those of alternative providers of similar services. Finally, as analysis of cost-effectiveness involves analysing the costs of alternative treatments and their outcomes as part of a fuller economic analysis (Gold et al., 1996), other information on service costs and public expenditure on drug treatment is needed to determine the cost-effectiveness of interventions, treatment programmes and the wider treatment and drug policy.

National estimates of drug treatment expenditure differ (EMCDDA, 2017), and the methods employed by researchers have varied and have not always been fully explicated. This not only affects the ability to assess the comparability of study results, but also limits further methodological development. This European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) Insights report seeks to address this information gap by gathering together a wide range of papers describing the methods used to estimate drug treatment expenditure in existing studies, as well as other associated costs. It draws on the experiences of a diverse group of contributors from Europe and beyond, including economists, policy advisers and scholars. The breadth of focus and approach across the papers provides a rich source of information on estimating drug treatment expenditure, including information on data sources, their uses and limitations. In turn, this allows the identification of common conceptual and methodological topics for discussion. By bringing together examples from diverse European countries, the United States and Australia, this publication also provides a unique insight into the role of contextual factors, such as national health systems, drug treatment provision and data availability, on the interpretation of results.

Furthermore, this publication provides examples of how public expenditure data can be used and which tools may be useful and further developed to carry out analysis. This may support commissioners and policymakers in their resource allocation and policy decision-making. Moreover, as some countries have had to face severe levels of austerity in the health sector recently (EMCDDA, 2014), it becomes more relevant to evaluate, for instance, if the savings in healthcare more than offset their implementation costs or if, conversely, they have generated a net increase in government expenditure over time. Finally, this publication aims to provide a better understanding of how studies can be used and interpreted. The last section discusses the type of information that helps to contextualise estimates of expenditure on drug treatment.

In the absence of a systematic discussion of these issues, there has been little opportunity for policymakers, practitioners and researchers to take advantage of existing knowledge and experience. As a first step in addressing this gap, this EMCDDA Insights report aims to bring together a set of very diverse studies, encompassing much of the recent work on drug treatment expenditure in different parts of the world. While acknowledging the heterogeneity of the studies, it also offers a rich source of information that represents to a large extent the current state of the art in this field. By focusing on methodology, it particularly aims to stimulate discussion about the main methodological commonalities and considerations, building up a knowledge base on which methods and data are appropriate in different circumstances.

This analysis will be of interest to both those commissioning — or thinking of commissioning — expenditure/cost studies and those carrying out the studies, including accounting authorities; entities seeking funds to finance their service provision; researchers; officials looking to evaluate drug policy priorities and develop drug policy strategies and action plans; and those involved in the economic evaluation of drug policy.

Background

The EU drugs strategy (2000-04) established evaluation of drug policy as an EU priority. Subsequently, the implementation of cost-effective actions in drug policy was addressed both in the EU drugs strategy (2005-12) and in the EU action plan on drugs (2009-12), specifically in objectives 23 and 24. In the years that followed, both the EU drugs strategy (2013-20) and the EU action plans on drugs (2013-16 and 2017-20) restated these principles. The EMCDDA was tasked with developing analytical instruments to better assess the effectiveness and impact of drug policy using a number of tools including analysis of public expenditure. Following on from this, in the EU action plans the EMCDDA was given responsibility for promoting scientific evaluation of policies and interventions at national, EU and international levels. It was also tasked with contributing to the development of estimates of public expenditure in EU Member States. The need to develop means of estimating public expenditure reflects the importance of making these data available, as a first step in the economic evaluation of policies and interventions.

In 2007, a first attempt was made to estimate drug-related public expenditure, including drug treatment, across European countries. The EMCDDA gathered national estimates of government funds spent on drug-related initiatives. However, the methods and coverage of estimates differed substantially across countries, making comparisons impossible (EMCDDA, 2008). In 2010, the EMCDDA invited Reitox ([1]) focal points to focus specifically on drug treatment costs within their national reports. Again, the topic was both politically and methodologically challenging, and the varying availability of information, as well as the complexity of funding arrangements, meant that, at best, only incomplete estimates could be made of the costs of (or expenditure on) drug treatment in Europe (EMCDDA, 2011). Consequently, with the support of Reitox focal points and using other additional datasets, the EMCDDA analysed trends in national spending on drug-related health (EMCDDA, 2014). Nevertheless, that study also found that difficulties in evaluating expenditure on health policy constrained the analysis. Various attempts to estimate drug treatment and related health expenditure have repeatedly been confronted with a common issue, namely that definitions and methods used to measure spending on treatment differed across estimations.

Taking these experiences into account and the repeated requests for guidance from some of the national advisers to policymakers, in 2013, the EMCDDA commissioned a literature review on the methods used to estimate public expenditure on illicit drug treatment. This resulted in a study that provided a short summary of the main approaches that had been applied in scientific studies and some grey literature (Vander Laenen and Lievens, 2013). From this study, the results clearly show that there are still methodological and data issues that require identification, discussion and development. First, there is a lack of a commonly accepted agreement on which costs should be included. Second, different definitions are used even when similar types of costs are analysed. Third, the data used vary markedly. Last but not least, the methods used to estimate the same type of costs are neither harmonised nor fully comparable.

This EMCDDA Insights report aims to address these challenges by focusing on the methodologies behind recent estimates rather than the results. Throughout the publication, authors have focused on different aspects of estimates, highlighting specific methods that have been used in practice either to collect data or to model the available data that produced the best possible estimates. These examples will help us to understand the diversity of approaches used, identify the underlying methodological and data issues and support an open and frank discussion of practice in the field and the strengths and limitations of different approaches. In doing so, the intention is to help

([1]) Reitox is the European information network on drugs and drug addiction.

to drive innovation and improve practice, which provides a solid foundation for the future development of the field.

Financing schemes, costs of health and funding drug treatment

In Europe and Australia, the public sector is the main source of finance for healthcare. Overall, health insurance coverage is universal or almost universal in all EU Member States through compulsory health insurance or national or local health service provision. In 2015, for instance, public expenditure represented 79 % of the total health expenditure in the 28 EU Member States (EU-28) and 67 % in Australia. In the United States, 49 % of total health expenditure was publicly funded in 2015. Furthermore, the proportion of national resources allocated to health is important to note. In Australia, public spending on health represented 8 % of gross domestic product (GDP), while in the EU national figures varied between 3 % and 9 %, and in the United States it was 8 % (OECD, 2016).

While the proportion of national resources spent on drug treatment policy is much smaller than the total public expenditure on health (EMCDDA, 2014), it still represents a significant component.

In addition to public expenditure on drug treatment, there are also important private sources of funding. The private sector (private entities) allocates resources that could be allocated elsewhere if illicit drugs did not exist. Examples of private expenditure are payments for health services using private health insurance or out-of-pocket payments made by individuals during drug treatment (Kopp and Fenoglio, 2000). Furthermore, economists also consider external costs, i.e. the costs of decisions taken by agents that have a relevant impact on others. A common example of an external cost is loss of productivity associated with the use of drugs: as a result of illness, a person may be less productive because of increased absenteeism or lower output during working time. The social costs of illicit drugs are the sum of public, private and external costs (Kopp and Fenoglio, 2000; Single et al., 2003; Vander Laenen et al., 2011). Social costs include both tangible, i.e. costs that can easily be measured in monetary terms, and intangible costs. Intangible costs such as the human pain caused by the premature drug-related death of a relative cannot be easily quantified, although there have been attempts to do so. Examples of methods used to measure intangible costs are, for example, the use of 'the willingness to pay approach'.

Although the focus of this publication is on public expenditure and the costs borne by public entities, in order to frame public expenditure on drug treatment in a wider context landscape, this collection of studies includes an estimate of the costs of treatment from both public and private perspectives and also the costs to society. This shows how estimates of public expenditure contribute to wider cost studies and provides insight into the potential impact of differences in the structure of health financing on treatment costs. Indeed, changes in the financing of healthcare, for example more private sector funding, are likely to have an impact on public expenditure on drug treatment (Reuter, 2006). This publication broadens the perspective further and discusses how other socioeconomic factors such as the epidemic situation in a country or its overall economic situation may have an impact on the volume and characteristics of public spending.

Public expenditure defined

Public expenditure of the general government is the value of goods and services purchased or utilised by the general government in order to perform each of its functions. The general government consists of a central government, sub-national governments and social security. Sub-national governments comprise the regional and local governments and municipalities (according to country) that usually manage budgets of varying size and nature, according to the political configuration of the country concerned.

Reporting health and drug-related public expenditure

Eurostat publishes annual data on total general government public expenditure. Total expenditure is broken down into 10 main socioeconomic functions of government if the Classification of the Functions of Government (COFOG) is used. Health is one of the functional groups defined. Furthermore, spending on health is broken down into sub-categories such as medical products; appliances and equipment; outpatient services; public health services; and research and development (R&D) related to health (Eurostat, 2011). Eurostat has been reporting these data for the EU-28 countries since 2002 (Eurostat, 2017).

In addition, a system of accountancy geared to classifying and producing data on health spending has been created by a group of international organisations — the World Health Organization (WHO), the Organisation for Economic Cooperation and Development (OECD) and Eurostat (Lequiller and Blades, 2014): the System of Health Accounts (SHA). The SHA aims, among other objectives, to provide a framework for the main aggregates relevant to international comparisons of health expenditure and health systems analysis and to provide a tool, expandable by country, to produce data to monitor the health system. The SHA has been used to develop common indicators on health and long-term care expenditure, to monitor various policy objectives, and to evaluate healthcare systems' performance. Annual data have been published by specific diseases for 12 countries since 2002. It includes data on total current spending for the public and private sectors and data for spending on the sub-groups such as inpatient/hospitals, outpatient/ambulatory and medical goods. Furthermore, spending data are published according to the *International Statistical Classification of Diseases and Related Health Problems*, 10th revision (ICD-10 codes), in which the class 'Mental and behavioural disorders' includes data on drug-related spending (OECD, 2017).

There are important differences between the SHA and COFOG. The SHA publishes data on public and private expenditure, while COFOG is restricted to governmental administrative spending. The purpose of the SHA is to provide a complete overview of all expenditure related to healthcare, while COFOG intends to classify transactions in government-funded healthcare.

Neither COFOG nor the SHA approach to public health spending provides data specifically on spending on drug treatment.

Studies on expenditure on drug treatment remain scarce. In the last 10 years, 18 EU countries have reported comprehensive estimates for drug-related expenditure incurred by general government, which includes spending on drug treatment. These have estimated total drug-related public expenditure at between 0.01 % and 0.5 % of GDP, with health expenditure representing between 15 % and 53 % of total drug-related expenditure (EMCDDA, 2017).

However, caution is required when interpreting these data. Comparisons between countries are not possible, as these studies do not always apply the same definition of drug treatment, they include different types of treatment provision services, they are not always equally comprehensive, they do not apply the same classification of expenditure, or they do not use comparable methods. Therefore, it is still not possible to provide a reliable and complete European picture of public expenditure on drug treatment (EMCDDA, 2014).

Core concepts associated with drug-related estimates

While a number of attempts to estimate public expenditure on initiatives to reduce drug demand have been made, the sub-categories used to classify activities vary considerably. One of the key issues in the design of an expenditure study on drug treatment is the definition of drug treatment itself. International definitions of treatment such the WHO's are broad, often encompassing a wide range of treatments:

> The term 'treatment' is used to define the process that begins when psychoactive substance users come into contact with a health provider or other community service, and may continue through a succession of specific interventions until the highest attainable level of health and well-being is reached. Treatment and rehabilitation are defined as a comprehensive approach to identification, assistance, health care, and social integration with regard to persons presenting problems caused by the use of any psychoactive substance.
>
> **(WHO, 1998, p. 3)**

The EMCDDA's Treatment Demand Indicator (TDI) Standard Protocol, which guides EU countries in the harmonised reporting of treatment activity data at a European level, contains a definition that is similarly broad. Treatment is defined as 'any activity that directly targets individuals who have problems with their drug use and which aims to improve the psychological, medical or social state of those who seek help for their drug problems' (EMCDDA, 2012). It is therefore important that an operational definition of treatment is developed. A major consideration is how expansive the definition of treatment should be. A broader definition of treatment leads to the inclusion of different types of drug treatment services and, therefore, has a large impact on cost estimates, methods and data.

In addition, the fluid boundaries between the conventional categorisation of drug-related interventions — treatment, harm reduction and prevention — can make it difficult to adhere to a narrow definition of drug treatment. Some researchers utilise the sub-categories of prevention,

treatment and harm reduction, while others categorise most activities in these areas under the broad heading of health. Some researchers also include expenditure on social protection, i.e. spending on programmes designed to reduce poverty and vulnerability, or reintegration initiatives. The papers within this publication, therefore, use a wide range of classifications, and authors have been asked to describe the methods they have used in 'real-life' projects. In Chapter 1, the authors stress the importance of starting empirical studies on costs by clearly defining which drug treatments are included in estimates.

One classification of drug-related public expenditure frequently used by authors is labelled drug-related expenditure versus unlabelled expenditure. Labelled drug-related expenditure is the *ex ante* planned expenditure that reflects, among other factors, the voluntary commitment of governments in the field of drugs**.** Labelled expenditure can be traced back by a detailed review of budgets and/or fiscal year-end accountancy reports for an implemented or executed budget. Concrete examples of the use of this type of data are provided in Chapters 2, 3 and 4.

Ideally, all public expenditure on drug-related matters should feature as labelled expenditure in government budgetary documents, with budget documentation covering all implemented drug-related activities. However, in practice this situation is confounded by three important issues that characterise drug treatment provision: (1) drug-related programmes and activities can be found at many different government levels; (2) drug-related programmes are frequently provided as part of programmes with broader goals; and (3) the reactive nature of some drug-related expenditure means that these costs depend upon the number of clients presenting for treatment, which cannot be known at the beginning of the financial year. Therefore, not all drug-related expenditure is identified as such in national budgets or year-end reports. Often, it is embedded in broader budgets, accounting for the 'unlabelled drug-related expenditure', and needs to be estimated using modelling approaches. Two main types of modelling approaches are commonly used: the top-down approach and the bottom-up approach (EMCDDA, 2008). The top-down modelling approach is mainly used when the data available on drug-related expenditure are embedded in programmes with broader goals and the fraction attributable to drugs is possible to disentangle with clear and measurable criteria. Criteria are frequently based on activity data, such as the proportion of drug-related clients or services in the total. The bottom-up modelling approach starts by estimating the cost of providing a unit of treatment, taking into account all possible productive factors, and then estimates the costs of providing all types of treatment to all clients. Ideally, the top-down and the bottom-up approaches should give comparable results. Chapters 5, 6, 7, 8 and 9 present examples of diverse methods used to estimate different types of drug treatments based on unlabelled expenditure data.

The structure of this publication

This publication is divided into six sections. Section I provides an introduction and overview of the topic by describing the methods used to carry out a comprehensive public expenditure study, helpfully setting out the key steps required. Section II explores how drug budgets can be interrogated to identify drug treatment expenditure. The authors use a variety of methods to do this, including using administrative documents and expert assessment. In Section III, the authors focus on the methods used to identify drug treatment expenditure within broader health budgets. The role of attributable fractions, the use of healthcare activity data, the identification of cost data, the choice of top-down or bottom-up methodology, and conceptual differences in the definition of drug treatment are all key issues here. In Section IV, the focus changes slightly and the tools described aim to support a different type of cost estimates. In Chapter 10, the authors suggest a method to help drug-related health providers to estimate costs themselves, while Chapter 11 describes a method to estimate the impact that variations in service provision have on spending. Furthermore, Section V broadens the focus and looks at contextual factors that help to understand how estimates of public expenditure can be used. Chapters 12 and 13 put the emphasis on the importance of the structure of the schemes financing health and on contextual (such as the epidemic situation of a country) or macroeconomic factors as determinants of costs. Chapter 14 presents an example of how studies of drug-related expenditure may contribute to the broader evaluation of societal costs. Finally, Chapter 15 covers the commonalities and main methodological considerations across the studies reported in this edition in our Insights series.

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SECTION I

Towards an overall estimate of public expenditure on drug treatment

CHAPTER 1

A methodology for estimating health expenditure on drug treatment: the Australian experience

Overview

In Chapter 1, Alison Ritter and colleagues provide a complete description of the method used to estimate total public expenditure on drug-related health, in a step-by-step approach. The method used to define treatment, choose data and model costs is detailed and the main challenges discussed. The authors, first, emphasise the need to establish clear definitions and boundaries for the types of health provision for which costs are going to be included; second, identify the types and categories of existing funding; and, third, suggest the most suitable method to estimate it, depending on the category, type of treatment and data available. In every case, consistency across the various estimates is valuable, and a clear description of the methods applied is required to permit other researchers to replicate the estimates. Last but not least, the limitations of estimates need to be clearly specified. Finally, the authors conclude that no method is perfect. Indeed, they conclude that any estimate of the costs of drug abuse treatment will require a series of compromises, with assumptions to be discussed and datasets that could be further improved. In their case, the authors could not isolate expenditure on treatment for alcohol misuse from the spending on drug treatment.

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CHAPTER 1

A methodology for estimating health expenditure on drug treatment: the Australian experience

Alison Ritter, Jenny Chalmers and Lynda Berends

Introduction

Estimating the expenditure associated with drug abuse treatment ([1]) is an important exercise. Conducted at a single point in time, it can inform the current investment in drug treatment for any one state or nation. Conducted over time, it can be used to monitor changes in expenditure. Furthermore, the investment in drug treatment relative to other areas of health (and overall government expenditure) can be an important performance indicator. It is also a useful tool for cross-national comparisons, for which the methodology needs to be standardised. Drug treatment expenditure can provide an evidence base for policy decisions about resource allocation, and can encourage policy reform such that better health outcomes are achieved from treatment.

In this study, we provide the details of one approach to estimating health expenditure in drug treatment, informed by an international framework, which draws on our experience in Australia (Ritter et al., 2015). We outline the steps and approach, highlighting lessons learned and potential pitfalls for other investigators. It is hoped this chapter can be used to inform drug treatment expenditure estimates in other locations and the evolution of methodologies.

It should be noted that, in Australia, treatment for alcohol use disorders is provided by and integrated with treatment for drug use disorders. Hence we cannot separate alcohol from other drug treatment, and the expenditure estimates in this study cover all substances (Ritter et al., 2015). It was not possible for us to separate alcohol expenditure from drugs expenditure. Indeed, we would argue that, given the very high rates of polydrug use (presentations to treatment for misuse of both alcohol and illicit drugs together), it makes little sense to even try and separate them.

International standards for health expenditure accounting specify the framework for health expenditure estimates (OECD et al., 2011). These are referred to as the SHA and have been developed with cooperation from the OECD, Eurostat and the WHO. The SHA 'proposes a framework for the systematic description of the financial flows related to health' (p. 3) such that reliable and timely data are developed that are comparable both across countries and over time ([2]). Our starting premise was that drug treatment expenditure estimates should be consistent with these international standards, and hence consistent with the ways in which health expenditure is analysed at a global level. There is little point in introducing novel or unique approaches when estimating costs within drug treatment that cannot then be compared with other health expenditure, because the allocation of resources across (and beyond) health portfolios occurs within a policy environment of competing priorities. As will be seen below, wherever possible we follow the SHA (OECD et al., 2011), but the particularities and peculiarities of both drug treatment and any one country's health system also need to be taken into account.

By way of background, Australian healthcare is funded through a number of complex arrangements (Duckett and Willcox, 2011; Hall, 2015). While Australia purports to have universal healthcare coverage, the reality is that most patients pay some form of co-payment and/or are privately insured. That notwithstanding, two levels of government

([1]) Although we use the generic term 'drug treatment', this is inclusive of alcohol, licit drugs used illicitly and illicit drugs.

([2]) Within each country, an institute or research body is usually responsible for filing that country's SHA return. The Australian Institute of Health and Welfare (AIHW) is responsible for the annual health expenditure estimates in Australia (Australian Institute of Health and Welfare, 2014).

fund healthcare in Australia — the federal (Commonwealth) government and the states/territories (the latter largely via tax transfers from the federal government to the states). Acute healthcare — hospitals and emergency departments — is funded by both levels of government, whereas primary healthcare (through general medical practitioners (GPs) in community settings) is funded solely by the federal government. The federal government also funds medications (through the Pharmaceutical Benefits Scheme). The more specific funding flows for drug treatment in Australia represent a complex set of arrangements from three levels of government — federal, state and local — along with numerous intermediary bodies. The full details of the Australian funding flows for drug treatment can be found in Chalmers et al. (2016).

The perspective taken for this study, as detailed below, is public expenditure funding only. We exclude all private and patient/client funding for healthcare. The focus is also only on funding from designated health departments. This is a limitation of applying the SHA to drug treatment where some drug treatment is not funded by government and it is not possible to differentiate, or it is funded by government departments other than health. These issues are discussed next.

First step: defining the scope of estimates and identifying the financing agents

The SHA (OECD et al., 2011) provides the following four criteria for establishing the bounds of the goods and services (activities) covered by health expenditure (pp. 55-56): (1) the primary purpose of the activity is health (improving or maintaining health, or preventing ill health); (2) the activity is provided on the basis of qualified medical or healthcare knowledge and skills; (3) the consumption is for the final use of healthcare goods and services of residents; and (4) some entity, not necessarily the recipient, pays for the healthcare activities (there is a transaction). The SHA identifies the range of health-related activities and services and it includes health promotion and prevention, treatment and rehabilitation, and ongoing or palliative care (p. 52). Australia's official estimate of health expenditure (Australian Institute of Health and Welfare, 2014) conforms to the international framework for health accounts (OECD et al., 2011) and creates a boundary for health interventions provided within healthcare settings, by health practitioners and funded by health departments. Already we see a potential issue for drug treatment — not all drug treatment is necessarily provided by healthcare practitioners (criterion 2), nor is it necessarily a transaction funded by health departments (criterion 4). For example, in the case of drug treatment in Australia, correctional services (such as prison and parole) provide considerable drug treatment. Non-healthcare practitioners, such as welfare officers, employment officers and correctional staff can provide drug treatment. Funding that sits outside the health department is not included within the SHA. Thus, in the work we present in this chapter, and consistent with the international framework of health expenditure, we do not include services funded by departments other than health or by non-government-funded sources of care (such as philanthropy). The extent to which this may underestimate the total health expenditure is an important consideration for each country. In the case of Australia, we suspect that most drug treatment is funded through public health departments and provided by healthcare services, and, as such, it is preferable to follow the boundaries given in international standards. This may not be true for other countries, notably developing nations.

Aside from defining the boundary around the health expenditure, a definition of drug treatment is required. In the work we completed in Australia, alcohol and other drug treatment was defined as 'that which is directed towards an individual regarding changing his/her alcohol or other drug use' (UNODC, 2006). This would include detoxification services, medication-assisted treatments, rehabilitation and counselling services. Under this definition, the authors excluded harm reduction interventions (such as needle syringe programmes) because they focus on reducing the harmful consequences of drug use, rather than the drug use itself ([3]).

Establishing the definition of drug treatment, and documenting the various treatment types, is an important step. The UNODC definition above is widely accepted. A useful reference may also be the WHO *Atlas on substance use* (WHO, 2010), which contains multiple descriptions of drug treatment types. The EMCDDA Treatment Demand Indicator (TDI) Standard Protocol (http://www.emcdda.europa.eu/html.cfm/index65315EN.html July 2000) defines treatment as 'any activity that directly targets individuals who have problems with their drug use and which aims to improve the psychological, medical or social state of those who seek help for their

([3]) Note that the EMCDDA TDI Protocol also excludes needle syringe services (Standard Protocol, July 2000, p. 18), unless they are provided as part of a treatment centre's activities.

drug problems' (p. 16). This definition is consistent with the UNODC definition ([4]).

We approached the exercise by developing a list of all the drug treatment interventions that could be included within the health expenditure accounts, and then deliberating on the inclusion/exclusion of each one in relation to its consistency with the SHA (OECD et al., 2011) criteria. Each country may come up with its own definition, and list of drug treatment types. In our Australian study, the following interventions were included: detoxification/withdrawal; counselling; therapeutic communities and residential rehabilitation; outreach support; assessment and case management; and pharmacotherapy — short-term medication prescribing or maintenance medications. This is consistent with the SHA (OECD et al., 2011) definition of health.

Having defined the boundary around health expenditure and drug treatment, it is also helpful in this preparatory stage to fully understand the various funding sources. This can be achieved through a systematic collation of information about drug treatment funding sources. Three strategies can be used: the first is a literature search (including grey literature), which identifies drug treatment funding sources in the country. This may include government reports and documents, along with research studies. The WHO *Atlas* may also be helpful in this regard (WHO, 2010). A second strategy is to take the list of treatment types (see above) and identify the funding sources for each of these. In our experience it is likely that there will be at least two or three different funding sources for each treatment type. Third, there is value in interviewing a number of treatment providers and asking them to describe their funding sources. This can sometimes reveal sources that are otherwise not identified. Understanding the funding sources for drug treatment is essential before beginning to assess the extent of expenditure. This preliminary step in documenting funding sources will reveal the different types of funds and the different 'buckets of money' from which drug treatment expenditure is drawn.

We appreciate that this is a challenging exercise. In our work, we identified more than 20 different funding sources in Australia and a complex array of funding flows, with many intermediaries between the funding source and the treatment provider (Chalmers et al., 2016). Nonetheless we argue that time spent in this preparatory phase, to understand the funding sources for the treatment types, is time well spent, as it will assist when the actual expenditure estimates (the amounts of money) are undertaken. The lists of drug treatment types and funding sources may also be useful as a stand-alone exercise for countries where expenditure estimates cannot be provided.

Next step: categorisation

The SHA (OECD et al., 2011) provides three 'axes' for categorising health accounts:

1. healthcare functions;

2. healthcare providers;

3. financing schemes.

These axes provide three different dimensions or ways of structuring health accounts. Each axis has a specific classificatory structure. While there is not such a precise match made clear in the SHA (OECD et al., 2011), if we take the first axis, referring to healthcare functions, i.e. in the accounting process, all the resources involved in the process of satisfying health needs are identified. The second axis refers to the type of healthcare provider, i.e. the accounting process captures all the organisations and actors involved in the provision of healthcare; and the third axis refers to the financing schemes (such as national health service, social health insurance and voluntary insurance). The SHA (OECD et al., 2011) notes that the first axis, healthcare by function, is the preferred axis on which to build expenditure estimates because it is seen to be the most inclusive (healthcare which has been 'consumed' needs to also have been 'produced' and 'financed') and the most consistent with the main aim of this study, i.e. to estimate health expenditure with the purpose of treating drug dependence. The 'healthcare function' axis also aligns well with the four criteria referred to earlier (the primary purpose of the activity is health; the activity is provided on the basis of qualified medical or healthcare knowledge and skills; the consumption is for the final use of healthcare goods and services of residents; and some entity, not necessarily the recipient, pays for the healthcare activities). However, as noted earlier, drug treatment sits at the boundary of these criteria and is not always provided by qualified medical personnel, and so on. For that reason, a single axis of the SHA may not suffice.

In our study, we explored each of the three axes in relation to the structure of drug treatment provision

([4]) It should be noted, however, that the TDI Protocol does not define inclusion based on this definition of treatment, but rather it defines inclusion based on the identification of the treatment centres, which are of five basic types: outpatient services; inpatient/residential services; low-thresholds service; treatment offered by GPs; treatment units in prison (TDI Standard Protocol, 2000). It is solely these units that are included in the identification of cases for treatment in the TDI.

and expenditure in Australia before selecting the most appropriate and most simple SHA classificatory system to use. Thus, for the purposes of estimating drug treatment health expenditure, selecting and categorising the expenditure can be done according to healthcare functions (axis 1), healthcare providers (axis 2) or healthcare financing schemes (axis 3). Categorisation of health expenditure by healthcare functions could follow the types of drug treatment provision, i.e. withdrawal, rehabilitation, pharmacotherapy maintenance, and so on. Thus, expenditure in each of these categories would be calculated. Alternatively, health expenditure can be calculated in terms of providers. In the SHA (OECD et al., 2011) the categories of providers include organisations such as hospitals, ambulatory care providers, and so on. This second axis (healthcare providers) is consistent with the current EMCDDA TDI Standard Protocol, which identifies the drug treatment centre types (e.g. inpatient, outpatient). For estimating drug treatment expenditure, however, it may be more relevant to conceptualise provider types by practitioners (such as medical doctors, including addiction medicine specialists, psychologists, social workers, drug workers/counsellors and pharmacists), rather than by type of treatment centre. Categorisation by practitioner type is helpful for thinking through the types of expenditure data because in many instances the type of expenditure data is linked to the type of practitioner. For example, in Australia GPs are funded through Medicare (which reimburses practitioners for each unit of service they provide), whereas drug treatment workers are funded through block grants provided to non-governmental organisations (NGOs). However, the problem with using only provider type (axis 2) is that it becomes unnecessarily complicated because most of the practitioners work together (in clinical teams) at any one site (or organisation). The third categorisation option is financing scheme. Here, the different financing schemes can be categorised: for example, government block grants, activity-based funding (ABF), public healthcare (e.g. Medicaid, Medicare).

In our study, we considered all three category types (functions, providers and financing schemes), which assists in ensuring that all types of health expenditure have been identified. Understanding the different types of expenditure across functions, providers and financing systems is, in our opinion, the only way to establish a clear approach to estimation of health expenditure. Then, in an ideal world, one of the category systems from the SHA would be selected and applied. In our study; however, it became apparent that not one of the three axes or categorisation systems alone would be suitably straightforward and simple, accommodate the variety of data sources available and ensure no overlap. For example, if hospitals (a provider) are all funded through a particular mechanism, it is sensible to choose the hospital category (and hence axis 2, providers) as the system to use. However, many treatment types are provided by multiple and different providers. In another example, if pharmacotherapy treatment (a function) is funded through a singular mechanism (whether provided in a hospital or in a community setting), then that categorisation system (function) may make the most sense. But this may not apply to other functions, such as withdrawal treatment, which can be provided in hospital or a community setting and by multiple practitioners (resulting in multiple expenditure data sources for those other functions). The target is to find a systematic way of categorising the types of expenditure that is pragmatic, is suitable for the data available, and does not entail unnecessarily complicated accounting work in order to use the categorisation. It is essential that the categories chosen are mutually exclusive — so that expenditure is not double counted.

Taking into account the difficulty in directly applying the classification suggested by the SHA, this study used the following mutually exclusive categories to classify health expenditure on drug treatment in Australia:

1. NGOs funded by government: national (federal) funding and state funding;

2. hospitals: public and private hospitals receiving funding from government;

3. primary care (community-based) services provided by GPs and allied health professionals;

4. pharmaceutical medication (Pharmaceutical Benefits Scheme).

In our pragmatically oriented approach, we did not confine ourselves to only one SHA axis (function, provider or financing), but we used a blended approach that made sense in terms of the separate 'buckets of money' spent on drug treatment in Australia. In the main, however, the categorisation largely follows the second axis approach, in which health accountancy is organised by provider type (NGOs, hospitals, GPs and allied health professionals) ([5]), with the exception of the pharmaceutical medications, which is a function, not a provider type ([6]). The four categories above are also largely distinguishable by financing mechanism: government funding to non-governmental treatment providers is via block grants; hospital funding is largely ABF in Australia (Eagar, 2010; Health Policy Solutions et al., 2011); pharmaceuticals are

([5]) And aligns with the SHA sub-accounts of, respectively HP.3.3 and HP.3.4; HP.1.1 and HP.1.2; HP.3.1.1 and HP.3.3.
([6]) And aligns with HC.5.1.1.

funded by the federal government at a unit cost per drug; and primary care services are funded through government reimbursement to the practitioner on a fee-for-service basis ([7]).

As noted previously, ensuring that there is no double counting is important. For example, in the case of hospitals, medications are provided for inpatients but are funded through the hospital funding system, not the pharmaceutical medications systems (which is confined to ambulatory care). Thus there is no double counting of medication expenditure between the two categories in our study. Each category needs to be reviewed for possible overlap with other categories.

In summary, categorisation for the Australian case example was largely by provider type, which usefully aligned with the different financing systems. This categorisation was the most appropriate for Australia, but it may not be as applicable in another country. Again, laying out all the functions, providers and financing systems will assist in identifying the most pragmatic categorisation for the health expenditure estimate in a country.

Third step: collating and counting the expenditure

Having established mutually exclusive categories of health expenditure on drug treatment, the next step is to calculate the expenditure for each of these items. Methods may vary depending on what data are available and the extent to which individual client versus total budget costs are available. Here we provide the detailed methods for the four categories used to assess Australian health expenditure on drug treatment. It is more complicated than it seems at first sight and, while each country will be unique in terms of its categories, systems, data availability and accounting records, it is hoped that, by providing a worked example, insights for other countries will be possible. The full details of the expenditure estimates and the results can be found in Ritter et al. (2015), including the supplementary information associated with the paper.

Non-governmental organisations

Drug treatment is largely provided by NGOs in Australia. The funding may be sourced from different levels of government: federal, state or local. In Australia, both federal and state governments provide funds to NGOs to deliver drug treatment. These funds are provided as block grants, specifically for drug treatment, and hence the expenditure estimate here is relatively straightforward: the total value of all grants awarded to NGOs to provide drug treatment. The expenditure estimates are generally labelled as public expenditure for drug-related initiatives, but one needs to know the programme name (in order to find it in budget papers ([8])) and also to extract any non-treatment activities from those accounts.

In an ideal world, each government would be able to provide a publicly available account of its expenditure (grants provided) to NGOs for drug treatment. In reality, there may be concerns about confidentiality, and data may be aggregated at such a level that drug treatment may not be distinguishable from other grants provided to NGOs. Furthermore, the opportunity to identify expenditure by type of drug treatment, such as withdrawal compared with pharmacotherapy maintenance, would be ideal in terms of analysing trends within drug treatment budgets and assessing efficiency, but achieving this level of detail was not possible in this study.

For the federal government estimate, two specific grant schemes covered federal expenditure in relation to drug treatment (see Ritter et al., 2015). In Australia, the details of these schemes and the grant amounts can be found in a number of different sources: notably published public records and direct from the federal government. Where possible, it is helpful to use two or more different sources as a check on the reliability of the figures. We found that our sources did not match perfectly (Ritter et al., 2015), and we took a middle point ([9]).

For state governments (of which there are eight in Australia), a different approach was taken. Public records are not available at state level, so we conducted interviews with senior health officials in each state and requested their expenditure estimates. The key challenge with this approach is that each state records expenditure in a slightly different way, and at different levels of detail. For example, in some cases, the data provided were highly detailed, down to individual programmes and organisations that were funded. In other cases, total spending figures

([7]) These financing schemes align with SHA sub-account HF.1.1 but describe the mechanism of payment.

([8]) In our case the two programmes were the Non-Government Organisation Treatment Grant Program (NGOTGP) and the Substance Misuse Service Delivery Grant Fund (SMSDGF).

([9]) The size of the difference was AUD 18 000 (the total federal government estimate was AUD 130 281 000 — see Ritter et al., 2015).

were provided. While we requested only expenditure on treatment, as per the definition given earlier, we were aware that in some cases the state governments were unable to provide a single figure for drug treatment, and their estimates included some prevention and/or harm reduction activities. In some cases this was readily identifiable (such as needle and syringe programmes), while in other cases the prevention and harm reduction activities could not be identified and excluded. This introduced some uncertainty into the estimation and it highlights one challenge of using a boundary between drug treatment and harm reduction services.

The year of the estimate needs to be consistent within this single category and between all categories. The choice of a reference year is somewhat arbitrary but should reflect the year for which most data are available. Data that pertain to years other than the reference year require adjustment with a price index, such as the consumer price index, so that expenditure is presented in constant terms. Furthermore, where data are from different years, a qualitative assessment of any major shifts in demand for treatment or shifts in government policy may be required. If there have not been major shifts in treatment demand or government policy since the year of the estimate, data from years other than the reference year can more reliably be interpreted as consistent with the reference year. It is important to document the likelihood of these impacts.

Hospitals

Hospitals provide a variety of drug treatments to admitted clients; in Australia, they are largely focused on withdrawal (detoxification) and counselling services. The approach to estimating hospital expenditure will vary depending again on available data and the financing system in use. In Australia, hospitals are funded through a combination of block grants and ABF. These two different systems need to be taken into account when estimating expenditure. The detailed calculations, including those for private hospitals ([10]) compared with public hospitals, can be found in Ritter et al. (2015).

For the ABF component of hospitals (which represents most of the funding), the number of hospital separations ([11]) by diagnostic code is available, along with the costs attached to those diagnostic codes, as derived from the ABF approach. The ABF approach for hospitals is internationally recognised (Eagar, 2010; O'Reilly et al., 2012). The basis of ABF (also called case-mix or episode of care funding) is the grouping of care for similar conditions with similar costs (that is, the activity is defined and classified into a discrete number of groups based on data about costs). The Australian ABF ([12]) has an elaborate classification system of several hundred diagnostic-related groups (DRGs) ([13]). Each care episode is allocated a DRG code by computer software based on clinical coding in medical records, which forms the basis of the payment.

A price is assigned to each DRG. There is a difference between the 'price' — which is the payment amount — and the 'costs', which is the total cost of providing the services for that specified DRG. While cost data are used to determine the DRG categories, the setting of the price paid is a different exercise. The agreed price paid may be set low to encourage technical efficiency or it may be set high to encourage certain types of practices/care (allocative efficiency). In Australia, the prices for public hospital services (activities) are set by an independent body, the Independent Hospital Pricing Authority (IHPA), in order to minimise political influence on price setting. Setting the price can occur either for each DRG (segmented approach) or by using a standard price (national efficient price) and then each DRG is weighted against that price. The latter system is used in Australia. The IHPA sets a single benchmark efficient price for all hospital services, called the national efficient price (NEP), and payments for specific activities (separations) are then calculated using payment weights, or national weighted activity units (Independent Hospital Pricing Authority, n.d.).

The exercise of estimating expenditure on drug treatment through hospitals, then, it is the multiplication of the number of diagnostically relevant separations by the appropriate unit cost, as specified under ABF. While that sounds relatively straightforward, there are a number of intricacies involved. Here we use the example of which diagnostic codes to use. First, one must decide between only using the primary diagnosis or including secondary diagnosis. The rationale for primary diagnosis only is that we are interested in drug treatment expenditure (not expenditure associated with hospitalisations and medical care for other conditions that may be compounded by alcohol or drug disorders). Hence the primary diagnosis alone was used. Second, one needs to choose which diagnostic system, as there is more than one. In Australia, hospitals code separations use two different codes:

([10]) In Australia, the federal government subsidies a proportion of private hospitals. Only federal government funding for private hospitals was included.

([11]) 'Separations' is the term used in Australia to refer to a single episode of care in a hospital.

([12]) Australian public hospital services' ABF is reputed to be one of the most sophisticated ABF systems in the world and has been sold to a number of other countries.

([13]) The DRG is determined by computer software using information from a number of variables including principal diagnosis (i.e. the ICD code), secondary diagnoses (complications and comorbidities), significant operating room and/or non-operating room procedures, age, sex, length of stay (same day/multi-day), and discharge status.

diagnostic codes (ICD-AM diagnosis of abuse and dependence — Australian modification) and DRGs (major diagnostic groups, classed together because of similarity in treatment approach) (O'Reilly et al., 2012). Neither of these codes (ICD-AM diagnosis or DRG) is a perfect match with the definition of drug treatment. In the main, drug researchers have tended to use the ICD codes to identify admissions related to alcohol and other drugs (Australian Institute of Health and Welfare, 2013) but these clearly overestimate hospital admissions for treatment and can be more correctly labelled 'hospitalisations associated with drug use' (Australian Institute of Health and Welfare, 2013, p. 86). The way in which hospitals are funded through ABF uses the DRG (rather than ICD) and for this reason — because it is more likely to reflect treatment received — the DRGs were used for Australia ([14]) (see also Ritter et al., 2015, for more details). This is merely by way of demonstrating that the decisions made during the analytical procedure, such as which diagnostic system to use to code hospital separations, will impact on the expenditure estimate, and they should be fully documented. To summarise, for our Australian estimates of hospital-based drug treatment, we established the number of treatment episodes that were provided in Australian hospitals (called 'separations') using the DRG codes in our reference year, using primary diagnosis only (because we wanted to count drug treatment, not other healthcare treatment). We then applied the weighted NEP to these, to give us the expenditure by government (the amount they paid the hospitals for the care provided).

A central issue here is the use of an activity-based costing approach, conforming to a more bottom-up method than largely top-down methods (which divide total budgets by the amount of drug treatment activity). While there is no definitive definition of top-down versus bottom-up estimation methods, we consider top-down to be an estimate that derives from a total budget, which may then be divided by the amount of activity under interest. Bottom-up is when individual activities are costed (usually at the client level) and then summed. In our work, the hospital ABF approach is nearer to bottom-up (the multiplication of numbers of clients by a unit cost), whereas the estimates of the government spending on NGOs are more like top-down to the extent that they are total expenditure figures from government; and the pharmaceutical cost estimates are definitely top-down inasmuch as they involve taking a labelled budget expenditure item (pharmaceuticals budget in Australia) and dividing by the amount of drug treatment prescribing. In an ideal world there would be complete consistency across all the estimates: that is, either an activity-based or bottom-up costing approach would be used for all expenditure categories, or a top-down approach would be used consistently. Top-down approaches can produce higher estimates (Chapko et al., 2009; Mercier and Naro, 2014). Therefore, where the methods vary, it is prudent to conduct some kind of cross-check of the figures. We did this for the Australian hospital data: comparing the ABF approach with a top-down accounting approach. We found that a total of AUD 53.5 billion was spent on Australian hospitals in 2011/2012 (Australian Institute of Health and Welfare, 2014), of which 70 % was spent on admitted clients. The percentage of drug treatment separations can be calculated from the total number of separations for admitted clients (Australian Institute of Health and Welfare, 2014) — in our case it was 0.71 % (Ritter et al., 2015), resulting in a top-down expenditure estimate of AUD 264 699 445. This is lower than the estimate obtained with the main method (AUD 313 169 372).

Primary care (community-based) services provided by GPs and allied health practitioners

As with all the other categories, a thorough understanding of how primary care works and the ways in which practitioners and services are funded is essential. In Australia, primary care is funded by the federal government through a universal healthcare scheme (Medicare). Where such a scheme exists, and specific details of drug treatment are recorded and published (such as 'item numbers', as they are called in Australia), the calculation can be relatively straightforward. Unfortunately drug treatment does not have its own item number in the Australian coding scheme (and we suspect in many other countries as well). This then requires sampled data about the extent of drug treatment activity within primary care settings.

In Australia, an annual survey is conducted (known as BEACH), which collects data from a sample of around 1 000 GPs, who each record details of about 100 consecutive consultations. The database contains details of approximately 100 000 consultations per year, including the problems managed and how they are managed, for each patient for whom a clinical service is provided by the participating GP (Britt et al., 2010). It also includes details of prescribing, which we used for the pharmaceutical medications estimate (see below). The extrapolation

([14]) The relevant *International statistical classification of diseases and related health problems, 10th revision, Australian modification* (ICD-10-AM). Seventh edition codes for principal diagnoses were F10 (alcohol), F11 (illicit opioids), F12 (cannabinoids), F13 (benzodiazepines), F14 (cocaine), F15 (stimulants, including amphetamines, pseudoephedrine, volatile nitrates and caffeine), F16 (hallucinogens, including LSD and ecstasy), F18 (volatile solvents), and F19 (multiple drug use and use of other psychoactive substances). We included separations where the Australian national DRGs (AN-DRGs) were intoxication and withdrawal or alcohol and other drugs disorder and dependence (V60A, V60B, V61Z, V62B, V63Z, V64Z).

method we used to get from sample to national estimates is fully described in Britt et al. (2010, 2014) ([15]). This provides the basis for an Australian expenditure estimate for drug treatment in primary care settings. If there is no ongoing survey of primary care services within the country, an alternative approach may be to use published research studies regarding sampled primary care services. The representativeness of any sampling is crucial in deciding whether the data are suitable for use in developing a national estimate. In the BEACH data, the representativeness of the final weighted age-sex patient sample of encounters is compared with that of patients at all encounters claimed (excluding those with Department of Veterans' Affairs (DVA) patients) as GP consultation service items through Medicare in the 2013-14 study period (data provided by the Department of Health). In each year, there is an excellent fit in the age-sex distribution of patients at the weighted BEACH encounters with that of the Medicare Benefits Schedule (MBS) claims distribution, with most precision ratios within the range 0.91-1.09 (Britt et al., 2014) ([16]).

Sampled data identifying the number of drug treatment services provided can then be multiplied by the unit cost per treatment (or occasion of service). In our case we used the price paid by the government to the providers (MBS ([17])) (refer to Ritter et al., 2015, for details). As with the hospital estimates, the amount therefore reflects the price the government pays for the service, not the cost of delivering the service. The MBS of fees is set by the federal government and is the amount the government considers appropriate and fair for each service type. The schedule fee for an item is determined at the time of listing and calculated in consultation with the medical profession. It takes into account the direct and indirect costs of providing the service (e.g. the length and complexity of the service, any consumables used, administrative costs and rent for premises). The schedule fees for MBS items are generally indexed yearly by a combination of a wage index (the safety net adjustment) and the consumer price index. However, some MBS items, for example pathology and diagnostic services, have not been routinely indexed since 1998 ([18]).

We compared the primary method we used here (more bottom-up) with a top-down approach (dividing the total primary care budget by the proportion of occasions of service represented by drug treatment). In our work, the top-down calculations resulted in a higher estimate (AUD 70 million) than the main calculation (AUD 53 million) (Ritter et al., 2015).

The boundary around primary care services, and the extent to which other drug treatment is provided by practitioners other than those whose services are recorded in the data, is of concern. In the Australian example, only GPs were included in the BEACH data, but we are aware that psychiatrists and physicians also provide drug treatment in primary care settings. These were not able to be included in the Australian estimates. Specification of the limitations and exclusions in any estimation is essential.

Another important expenditure item is the allied health services provided in primary care settings. The extent to which national administrative data (such as 'item numbers') or national regular survey sampled data (such as BEACH data) are available varies. In Australia, expenditure on allied health services is not available from either of these sources. As a result, we turned to research studies of allied health services to ascertain expenditure. The use of research studies or published evaluations is a valuable approach when systematic administrative data are unavailable, but this approach is limited by concerns about generalisability and representativeness.

In Australia we identified two specific schemes ('Better Access' and 'ATAPS') that are programmes aimed at improving access to allied health services for people with mental health problems, inclusive of alcohol and other drug use disorders. Both programmes provide treatment for alcohol and drug use disorders, so they meet the definition of treatment used across the study. But directly labelled expenditure items for the programmes were not available. As a consequence, we turned to published evaluations that included budget data (details can be found in Ritter et al., 2015). This small example highlights the inherent limitations of any expenditure estimate — it is driven by knowledge of programmes and services and/or funding schemes as well as available data. We were able to include some allied health expenditure estimates for drug treatment in Australia. This may not be the case in other countries, where services cannot be readily identified or

([15]) The annual rate per 100 encounters is extrapolated to national estimates based on the number of Medicare GP consultation items claimed in that year. For example, in 2013-14, 133.4 million GP service items were claimed. Depression was managed at a rate of 4.3 per 100 GP encounters in 2013-14. Hence the Australia-wide estimate was (4.3/100) × 133.4 million = 5.7 million times (Britt et al., 2014).

([16]) Occasionally, where participants in a particular age or sex group are over-represented or under-represented, GP age-sex weights need to be applied to the datasets in post-stratification weighting to achieve comparable estimates and precision. Because there are always marginal (even if not statistically significant) differences, even in years where the BEACH participants are representative in all age and sex categories, post-stratification weighting is applied for consistency over recording years. In addition, because each GP provides data on 100 consecutive encounters, the data are assigned another weight directly proportional to the activity level of the reporting GP (where GP activity level is measured by the number of MBS general practice service items claimed by the GP in the previous 12 months).

([17]) MBS online: http://www.mbsonline.gov.au/internet/mbsonline/publishing.nsf/Content/Home accessed 20 June 2017.

([18]) MBS Online: http://www.mbsonline.gov.au/internet/mbsonline/publishing.nsf/Content/Home accessed 20 June 2017.

where services have not been subject to evaluations from which data can be drawn.

Pharmaceutical medications (Pharmaceutical Benefits Scheme)

In the first instance, understanding the kinds of pharmaceutical medications used in the treatment of alcohol or other drug use disorders and how they are provided and funded is important. For example, as noted earlier, hospitals provide medications, but this cost is included within the above expenditure estimate. So, for Australia, we need to estimate only medications provided as part of ambulatory care (in general medical practice settings). Ideally one would have data concerned with the extent of prescribing for drug treatment, the specific types of medications and the number of prescriptions, so that government expenditure on those medications can be apportioned. The extent to which all these data are available in any one country will vary. In Australia, we do not have data on all prescribing for drug treatment (there are data on all prescribing, but they are not distinguishable by the condition for which the prescription is made). In this circumstance, we have to return to the use of sampled data and assume that the sample is representative of the whole country.

In Australia, medications are funded through the Pharmaceutical Benefits Scheme (PBS). There are readily available data sources for the expenditure on the PBS in Australia (for example Australian Statistics on Medicines: http://www.pbs.gov.au/info/browse/statistics). It is hoped that other countries also have government reports detailing total expenditure on prescription medications. In a top-down approach, these total spending figures can then be divided by the amount of GP prescribing that is drug treatment specific (from the BEACH sampled data described earlier). The key assumption here is that the medications used in drug treatment cost the same, on average, as all other medications. This top-down method, as discussed earlier, would ideally be compared with a more bottom-up estimate. Unfortunately we had no way of doing this, given the data limitations in Australia.

One specific type of medication used in drug treatment is opioid agonist medication (methadone and buprenorphine). In Australia these two medications have a separate funding stream and hence are readily identifiable in government reports (i.e. labelled expenditure). It is important, therefore, to account for these separately (and remove them from the top-down estimate to avoid double counting). These calculations can be seen in Ritter et al. (2015). There may be other special medications in other countries that are confined to drug treatment that also require such special treatment.

There are other costs within this category of pharmaceutical medications, such as diagnostic testing and pathology, that are very difficult to estimate accurately (see Ritter et al., 2015). All such exclusions should be noted in the analysis.

Concluding comments

As we have demonstrated in this paper, there are four key stages that are essential when estimating drug treatment health expenditure:

1. Understand the system, the providers, the financing approaches and the treatment types. Each country and health system is different; detailed understanding of the system will be invaluable in dealing with the micro-issues around the expenditure.

2. Be pragmatic in making decisions about the approach: there will always be uncertainties, and having a completely standardised method for every number generated is unlikely to be feasible.

3. 'The devil is in the detail'. In other words, as one burrows into the actual estimation, there will be many decisions to be made, assumptions to be dealt with and uncertainties to manage.

4. The documentation of all decisions made, no matter how trivial, is essential for research transparency and replication.

Beyond the development of the health expenditure estimate, there are further important analyses — such as reporting the results in terms of confidence intervals and conducting sensitivity analyses. These are the next steps once the drug treatment health expenditure has been estimated ([19]).

No method is perfect — any expenditure estimate for drug treatment will be a series of compromises. There will always remain assumptions and unknowns in these analyses. Each time such an analysis is undertaken, there

([19]) Note that capital expenditure has not been explicitly covered, except where capital expenditure forms part of the expenditure estimate, which is the case for the Australian hospital estimate, where the NEP is inclusive of capital expenditure. The SHA manual (OECD et al., 2011) provides some details regarding capital items and the approach taken in the international health accounts system.

is opportunity for improvements in the estimation and the associated methods. The use of the SHA (OECD et al., 2011) is encouraged because it provides the potential for an internationally consistent approach.

The purpose of these health expenditure estimates is to enable analysis of trends over time within any one country (including changing trends in funding sources as well as amounts and distribution between functions) as well as cross-country comparisons. This is not an end in itself, but rather contributes to the possibilities for policy reform, improvements in treatment service systems and hence improvements in health outcomes.

Acknowledgements

This paper draws on work funded by the Commonwealth Department of Health as part of the Review of Alcohol and Other Drug Treatment Services in Australia. Alison Ritter is a National Health and Medical Research Council Senior Research Fellow (APP1021988).

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II

SECTION II

Focusing on labelled expenditure

Overview

Chapters 2, 3 and 4 present different methods used to estimate drug-related public expenditure based mostly, but not only, on data identified as drug-related expenditure, i.e. labelled expenditure. Data sources used to compile labelled expenditure were mostly public accountancy documents or key experts' advice. Sanja Mikulić, in Chapter 2, shows the method applied to make a systematic data collection of labelled public expenditure on drug abuse treatment in Croatia. The author made a systematic review of public accountancy documents from the state and local and regional self-government units, and consulted the financial plans of public bodies and the budgets of institutions treating drug misuse. To assess the data collected, a questionnaire was sent to the entities responsible for implementing the national drug strategy. Despite the success in developing comprehensive estimates, this study describes the difficulties of identifying all sources of public expenditure on drug treatment in Croatia.

In Chapter 3, Jiri Vopravil describes the data collection exercise developed in the Czech Republic, a country where data on drug-related labelled public expenditure on treatment are compiled annually. One important data source for Vopravil was the executed budgets of ministries with drug programmes. Data either are collected from budgetary documents or are provided by representatives of individual ministries, governmental institutions and regional drug policy coordinators. In this country, despite the public accountancy system providing annually available data on labelled drug-related expenditure, it is not possible to differentiate between spending on harm reduction and drug treatment.

In Chapter 4, among other topics, György Hajnal and Iga Kender-Jeziorska describe the use of interviews of experts as a method of compiling information on data sources, and methods for estimating or contextualising the results of estimates in Hungary. The authors discuss the usefulness and the validity of this method, especially for countries hampered by scarce data and poor-quality data or exposed to high-risk biased data. There was the concern that data reported would be biased, as the financing of the data providers can depend, at least partly, on their reporting. In this context, the authors discuss how to achieve the best possible estimates in the face of limited data availability.

2

CHAPTER 2

Estimating labelled public expenditure on drug treatment in Croatia

Sanja Mikulić

Introduction

For many years, there were no available data on public expenditure on drug abuse treatment in Croatia, as there were no data encompassing all types of labelled and unlabelled public expenditure. Therefore, in cooperation with the Institute of Economics, the Office for Combating Drug Abuse conducted a research project, 'The study of public expenditure and the establishment of performance indicators in the field of combating drug abuse in the Republic of Croatia', in 2012 (Budak et al., 2013). The objective of the project was to analyse public expenditure in the area of combating drug abuse and to propose a system of performance indicators for systematic monitoring of the results and the use of public funds for combating drug abuse in the Republic of Croatia. The research involved major stakeholders in the area of combating drug abuse, ministries and public institutions at the state level, counties and institutions at the country level, and civil society organisations active in the areas of addiction prevention, law enforcement, treatment, harm reduction and social reintegration of drug users.

This study describes the method used to compile the data on labelled drug-related public expenditure on drug treatment.

Institutional framework

In Croatia, there are several types of treatment provided to drug users: inpatient and outpatient treatment provided by medical facilities and hospitals; and treatment and psychosocial rehabilitation, carried out in therapeutic communities.

Outpatient treatment is the main form of treatment for drug-dependent persons not only for opiate users, but also for users of other types of substances. It is carried out in services responsible for implementing prevention initiatives and for the outpatient treatment of drug dependence within the county institutes for public health. The most common form of treatment carried out in the services is opioid substitution therapy (OST), with the support of methadone or buprenorphine. The same treatment units providing OST also provide other types of health services to drug users: psychosocial treatment; screening of urine for the presence of drugs and their metabolites; testing of capillary blood for human immunodeficiency virus (HIV), hepatitis C virus (HCV), hepatitis B virus (HBV) and syphilis; somatic reviews; and a number of preventive and educational activities, as well as other specific methods and procedures in accordance with the needs of the users. In 2013, the prevalence of opiate users in the total number of persons treated was similar to previous years and amounted to 80 %. In terms of the main substance used by opiate users, the most frequently used was heroin, while the most commonly used substance among non-opiate users was cannabis. Most opiate users are on some form of substitution therapy. Within the Croatian health system, inpatient treatment is provided in hospitals. This is available in different types of hospitals. Treatment is provided at psychiatric hospitals, at addiction departments in general, county and university hospitals, and at the prison hospital in Zagreb. As addiction requires long-term care and follow-up after hospital treatment, outpatient treatment is provided by the mental health and addiction prevention service and/or in one of the therapeutic communities in Croatia.

There are eight therapeutic communities providing treatment and psychosocial rehabilitation to drug users, as well as provision from NGOs and religious communities. By fulfilling certain conditions, therapeutic communities can get a contract on a permanent base with the Ministry of Social Policy and Youth. In these cases, the costs of the services are funded as ongoing activity by the Ministry.

According to the Law on Combating Drug Abuse ([1]), the responsibility for financing drug treatment programmes lies with the Ministry of Health, whereas the delivery of drug treatment programmes is the responsibility of the services for addiction prevention and hospital institutions. They are financed by the Ministry of Health for the implementation of their work programmes, while the Croatian Institute for Health Insurance (social security) and local government are responsible for the administrative and basic operational costs (staff and utilities costs). All programmes to treat drug misuse are funded by public funds.

Methods of estimates

As defined by the EMCDDA, drug-related labelled expenditure comprises those funds allocated by governments to spend on programmes to tackle the illicit drug phenomenon, which are identified as such in the budget ('labelled') ([2]). Therefore, in this study, drug-related labelled expenditure includes all expenditure referenced as drug related and found in public accountancy with the keywords 'combating drug abuse and drug addiction', 'social reintegration' and 'addiction treatment' as part of their description, and similar activities listed as special programmes, activities or projects in the state budget, budgets of local and regional self-government units, financial plans of public bodies and budgets of other institutions active in different aspects of combating drug abuse.

The data gathered and used to estimate labelled drug-related public expenditure in Croatia were based on the analysis of documents and data ([3]), on the findings of a questionnaire sent to all entities, and on interviews with key stakeholders in this field. Each ministry and other central and local government units and institutions responsible for the implementation of the national drug strategic documents ([4]) were asked to specify labelled expenditure from 2009 to 2012. In the questionnaire that was specifically created by an expert team from the Institute of Economics for the purpose of the study (available in Budak et al., 2013), all surveyed institutions had to enter drug-related public expenditure in the national currency as specified in their annual budgets.

In addition to the data on labelled expenditure collected through the questionnaire, the state budget data available from the Ministry of Finance were also consulted (Švaljek and Budak, 2014).

Classifying drug-related expenditure

In order to identify the different elements of drug-related expenditure, the activities conducted by public bodies to combat drug abuse and financed from state or county budgets were grouped in accordance with the division provided by Reuter (2006). The classification was extended to include social reintegration, resulting in five groups of activities: addiction prevention, treatment, social reintegration, harm reduction programmes and the penal system. Total public expenditure in the area of combating drug abuse was also broken down by the five relevant international COFOG categories: general public services, public order and safety, health, education and social protection.

Table 2.1 gives an overview of the relevant public expenditure groups used by public institutions involved in activities aimed at combating drug abuse in Croatia, broken down by the main public functions using the COFOG system.

([1]) Law on Combating Drug Abuse (OG 107/01, 87/02, 163/03, 141/04, 40/07, 149/09, 84/11, 80/13).

([2]) See http://www.emcdda.europa.eu/topics/drug-related-public-expenditure

([3]) Strategy and related documents: National Strategy on Combating Narcotic Drugs Abuse in the Republic of Croatia 2006-2012, Action Plan on Combating Narcotic Drugs Abuse for the period 2009-2012, Annual Implementing Plan of the Action Plan on Combating Narcotic Drugs Abuse, County Action Plans on Combating Narcotic Drugs Abuse 2009-2012, reports on the implementation of the National Strategy on Combating Narcotic Drugs Abuse in the Republic of Croatia, Strategic Plan of the Office for Combating Narcotic Drugs Abuse (2012-2014), budgetary statistics of the Ministry of Finance (Implementation of the State Budget of the Republic of Croatia for the period 2009-2011, implementation of the budgets of local and regional self-government units for the period 2009-2011).

([4]) Office for Combating Drug Abuse, Ministry of Health, Ministry of Social Policy and Youth, Ministry of Defence, Ministry of Science, Education and Sport, Ministry of the Interior, Ministry of Finance — Customs Administration, Ministry of Justice, Croatian Institute for Health Insurance, Croatian National Institute of Public Health, Croatian Employment Service, counties, NGOs.

TABLE 2.1
Public expenditure according to the classification of public functions

Public functions	Sub-categories of public functions
01 General public services	014 Basic research
03 Public order and safety	031 Police services
	033 Law courts
	034 Prisons
07 Health	071 Medical products, appliances and equipment
	072 Outpatient services
	073 Hospital services
	074 Public health services
	075 R&D
09 Education	091 Pre-primary and primary education
	092 Secondary education
	094 Tertiary education
	095 Education non-definable by level
	096 Subsidiary services to education
10 Social protection	105 Unemployment
	106 Housing
	107 Social exclusion

Source: Institute of Economics, Zagreb, 2013.

For the identification of treatment costs, the relevant budget expenditure was public function 07 Health (COFOG definitions) and its sub-categories and treatment programmes (Reuter's definition).

In the questionnaire, the institutions responsible for drug treatment (i.e. the Ministry of Health, the Ministry of Social Policy and Youth, the Croatian Employment Service, the Croatian Public Health Institute, the Croatian Health Insurance Agency, the Office for Combating Drug Abuse and all Croatian counties) were asked to classify budget expenditure by public functions and by the type of programme using the COFOG categories and Reuter's categories (Reuter, 2006).

Direct participation of relevant ministries and other public bodies was necessary, to provide help to classify labelled public expenditure according to activities, based both on the Reuter categories and on the COFOG categories. Experts were, therefore, invited to interviews and were selected upon recommendation and their track record of cooperation with the Office for Combating Drug Abuse of the Government of the Republic of Croatia. The refined selection criteria aimed to create a representative pool of experts representing each institution, comprising at least one budgetary/financing expert, one drug-related programme expert and one 'hands-on' implementation expert.

The interviews were also used to help classify labelled expenditure and identify unlabelled expenditure. Certain public bodies responsible for drug policy do not have a special allocation for drug-related initiatives in their budgets. Instead, financing is carried out in the framework of regular activities. Institutions were expected to assess part of the funds for their regular activities, aimed at drug policy activities.

Prior to the interviews, the invited experts were provided with the previously collected data on labelled expenses reported in their institutions' budgets for 2009-12. For each institution, the preliminary indicators to estimate unlabelled expenditure were listed (Budak et al., 2013). The questions developed in the interview guides were: 'Please describe your institution's activities that might be related to drug control'; 'Which activity do you consider to fall into prevention, treatment, harm reduction, law enforcement and social integration?'; and 'What portion of your institution's regular activity could be attributed to each programme, and why?' In the course of the interview, questions were directed towards exploration of topics related to assessing and allocation of activities to a particular programme. There were two interviewers present at each interview. One asked questions, while the other one made notes, and their roles were reversed in consecutive interviews. Afterwards, notes were transcribed and sent to interviewees for verification and amendments. Verified notes were used for estimating the structure of unlabelled public expenditure by the type of programme. All interviews were conducted face to face. The average duration of the interview was 90 minutes. In total, 88 persons were consulted during the whole process, among them 27 in the direct semi-structured interviews held in November 2012. The list of participants, their positions and dates of interviews are available in Budak et al. (2013, pp. 77-80) and Švaljek and Budak (2014, p. 418).

Findings

Labelled expenditure by activity groups amounted to between HRK 70 and 88 million per year, between 2011 and 2013. Annual labelled expenditure on treatment (close to HRK 50 million per year) was rather stable. The largest element was the cost of methadone therapy for the treatment of opiate drug users (HRK 40 million in 2011), financed by the Croatian Health Insurance Agency (the social security).

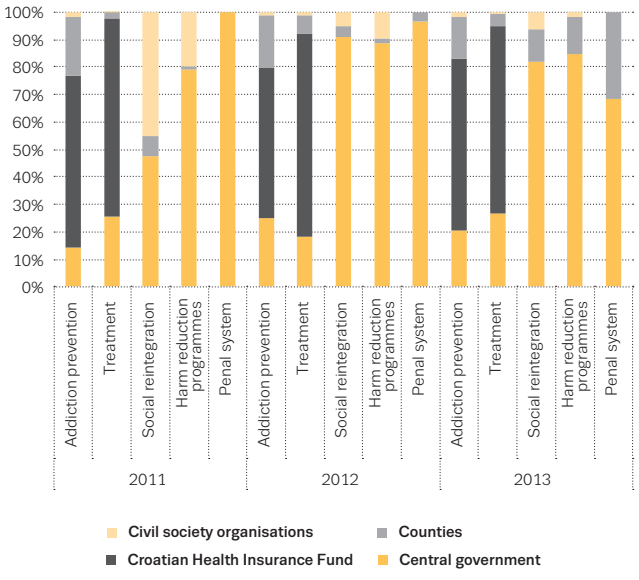
Labelled expenditure on drug-related health, classified in accordance with the COFOG system, was, for the most

part, directed to financing public health services and medical products, appliances and equipment. By type of treatment provider, the largest proportion of expenditure was allocated to public health services, followed by hospital services and outpatient services (Table 2.2).

Figure 2.1 provides an overview of the structure of the financing of labelled drug-related public expenditure in Croatia grouped by ministries and public bodies at state level and counties and county public bodies at regional level, as well as civil society organisations in the following activity groups: (1) addiction prevention, (2) treatment, (3) social reintegration, (4) harm reduction programmes and (5) penal system (Budak et al., 2013, p. 18). Treatment programmes were funded mostly by health insurance funds and central government and in small part by counties.

FIGURE 2.1

Labelled drug-related public expenditure by activity groups, 2011-2013



Source: Institute of Economics, Zagreb, 2013, and Office for Combating Drug Abuse, Zagreb.

Furthermore, it is estimated that the major part of drug-related unlabelled health expenditure is assigned to treatment (80 %). The unlabelled expenditure relates to the out-of-hospital medical treatment of opioid-dependent clients, such as visits to the primary healthcare doctor's office in order to receive prescribed methadone therapy. It also includes the unlabelled costs of hospital treatment of addicted clients. Distribution of clean needles, free HIV testing and other harm reduction programmes also make up part of the unlabelled health public expenditure, at an estimated 20 %. As external healthcare staff also provide such treatment services in the prison system for all drug-addicted prisoners, this expenditure is evidenced under the health sector expenditure as treatment.

Within health services, unlabelled public expenditure associated with preventing drug abuse in primary care and hospital healthcare are estimated. An appropriate indicator is the ratio of the total number of hospital beds to the number of hospital beds for the treatment of disorders caused by drugs. The calculated value of this indicator was 0.46 %, and this is then multiplied by the percentage of total expenditure that the Croatian Health Insurance Institute focused on primary and hospital care in order to assess unspecified expenses in healthcare. Unlabelled public expenditure on drug treatment amounted to between HRK 52 and 49 million per year between 2011 and 2012.

Total public expenditure for treatment (labelled and unlabelled) in 2012 amounted to HRK 123 564 311.98, of which HRK 74 236 386.63 was for labelled expenditure (close to 60 % of total drug-related public expenditure on treatment) and HRK 49 327 925.35 for unlabelled expenditure. Labelled drug-related public expenditure was mostly intended to finance healthcare (spending on treatment amounted to an average of 82.3 % of total labelled public expenditure).

TABLE 2.2

Estimation of labelled public expenditure on drug treatment by COFOG classification, 2009-2012, in kunas

COFOG classification	2009	2010	2011	2012
07 Health	**60 781 706.79**	**65 943 523.81**	**71 237 249.41**	**60 838 823.51**
071 Medical products, appliances and equipment	26 742 655.31	37 580 189.52	39 621 972.25	28 886 968.88
072 Outpatient services	110 000.00	110 000.00	0.00	0.00
073 Hospital services	600 000.00	840 000.00	1 040 000.00	520 000.00
074 Public health services	33 271 446.85	27 355 729.66	30 517 672.53	31 374 250.00
075 R&D	57 604.63	57 604.63	57 604.63	57 604.63

Source: Institute of Economics, Zagreb, 2013.

Conclusions

The drug-related labelled public expenditure on treatments does not capture all drug treatment-related public expenditure. Some parts of particular programmes can be identified in the budget, but some activities are 'hidden' in other budgetary items. Most public bodies do not have in their budgets labelled public expenditure intended for combating drug abuse and drug addiction, i.e. there are no special-purpose programmes, activities and projects or a plan for allocation of appropriate resources to activities aimed at combating drug abuse and drug addiction, but they are financed within regular activities. To assess the total drug treatment-related public expenditure, one has to identify both the labelled and unlabelled expenditure.

Assessment of drug treatment-related expenditure requires many assumptions to identify to which type of programme expenditure belongs. Estimation of this cost was constrained by the data available and the lack of evidence from the budget programmes of central government units.

The government spending intended for drug treatment mentioned in the national drug strategy is not complete and refers only to labelled expenditure, and it is highly likely that the unlabelled expenditure exceeds this amount (Švaljek and Budak, 2014, p. 409).

The study demonstrates the difficulties in developing precise estimates and helps to identify the main sources of data for expenditure on drug treatment and drug policy. Besides the issue of public finance information, there is a general lack of the data needed to estimate drug treatment costs. For example, detailed national data on the number of days that drug users spend in treatment, expenditure by the type of treatment, costs of social care per drug user and other important indicators of drug treatment expenditure are still lacking (Švaljek and Budak, 2014, p. 422).

The results of public expenditure studies can show whether the programmes afforded the highest priority receive the most money. Drug treatment accounts for a relatively small proportion of total drug-related public expenditure. The majority of public funds allocated to drug policy are spent on law enforcement. Prevention accounts for a much lower proportion of funding than law enforcement, even though it is deemed to be the first priority of drug policy.

This paper describes the main steps taken in Croatia to estimate labelled public expenditure, focusing on treatment programmes. The main aim of this study was to contribute to the development of a sound method to estimate drug-related expenditure, depending on the type of drug policy programme. Then, in future studies it will be possible to analyse the cost-efficiency of alternative programmes and improve the allocation of resources for drug policy. It is hoped that this study provides a useful baseline for further work to improve the national system for reporting on public expenditure in the field of drugs, as well as policy evaluation and planning.

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3

CHAPTER 3

Expenditure on drug treatment in the Czech Republic

Jiri Vopravil

The institutional framework of drug treatment

In the Czech Republic, drug abuse treatment is delivered through GPs, low-threshold programmes, inpatient and outpatient drug treatment centres, detoxification units, opioid substitution therapy (OST) units, therapeutic communities and aftercare programmes. Treatment is primarily delivered by public organisations and NGOs. It is also delivered, to a lesser extent, by private institutions, which provide three main treatment services: detoxification, outpatient care and institutional care. Inpatient services are divided into short-term (four to eight weeks), medium-term (three to six months) and long-term (seven months or more) services. NGOs mainly provide outpatient care and OST, and some of these programmes are accredited as healthcare facilities. There are also 15 NGO-based therapeutic communities that provide long-term residential care for drug users. OST with methadone was introduced in the Czech Republic in 1998. OST is delivered in specialised psychiatric facilities and is also available in prisons. In addition, any medical doctor, regardless of his or her speciality, may initiate high-dosage buprenorphine as well as Suboxone (buprenorphine and naloxone) treatment. An independent agency is responsible for the accreditation of medical and inpatient drug treatment facilities.

In the Czech Republic, the Council of the Government for Drug Policy Coordination (CGDPC) is the main coordinating body for drug-related initiatives. Healthcare is funded from three sources, including health insurers (public health insurance), public budgets (the state budget, local budgets) and households. The ministries directly concerned with the financing of drug treatment include the CGDPC, the Ministry of Labour and Social Affairs, the Ministry of Health and the Ministry of Justice (for drug service in prison). Local budgets are managed at the regional and municipality levels. OST and outpatient and inpatient medical and pharmacological drug treatment are mainly financed through public health insurance, whereas outpatient and inpatient psychosocial treatment are primarily funded by the public budget at national and regional/local levels.

Identification of labelled drug treatment costs

Expenditure on drug treatment forms part of the total expenditure on drug policy. Drug-related public expenditure in the Czech Republic is divided into labelled and unlabelled expenditure (Vopravil and Běláčková, 2013). Labelled drug-related expenditure is expenditure earmarked for drug policy (EMCDDA, 2008). It is accounted for in the state and/or regional and/or municipal budgets and divided into (1) sources of funding — from the state budget and local budgets (regional budgets and the budgets of municipalities); (2) geographical level of drug policy implementation; and (3) purpose (type of service**)** — using Reuter's classification of drug policy (prevention, harm reduction, treatment and enforcement) (Reuter, 2006).

Data are obtained from the final accounts of the national ministries whose budgets include drug policy programmes on treatment. Additional information is obtained directly from the representatives or contact persons of individual ministries and governmental institutions and from regional drug policy coordinators (Mravčík et al., 2012). Labelled expenditure on drug treatment from the state budget is partly transferred to the regional level and the remainder supports national programmes. Labelled expenditure on drug treatment from regional and municipal budgets is designed for regional drug treatment programmes. The finance for regional drug treatment programmes (from both state and local budgets) is geographically divided into 14 regions, in accordance with the EU classification (Nomenclature of Territorial Units for Statistics, NUTS) for EU regions (Eurostat, 2011) at the NUTS3 level.

The main division of drug expenditure, in general, follows Reuter's classification: prevention, harm reduction, treatment and law enforcement (Reuter, 2006). For the purposes of this chapter, harm reduction and treatment are relevant areas of expenditure.

In order to provide a useful analysis for policymakers, Reuter's classification needs to be more detailed. Harm reduction is thus divided into drop-in centres and outreach programmes, and treatment is divided into healthcare (outpatient and inpatient alcohol/drug treatment, including substitution therapy, detoxification and social services provided as part of institutional healthcare), non-health outpatient care (outpatient and intensive outpatient non-health programmes, crisis intervention, social counselling, social rehabilitation, and prison-based programmes delivered by NGOs) and therapeutic communities. It also includes a separate item for aftercare services and for the sobering-up stations (for alcohol and other drug users), which are treatment centres with harm-reduction services financed by local budgets.

Table 3.1 shows the detailed treatment expenditure by service category for 2013, and Table 3.2 shows expenditure between 2009 and 2013 by general service category, in nominal terms (no adjustment for inflation).

TABLE 3.1

Labelled drug-related expenditure on treatment provided from public budgets by service categories in the Czech Republic, 2013 (thousand EUR and nominal terms)

Service category		GCDPC	Ministry of Labour and Social Affairs	Ministry of Health	Ministry of Justice	Regions	Municipalities	Total
Harm reduction	Outreach programmes	617	653	18	–	635	576	**2 499**
	Drop-in centres	1 119	1 393	66	–	514	451	**3 543**
	Integrated programmes	152	0	111	–	325	80	**668**
	Total	1 888	2 046	195	–	1 474	1 107	**6 710**
Outpatient services	Health services	0	24	202	–	340	104	**670**
	Social services	27	197	0	–	99	143	**466**
	Others and unspecified	419	0	0	–	97	25	**541**
	Total	446	222	202	0	536	272	**1 678**
Prison-based services		41	52		334	40	13	**480**
Residential services	Inpatient health services	0	33	148	–	7	84	**272**
	Therapeutic communities	756	706	–	–	518	151	**2 131**
	Others and unspecified	0	–	–	–	0	2	**2**
	Total	756	739	148	0	526	237	**2 406**
Aftercare services		255	627	–	–	319	153	**1 354**
Sobering-up stations		0	–	–	–	3 070	1	**3 071**
Total								**15 699**

Source: Mravčík et al., 2014.

TABLE 3.2

Labelled drug-related expenditure on treatment provided from public budgets by service categories in the Czech Republic, 2009-2013 (thousand EUR and nominal terms)

Service category	2009	2010	2011	2012	2013
Harm reduction	6 616	6 572	6 209	6 410	6 710
Treatment	4 278	4 304	4 155	4 460	4 564
Sobering-up stations	2 421	3 449	2 807	3 175	3 071
Aftercare	1 201	1 238	1 200	1 349	1 354
Total	**14 516**	**15 563**	**14 371**	**15 394**	**15 699**

Source: Mravčík et al., 2014.

Identification of unlabelled drug treatment costs

Unlabelled drug-related expenditure cannot be directly identified from public budgets or reports, and therefore an estimation exercise must be carried out. In the case of drug treatment, this includes all drug treatment expenses incurred by health insurers (Mravčík et al., 2014).

The estimation uses the SHA, developed by international organisations (OECD et al., 2011). The data from the health insurers are collected by the Czech Statistical Office.

The Ministry of Health (Institute for Health Information and Statistics) makes an estimation of unlabelled expenses incurred by health insurers on any treatment of substance use disorders on an annual basis, concerning drug treatment provided either by hospitals or by any doctor who initiates an outpatient drug treatment. It uses data from the International Shortlist for Hospital Morbidity Tabulation (ISHMT) on the expenses of public health insurers classified using the SHA (Mravčík et al., 2014), using the ICD-10 for the diagnosis categories ([1]).

Therefore, in this study we extracted from the data for the expenditure of public health insurance directly identifiable expenditure with the codes F11-F19. Then, we added unidentifiable costs, with no link to a diagnosis, in the proportion of what was spent in relation to F11-F19 diagnoses compared with that spent on total diagnoses (Mravčík et al., 2011). These data are not duplicated in any reported labelled expenditure, because they refer only to public health insurance expenditure rather than all expenditure.

The National Monitoring Centre for Drugs and Drug Addiction, in collaboration with the Institute of Health Information and Statistics, processed data estimating expenditure on drug treatment from health insurance funds over the period 2007-2010 (Mravčík, et al., 2012). Data on health insurance were processed by the Czech Statistical Office for inclusion in the SHA. This system is used to give a comprehensive estimate of the total national healthcare spending. Expenditure is broken down by source of healthcare finance (such as social security, private health insurance, out-of-pocket payments). The largest share of the financing of healthcare in the Czech Republic is covered by the public system of health insurance, which includes approximately three quarters of all medical expenses. The costs from health insurance can be calculated from the ICD-10 diagnoses and their subgroups (F11-F19). Based on the data reported by insurers, treatment costs associated with the use of drugs and tobacco (alcohol not included) were estimated (F11-F19) as the sum of costs identified for each diagnosis, and as the sum of unidentifiable costs that were not allocated by diagnosis. The unidentifiable costs had to be adjusted before processing. The expenditure on different healthcare segments (inpatient care, outpatient care, capitation payments to medical practitioners, etc.) was estimated by multiplying the proportion of the primary F11-F19 diagnosis costs by total costs for each of these segments (Table 3.3).

Conclusions

Labelled expenditure on drug treatment in the Czech Republic is collected from the state and local budgets, where these items are identifiable. The difficulty in distinguishing between harm reduction and treatment remains, and therefore these two categories are combined under drug treatment.

Unlabelled expenditure on drug treatment in the Czech Republic are currently estimated with data extracted from national reporting according to the SHA. These data are produced in EU countries annually and reported to Eurostat. The model of estimation could be improved for implementation in other countries and used for international comparison. The Czech Republic already has time series of labelled and unlabelled expenditure on drug treatment.

([1]) The diagnoses F11-F19 used were F11, Opioid-related disorders; F12, Cannabis-related disorders; F13, Sedative, hypnotic, or anxiolytic-related disorders; F14, Cocaine-related disorders; F15, Other stimulant-related disorders; F16, Hallucinogen-related disorders; F17, Nicotine dependence; F18, Inhalant-related disorders; and F19, Other psychoactive substance-related disorders.

TABLE 3.3

Estimated costs incurred by health insurers in relation to the F11-F19 diagnoses (unlabelled drug-related expenditure) according to the type of care, 2007-2012 (thousand EUR)

Type of care	Cost of diagnoses F11-F19					
	2007	2008	2009	2010	2011	2012
Treatment services	7 826	9 127	10 766	11 283	12 546	13 741
Inpatient care	6 620	7 857	9 244	9 699	11 088	11 545
Intensive inpatient care	323	339	467	532	495	453
▸ inc: — psychiatry	122	111	129	117	126	82
Standard inpatient care	1 289	1 552	1 583	1 659	1 266	1 648
▸ inc: — psychiatry	870	1 031	901	915	910	997
— child psychiatry	1	1	9	1	2	5
Long-term inpatient care	5 002	5 955	7 182	7 492	9 316	9 444
▸ inc: — alcohol/drug treatment (addiction clinics)	1 686	1 591	2 198	2 242	2 460	2 352
— psychiatry	3 264	4 276	4 879	5 127	6 670	6 956
— child psychiatry	51	88	98	120	180	130
One-day care	7	11	11	17	11	34
Outpatient care	1 184	1 223	1 496	1 553	1 432	2 147
Primary care	24	15	25	28	28	37
Dental care	4	4	15	5	3	3
Specialised outpatient care	931	994	1 193	1 282	1 098	1 981
▸ inc: — alcohol/drug treatment (AT clinics)	150	128	163	144	187	196
— psychiatry	552	582	603	639	757	751
— child psychiatry	15	11	16	13	18	12
Other specialised outpatient care	90	117	114	108	132	126
▸ inc: — clinical psychology	75	82	98	92	116	125
— psychotherapy	0	0	1	0	0	0
Home care	15	35	14	14	14	15
Rehabilitation services	10	8	100	136	138	24
Long-term care	37	138	99	144	150	71
Supporting services	1 419	1 369	1 558	1 637	1 308	1 403
Laboratories	1 169	1 100	1 247	1 306	999	1 041
▸ inc: — toxicology	295	303	388	320	363	317
Imaging techniques	84	85	122	134	74	95
Transport and emergency medical services	166	184	189	198	235	267
Medication and medical equipment and supplies	2 561	2 753	3 306	3 233	3 792	3 488
Medication	2 395	2 579	3 066	3 011	3 560	3 443
Medical equipment and supplies	166	174	241	222	233	44
Prevention	76	738	154	114	56	26
Unidentified care	10	28	9	19	14	43
Total	**11 931**	**14 150**	**15 981**	**16 551**	**18 035**	**18 796**

Source: Mravčík et al., 2014.

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4

CHAPTER 4

Bottom-up versus top-down methods of cost estimation: the case of medical drug treatment and rehabilitation in Hungary

György Hajnal and Iga Kender-Jeziorska

Introduction

This paper gives an overview of the methods applied in a 2006 study to estimate drug abuse treatment-related expenditure incurred by the health insurance system and social care system in Hungary. The study was commissioned by the Hungarian national focal point and carried out between May and September 2006.

The project considered only significant expenditure borne by the sub-systems of the Hungarian public finances and indicated in the budget that arise directly from the misuse of illicit drugs. Only large-scale items were included in the estimation. According to Reuter (2006), drug-related public expenditure comprises four main categories. The goal of the project — which was the first of its kind in Hungary — was to give an estimation of drug-related expenditure for each of these categories — (1) law enforcement; (2) drug treatment; (3) prevention/research; and (4) harm reduction — and to contribute to a European study (EMCDDA, 2008).

The objective of this study was to provide an overview and discussion of the major methodological and conceptual issues that emerged in the course of estimating Hungary's drug treatment expenditure. The institutional framework was — at the time of the study — quite complex. Furthermore, the study required the development of a methodology that would overcome existing data limitations. Therefore, this chapter aims to offer an insight into the assessment of drug treatment public expenditure that may be useful for other countries characterised by similar systems. Such an overview will also contribute to the ongoing discussion about the refinement of a plausible approach to estimating the drug budget in EU Member States (EMCDDA, 2003, 2004; Reuter, 2004).

Identification of drug-related health costs

A major conceptual choice in the estimation of drug treatment public expenditure was the question of whether or not, and to what extent, expenditure resulting from various indirect health consequences of drug abuse — such as treatment of injuries or of medical problems caused by drug abuse — should be included, in addition to direct drug treatment costs, in our concept of drug-related expenditure.

A decision was made to narrow down the focus to the estimation of drug treatment costs only. In other words, the estimation focused only on the costs of medical interventions. In operational terms, detoxification/stabilisation and rehabilitation/continuing care formed part of our concept of drug treatment. The reasons for this restricted conceptualisation were twofold:

1) The complex causal structure of medical conditions — involving multiple and/or bi-directional causation and the overwhelmingly probabilistic, as opposed to deterministic, causal connections — make it very difficult to describe any non-arbitrary concept of drug treatment that is broader than the above.

2) From a practical perspective, the limited reliability and — even more often — the lack of data currently available in Hungary make it difficult to operationalise any broader concept of health expenditure.

In view of these considerations, it is no surprise that a similar narrowing down of the concept has been applied in other drug-related public expenditure research (Harwood et al., 1999; SAMHSA, 2003).

Institutional framework

During the period covered by this research, drug treatment institutions in Hungary were run and financed by two different sources: ambulatory and active inpatient ([1]) treatment institutions operated in the framework of the National Health Insurance Fund, while chronic inpatient, outpatient and residential treatment institutions were funded by the Ministry of Social and Labour Affairs. In both cases, supplementary funding was provided to the local or county self-governments, churches or non-profit organisations operating the service. All expenditure estimated using the following methods was public expenditure, borne by the state (either National Health Insurance Fund or Ministry of Social and Labour Affairs).

Method of estimation

Bottom-up approach: estimating treatment costs funded by the health insurance system

One of the core features of the institutional segment funded by the health insurance system was the existence of a national-level, official, centralised database system, into which detailed, transaction-level data on each medical treatment and patient are recorded and stored for the entire period covered by the study. These data include, among others:

- the ICD-10 classification of medical diagnoses;
- the ICHI (International Classification of Health Interventions by WHO) classification of medical treatments/interventions applied;
- detailed, individualised data on the healthcare providers and the patients involved;

All sets of data given above were available for outpatient and both types of inpatient (active and chronic) treatment, as well as for medication and laboratory tests.

An important element of the bottom-up estimation method was using interviews with key experts to reveal the content, location, format, limitations and biases of existing data. Subsequently, this information was used to build a particular method of estimation in each different organisational setting, tailored to the specific features of the given individual setting.

There was no pre-existing data collection on drug treatment that could be modelled in a straightforward way. Drug treatment service providers are deeply embedded in a broader institutional context in which many different types of care are provided, ranging from treatment for alcohol dependency and general mental health/psychiatric treatment to care for the elderly and the mentally or socially disadvantaged. Therefore, healthcare expenditure incurred by the National Health Insurance Fund was estimated on the basis of detailed activity data reported by health service providers to the Fund. These activity data cover every single treatment provided to patients; the data reported to the Health Insurance Fund include specific information concerning the patient, the healthcare provider, diagnosis and the treatment provided. These datasets are periodically sent to the Health Insurance Fund and form the basis of the funding received by the healthcare provider from the Fund.

In the system of healthcare provision related to drug use we can distinguish the following categories:

- Drug treatment provided by GPs: although it is not impossible that an individual using drugs visits a GP for a medical check-up or referral to some healthcare specialist, it is rather infrequent. Moreover, speaking in absolute terms, the vast majority of treatment services provided by GPs have minimal cost. Therefore, this expenditure category was not included in estimates.
- Specialised ambulatory care: includes mostly the 'drug ambulances' — ambulatory treatment units dedicated specifically to providing drug treatment — and ambulatory services provided in the framework of general psychiatric ambulatory care.
- Acute inpatient care: concerns drug treatment provided in addiction clinics or, sometimes, general psychiatric, as well as detoxification procedures provided by other units, mostly physicians.
- Chronic inpatient care: provided by long-term addiction institutions.
- Medication used in drug treatment.
- Medical emergency services linked to hospital emergencies, drug-related accidents.

([1]) In the Hungarian hospital system, there is a differentiation between what are known as 'active inpatient' and 'chronic inpatient' treatment. The former type is highly personalised and involves specialised examinations and individualised services; expenditures are reimbursed by the National Health Care Fund individually according to the particular treatment a person received. The 'chronic inpatient' treatment, in turn, is focused rather on simply providing care to patients and involves fewer personnel and a lower level of treatment personalisation; the public financing scheme pays a flat rate per day of treatment and per capita.

A key feature of the health insurance system is the fact that the data reported by the healthcare providers are also used to calculate their own funding. As a consequence, the data reported suffered from generally poor quality and inconsistency. Furthermore, the funding system was organised in such a way that encouraged systematic bias in the data reported, in other words 'reporting wrong data' to increase funding. In order to improve the accuracy and the validity of the estimation, a layered method of estimation was used, involving the extensive use of expert judgement. More specifically, the estimation was made as the sum of the following components:

Component (1): total public funding provided to institutions that provide drug treatment only.

Component (2): total funding provided to treatments where a 'drug diagnosis' was reported (this set of diagnoses was identified by experts in the field) ([2]). Note that if these funds were already included in component 1, in order to avoid double counting, the database query was designed to omit them from this component.

Component (3): total funding provided for treatments provided to 'drug users' either (i) by institutions with a general psychiatric profile ([3]) or (ii) with a 'drug diagnosis'. 'Drug users' are persons who had received any treatment having fallen under component (1) or (2) during the preceding two years. 'Drug diagnoses' were determined, on the basis of the ICD-10, by selected experts. Likewise, the set of psychiatric institutions was identified by experts in the field. Note that funding already included in components 1 and 2 is, in order to avoid double counting, not included in this component.

Component (4): total funding provided for medications reported on 'drugs lists' submitted over the years that the research covered.

Component (5): total funding provided for drug-related laboratory procedures over the years that the research covered ([4]).

In practice, three lists developed by experts on drug treatment were used in the database query producing the above five components. List 1 included institutions with a profile that was mostly or entirely drug related; list 2 included all direct drug diagnoses; and list 3 included 'hidden' diagnoses used by healthcare providers to 'mask' *de facto* drug-related treatments in order to achieve higher cost reimbursement from the National Health Insurance Fund (OEP) ([5]). The cost of such 'hidden' treatments was calculated on the basis of the assumption that treatments were based on such 'hidden' diagnoses — if provided to persons who within the preceding year either were a client of one of the institutions from list 1, or had a direct drug diagnosis in any other institution or were undergoing a *de facto* drug treatment (duplications in treatment data were eliminated in order to avoid double counting of the same expenditure).

Top-down approach: estimating treatment costs funded by social security

The estimation of costs for the system of social security covered all services provided to clients receiving drug treatment — inpatient, outpatient and residential care — that fall under the definition of 'health treatment'.

In the face of poor quality of data, as a first step, relevant experts were identified using the snowball sampling method and invited to interview. This method was possible because the research was commissioned by Hungary's top drug policy forums (and therefore may not be feasible for researchers who have little or no access to the 'inner circles'). Among the stakeholders of this project were institutions such as the national focal point, the National Institute for Drug Prevention and the Committee on Drug Coordination. This gave us access to high-profile drug experts in various institutions, including the National Health Insurance Fund.

([2]) ICD-10 codes: F1100-F1290, F1400-F1690 and F1900-F1990.

([3]) According to experts' opinions, there is a set of diagnoses that doctors use instead of direct 'drug diagnoses'. Therefore, costs of treatment of patients with those particular diagnoses are included in the estimation as being actually drug treatment costs. Those include the following ICD-10 codes: F0100-F0130, F0180-F0190, F0240, F0700, F0720, F0780-F0790, F09H0, F2080-F2090, F21H0, F2200, F2280-F2290, FF2300-FF2330, F2380-F2390, F28H0, F29H0, F3000-F3020, F3020-F3090, F3200-F3230, F3280-F3290, F4390, F3800-F3810, F3880, F39H0, F4000-FF4020, F4080-F4090, F4100-F4130, F4180-F4190, F4200-F4220, F4280-F4290, F4300-F4320, F4380-F4390, F4400-F4490, F4500-F4540, F4580-F4590, F4800-F4810, F4880-F4890, F5010, F5030-F5050, F5080-F5090, F5130-F5150, F5180-F5190, F5200-F5290, F5300, F54H0, F59H0, F6000-F6090, F61H0, F6280-F6290, F6390, F6800-F6810, F6880, F69H0, F88H0, F89H0, F9100-F9130, F9180-F9190, F9890, F99H0.

([4]) ICHI codes: 21291, 21690-2695, 2169P, 22441, 25504, 25566-25568, 26260-26261, 2627Q, 2627R, 2627S, 2627T, 2639A, 2639B, 2639E, 2639L, 98410.

([5]) Note that this type of masking — in practice, reporting false data — by healthcare providers to the OEP was and is a general practice in Hungarian healthcare. There are commercial sofware products available which are used to 'optimise' treatment reports to increase the OEP funding, and the OEP's capacity to control and limit this type of cheating is minimal or non-existent. The list of substitutive diagnoses was determined by healthcare experts with insider knowledge on institutional practices.

Expert interviews with senior practitioners and researchers working in social and health administration, in the National Health Insurance Fund, in various addiction treatment facilities and in drug policy NGOs were conducted and used extensively in order to identify the data sources to be used for estimation; assess data quality; and improve estimations by incorporating correction methods for handling poor-quality data.

In total, 15 such expert interviews were prepared. On the basis of expert opinion, a list of service providers in each service category was compiled. The list included 50 inpatient facilities (of which 17 had a drug-related profile) and 25 outpatient facilities (of which 12 had a drug-related profile, i.e. 30-100 % of clients using drugs). Total annual funding data for these service providers were available to a greater or lesser extent from ministry compilations.

However, many of the above organisations provided, in addition to drug treatment, various other services for non-drug-related clients. Therefore the proportion of drug treatment within the overall service output — and, thus, the proportion of drug-related expenditure in total expenditure — had to be estimated. This was done on the basis of telephone interviews with managers of the relevant institutions. The unit of measurement in this case was a unit cost for each drug treatment, based on the Hungarian Health Agency's *Classification of Procedures in Medicine* categories (OEP, 2016) ([6]).

It is important to emphasise that estimating the drug-related proportions within the overall budget of these institutions required original extensive data collection and use of expert and practitioner opinion. Specifically, a list of treatment institutions with at least some kind of drug treatment profile was created on the basis of expert opinion. Subsequently, each institution was contacted and queried regarding the proportion of its patients that were receiving some sort of drug treatment.

In 2007, a pilot project (Kelen-Consult BT, 2007) exploring the applicability of the EMCDDA guidelines (EMCDDA, 2007) for estimating drug-related public expenditure was carried out. The suggested estimation method was similar to the one used to report data for the social security system, a top-down approach. However, the proposed starting point of the estimation was the Eurostat dataset, published by Eurostat and based on data on public expenditure categorised according to COFOG and provided by the Hungarian statistics agency. Analysis of the data showed that in the case of Hungary this procedure was not suitable for estimating drug-related public expenditure. The reason was that the level of aggregation in which expenditure data were available was too high to allow the estimation of drug treatment expenditure and the Hungarian research team was not able to design a model that produced the required estimates. Moreover, the method used to create the COFOG-based statistics was not clear enough and did not reflect the institutional and operational idiosyncrasies of healthcare providers in Hungary. Therefore, it should be emphasised that this method, suggested by the EMCDDA guidelines, was not used in the original expenditure assessment in Hungary.

Discussion

Although health insurance activity data served as a basis for the estimates of the funding of drug health services, because of the lack of adequate control mechanisms the validity of these data is rather uncertain. In addition, the use of these data as a basis for the funding of services is an incentive to manipulate the data. However, the estimation method attempted to address this by using expert opinion and a number of different components. As activity reports containing activity data are stored in a large electronic database of the National Health Insurance Fund, resolving data queries was technically feasible. In the case of drug treatment financing by institutions funded from sources other than the Fund, budgetary estimates included the amounts directly transferred by the national government (known as normative financing), as well as additional funding from the public budget allocated to church-run centres and those provided by local and regional governments. In addition, the expenditure on social inclusion and diversion programmes, managed by the Ministry of Social Affairs and Labour, were also taken into account ([7]).

Hungary's public services, unlike those in many northern European countries, cannot be considered 'data rich' by any standards. In other words, financial and activity data, and especially results-/products-related data ([8]) are, most of the time, very limited in scope and, sometimes, in reliability. This general feature is also a characteristic of the drugs field: none of the organisational (sub-)systems examined had data concerning the provision of drug-related health services. Nevertheless, the method used, particularly the

([6]) *Classification of Procedures in Medicine* is an official list of procedures issued by the Hungarian Health Agency (OEP).

([7]) Namely social benefits, day care, care-providing institutions, rehabilitation centres, residential homes, organisations providing temporary accommodation.

([8]) By result/product we mean individual unit of activities and services, to which we can attach some particular value.

inclusion of expert judgements, allowed the best possible estimations within the scope of the above limitations.

Conclusions

The method of estimation reflected the significant differences in the data available between the two funding sources. The estimation of public expenditure on drug treatment in Hungary is hampered by poor-quality data, creating a challenging task. There are a number of reasons for this:

- Data are scattered or non-existent either because no systematic data collection exists or because existing policies and procedures for systematic data collection are not implemented.
- The validity of data may also be considered dubious, especially if reported data are used to establish funding or otherwise have significant material consequences for service providers.
- Finally, the reliability of data also suffers from the generally low level of administrative capacity and resources available for data collection and reporting.

The idiosyncrasies inherent in the Hungarian national healthcare system funded by the National Health Insurance Fund and, therefore, the drug treatment expenditure system at the time of conducting the study mean that the bottom-up method is unlikely to be widely adopted by many countries. The reason is that such detailed, transaction-level data covering each and every medical intervention usually do not exist or are not available for the purpose of estimating expenditure. This method may, however, be a starting point for developing applicable methods, provided that such detailed activity reporting of healthcare interventions is collected in a centralised manner, and if the resulting — highly sensitive — personal health data are available for the purposes of the research.

In contrast, the top-down approach to estimates — backed by an achievable level of data collection and supported by expert judgement to estimate the drug-related proportions within providers' operations — could be applied, provided that the resources and expertise for such field research are ensured. The top-down approach offers a flexible and feasible (possibly, the only feasible) method, even in relatively data-poor environments. What should be emphasised, however, is that in cases of highly aggregated data (e.g. COFOG classification), especially when combined with poor data collection methods, significant difficulties may arise. The institutional specifics of particular national healthcare systems might make it impossible to estimate specific costs of drug treatment. Therefore, the relatively limited accuracy of these estimations must be openly acknowledged and taken into account.

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III

SECTION III

Focus on unlabelled expenditure

Overview

In Chapters 5-9, the authors focus, among other topics, on methods applied to estimate unlabelled public expenditure on drug abuse-related health. In Chapter 5, Alain Origer describes the methods used in Luxembourg since 2002 to estimate annual public expenditure on hospital episodes, inpatient drug treatment episodes, OST, and the treatment of HIV infections and AIDS (acquired immune deficiency syndrome) associated with drug use. In Chapter 6, Charlotte Davies describes the method used to estimate public spending on drug treatment and on associated comorbidities in hospitals in the United Kingdom. Expenditure in hospitals accounts for inpatient stays, which covers emergency treatment for acute problems (overdoses and psychosis) and planned treatment for chronic associated infectious diseases. Davies shows that the adoption of a pragmatic approach allows estimates to be made based on routinely available data and allows estimates to be replicated in the future. In Chapter 7, Sabrina Molinaro and colleagues describe the development of a model to estimate public expenditure on drug treatment in Bergamo, Italy, taking into account drug-related pathologies and associated comorbidities. The authors include estimates for public spending on hospitalisation, outpatient specialist care, pharmaceutical prescriptions and services provided by drug abuse treatment services. Data were extracted from official healthcare administrative financial flows. In Chapter 8, Bruno Genetti and colleagues describe a method to estimate public expenditure on OST in Italy, taking into account available datasets, with data for 2012 and 2013. The model uses a top-down approach to estimate spending on OST from annual public expenditure on addiction treatments (alcohol, drugs and gambling). The study disentangles spending on drug treatment from spending on the treatment of other dependencies, based on detailed budgets available for spending on personnel and medicines. Last but not least, in Chapter 9, Delfine Lievens and Freya Vander Laenen present a methodology to estimate public expenditure on drug treatment in hospitals, for most European countries. This method uses data drawn from Eurostat and applies a uniform methodology, allowing cross-country comparisons. The authors present a critical assessment of their method and database, which alerts readers to the limitations of estimates.

5

CHAPTER 5

A methodological inventory for the assessment of selected, unlabelled direct public expenditure in the field of drug demand reduction

Alain Origer

Identification of drug-related health costs: methodological preliminaries

At their most holistic level, drug abuse-related public expenditure studies cover the entire spectrum of costs arising from drugs and to be borne in some way or another by a given community (e.g. the national population). The straightforward but relevant question to ask when determining whether or not an expense is eligible for the assessment of expenditure in the field of illicit drugs is the following: Would the expenditure have occurred if illicit drugs did not exist ([1])? The purpose of this chapter is narrower, as it focuses on a selected type of expenditure in order to provide a methodological in-depth analysis.

This methodological inventory does not address global social costs, as it exclusively refers to unlabelled, direct public economic costs of selected drug demand reduction measures, thus excluding 'external costs' (e.g. loss of economic productivity) and 'intangible costs' (e.g. pain, suffering and loss of life quality), as well as expenditure related to the acquisition of illicit drugs by users, i.e. private spending on illicit drugs.

More specifically, we compiled an inventory of methods applied nationally to estimate public expenditure related to drug treatment hospital episodes, OST and the treatment of HIV infections and AIDS attributable to drug use. Applied methods and alternative models are discussed, as well as the eligibility of collateral costs and limitations in analysed data and final estimates.

Given that this paper is addressing the costs induced by the use of illicit psychoactive products and/or a series of licit products that have been diverted from their purely therapeutic use, it is essential to rely upon a classification that takes into account the nature and the origin of the substances involved. A substance such as heroin, for instance, is illicit under national law, whereas psychotropic prescription drugs are regulated but can be acquired illegally for a non-medical use, thus generating or maintaining an addictive condition. Polydrug use — combining illicit drugs and other substances such as benzodiazepines and alcohol — is the most frequently observed consumption pattern of problem drug users at the national level (Origer, 2015). For these reasons, and for the sake of editorial ease, we hereinafter refer to 'illicit drugs' as the entire range of illicit psychoactive substances and those diverted from their genuine therapeutic indication. 'Drug treatment' thus refers exclusively to interventions targeting individuals who have problems related to the use of illicit drugs, possibly in combination with other drugs.

It is also relevant to set a 'window of observation' that applies to the estimation methods. The present analysis relies upon 'prevalence-based calculations', given that they reflect cost manifestations observable within a defined period of time (one year), whose origin or generating process may date back earlier. In contrast, in 'incident-based estimation' only events (incidences) having occurred within the observation window are considered. An example that will be addressed in greater detail in the present inventory is the expenditure related to the treatment of HIV-positive clients and those living with AIDS who

([1]) A sound example of the hypothetical causality between drugs and adverse, cost-generating outcomes might be seen in the acquisition of a liquid chromatography/mass spectrometry (LC-MS) system by a forensic laboratory. The latter may be used to analyse seized drugs and thus contribute to the fight against drug trafficking, for instance. However, the same analytical instrument may serve other purposes (e.g. forensic evidence for accidental poisoning) and might have been acquired anyway for overall service needs. The cost of the purchase may thus not entirely be attributable to illicit drugs-related outcomes, although the working time spent by the forensic experts, the chemical materials used and even the electrical power required to run LC-MS analysis on illicit drugs should be fully accounted for in a drug-related cost assessment.

were infected via (injecting) drug use. In a prevalence perspective, all referred clients in treatment during the observation window will be included in the estimation model, whereas, in an incidence-based estimation, only new HIV and AIDS cases caused by drug use-related transmission and having occurred during the observation period will be retained.

The applied methodological approach is entirely based upon costs. The benefit, income or revenue aspects linked to illicit drug use or trafficking (e.g. selling income, confiscated assets) are not accounted for. Instead of referring to a cost-benefit analysis, the described approach builds upon the concept of the 'cost of illness (COI)' method (Hodgson and Meiners, 1982), abundantly developed in the English-language literature in the field of drug-related cost studies and applied notably by Rice et al. (1990), the National Institute on Drug Abuse research teams (NIDA, 1993) and Kopp and Fenoglio (2000). The COI method is closely linked to the concept of 'cost of opportunity', which assumes that resources allocated (to the fight against drugs in this case) might have been assigned to other needs — ideally in a more beneficial way.

The methods described herein have been applied nationally on the basis of available data or newly compiled or reformatted data, as well as multiplier and valuation techniques.

Institutional framework

According to the latest estimates, Luxembourg counts 5.68 injecting drug users per 1 000 inhabitants aged 15-64 (range 4.54-6.90) and 6.2 problem drug users per 1 000 inhabitants aged 15-64 (range 4.60-7.83), figures that have been showing a decreasing trend since 2003 (Origer, 2012).

Regarding demand reduction, specialised drug treatment services in Luxembourg rely on governmental support and control. Drug treatment is decentralised and is most commonly provided by state-accredited NGOs. Most of these specialised agencies have signed an agreement with the Ministry of Health that guarantees their annual funding. NGOs involved in drug treatment fall under the obligations of the so-called ASFT law (8/09/98) and the subsequent Grand-ducal Decree of 10 December 1998, both of which regulate the relationship (duties and rights) between the state and NGOs or organisations providing psychomedical, social and therapeutic care.

All specialised national treatment providers or agencies accept drug-using clients, irrespective of the type of substances that are involved. Detoxification treatment is provided by regional hospitals via their psychiatric units and related costs are generally covered by health insurance. Nationally, there are specialist outpatient treatment facilities, residential therapeutic communities and inpatient occupational centres. While outpatient treatment is provided free of charge (state financed), inpatient treatment is covered by health insurance. Special counselling and treatment offers for minors and young adults are available. In- and outpatient treatment opportunities for pregnant women, drug-using couples and mothers with children are also available. A dedicated psychosocial and medical care programme is operational in national prisons (Programme TOX).

OST is mainly delivered by office-based medical doctors. In addition, a multidisciplinary OST programme is run by a specialised NGO, which primarily provides liquid oral methadone and psychosocial care. The modified Grand-Ducal Decree on substitution treatment of 30 January 2002 regulates OST in general by means of substitution treatment licences granted to medical doctors and specialised agencies. This legal framework lists medicines allowed for substitution treatment, including methadone, buprenorphine and morphine-based medications, as well as substitution treatment modalities. It also sets the legal framework for the implementation of a pilot programme of heroin-assisted treatment at the national level. With regard to the cost of treatment, medical interventions and counselling are covered by health insurance, while the state covers pharmaceutical costs and pharmacy fees. In 2014 around 1 300 clients received OST treatment nationally, which makes Luxembourg a country with one of the highest OST coverages per opioid user in the EU (EMCDDA, 2014).

A legal framework for a series of risk and harm reduction measures, such as supervised drug consumption rooms, was set in 2001 by amending the basic national drug law of 1973. The first supervised injection room at the national level opened in July 2005 and has been integrated into a low-threshold centre for drug users. By the end of 2014, some 1 500 clients had signed the facility's user contract, and around 40 000 injections are annually supervised by trained staff. More than 1 800 overdose incidents had been managed in the consumption rooms by 2016 and none ended fatally. In 2012, a first supervised blow (inhalation) room was opened within the same premises. According to the National Drugs Action Plan, a national feasibility assessment of heroin-assisted treatment was conducted and the first national heroin-assisted treatment was introduced as a complementary treatment option in Luxembourg in May 2017.

The last national HIV and AIDS action plan was launched by the Ministry of Health in 2011. Its aims include the prevention of infectious diseases and harm reduction in drug-using populations. This plan has been elaborated to take into account the recommendations of the external evaluation of the previous plan. HIV prevention and counselling are provided by specialised agencies. A new national HIV/AIDS plan and a first national hepatitis action plan are expected to be launched in the course of 2018 and 2017, respectively. Treatment of HIV-infected drug users is hospital based and the costs are covered by health insurance.

The national needle and syringe exchange programme, financed by the state, is decentralised and includes drug counselling centres, drop-in centres for sex workers and at-risk populations, low-threshold services and vending machines situated in the towns most affected by injecting drug use. Needle and syringe exchange is also provided at prison-based sites. In 2012, a mobile medical care unit was launched as an additional service, facilitating the provision of primary medical care at low-threshold agencies.

Methods and required data

Annual costs of hospital-based inpatient drug treatment

Applied methodology

Expenditure generated by inpatient drug treatment episodes in hospitals (C^{HOSP}) is composed of infrastructural, nursing and pharmaceutical costs, also called hospital bed-day costs (C^{BED}) and the cost of in-house medical care (C^{MED}).

Hospital episodes are generally recorded according to the ICD-10, and the list of diagnostic criteria to be included in a given cost assessment should be compiled in the first place.

After consultation of national hospital staff and psychiatric units' teams, the following ICD-10 criteria were included in national cost studies: mental and behavioural disorders due to use of opioids (F11), cannabinoids (F12), cocaine (F14), other stimulants (F15), hallucinogens (F16), volatile solvents (F18) and multiple drug use and use of other psychoactive substances (F19). Not included were episodes related to mental and behavioural disorders due to various licit and prescription drugs (i.e. alcohol (F10), sedatives or hypnotics (F13) and tobacco (F17)), unless they were associated with retained disorders. The selection of ICD codes should take into account coding routines and reflect the target population to which the estimation applies.

As a first step, national administrations of health insurance funds should be contacted to determine if they are in a position to provide a total annual cost breakdown according to relevant ICD-coded episodes. In the context of national cost studies, the principal ICD-10 diagnosis, as recorded at hospital discharge, is used. Otherwise, an alternative option is to use average multipliers provided by national administrations or experts. Required data for the latter approach and the respective calculation formulae are detailed in Table 5.1 and equation 5.1.

The quantification of costs related to medical consultations and care provided during inpatient hospital drug treatment requires a series of nationally specific data. Ideally, hospital administrations and/or central social security funds will be able to provide the sum of annual expenditures for medical care related to drug treatment as defined, as well as the specification of medical care interventions. In the event that these data are unavailable or inaccessible, the number of hospital drug treatment episodes ($N^{EPITOTAL}$), the number of hospital bed-days ($NDAYS^{HOSP}$) and the average number of medical consultations per day ($AVRN^{MED/DAY}$) can be used as intermediate multipliers to calculate C^{MED}.

Before running this type of cost equation, one must also take into account national medical consultation fees, social security intervention nomenclature and reimbursement schedules. Hospital fees and related medical interventions are commonly defined by social security codes. These fees might, however, be dependent on time factors such as length of hospital stay for instance. Medical fees due for the first hospital day might be higher than those due for the following days (as is the case in Luxembourg). This adds some complexity to the calculation, as one has to add up the costs of first hospital days and the following days based upon the number of consultations per day ($NCONS^{MED1}$ *and* $NCONS^{MED1*}$) and daily medical care fees (FEE^{MED1} *and* FEE^{MED1*}).

As only public expenditure is of interest here, it is necessary to deduce the proportion that is not reimbursed by social security schemes and thus to be borne by individual clients and not by the community.

Information and data requirements

TABLE 5.1

Information and data requirements for the determination of the annual cost of hospital-based inpatient treatment (C^{HOSP})

General preliminary information	Compilation of considered ICD codes	*National selection F[11, 12, 14, 15, 16, 18, 19]*
	Inventory of eligible national hospitals (a)	
	National social security code (b)	
	Nomenclature of medical treatment (c)	
	Prescription medicines reimbursement schemes (d)	
C^{BED} data	Number of episodes/ICD code (e)	$N^{/EPI}$
	Average duration/episode (e)	$DUR^{/EPI}$
	Average cost/episode (e)	$AVRC^{/EPIHOSP}$
	% of hospital bed-days fees not reimbursed (e)	$SHAREPAT^{HOSP}$
C^{MED} data	Total number of episodes (e)	$N^{EPITOTAL}$
	Average number of medical consultations/day (e)	$AVRN^{MED/DAY}$
	Total number of hospital bed-days (e)	$NDAYS^{HOSP}$
	Number of first day medical consultations (e)	$NCONS^{MED1} = (N^{EPITOTAL} \times AVRN^{MED/DAY})$
	Number of after first day medical consultations (e)	$NCONS^{MED1+} = (NDAYS^{HOSP} - N^{EPITOTAL})$
	Fee of first day medical consultations (c)	FEE^{MED1}
	Daily fee of after first day medical consultations (c)	FEE^{MED1+}
	% of medical care fees not reimbursed (c)	$SHAREPAT^{MED}$

National data sources:

(a) Ministry of Health, National Health Map: http://www.sante.public.lu/fr/publications/c/carte-sanitaire-5e-ed-2012-doc-principal/carte-sanitaire-5e-ed-2012-doc-principal.pdf

(b) Social security code: http://www.legilux.public.lu/leg/textescoordonnes/codes/code_securite_sociale/code_securite_sociale.pdf

(c) Ministry of Health, Ministry of Social Security, Caisse Nationale de Santé (CNS) (Mandatory Health Insurance — Social Security Fund): http://www.cns.lu/employeurs/?p=121&lm=3-0-0&lp=125

(d) Ministry of Health, Ministry of Social Security, Caisse Nationale de Santé (Mandatory Health Insurance — Social Security Fund): http://cns.lu/files/listepos/16.01_Liste_pos_assures.pdf

(e) CNS: specific data processing/breakdown upon request.

Calculation formulae

The formulae to calculate C^{BED} and C^{MED} are the following:

$$C^{BED} = \sum_{F11,12,14,15,16,18,19}^{n} [(N^{/EPI} \times AVRC^{/EPIHOSP}) - SHAREPAT^{HOSP}] \quad (5.1)$$

and

$$C^{MED} = [(NCONS^{MED1} \times FEE^{MED1}) + NCONS^{Med1+} \times FEE^{MED1+}] - SHAREPAT^{MED} \quad (5.2)$$

The total public expenditures generated by hospital inpatient drug treatment episodes thus equal:

$$C^{HOSP} = C^{BED} + C^{MED} \quad (5.3)$$

Requirements, strengths, weaknesses and limitations of applied methodology

The described methodology implies sound knowledge of the national hospital offers, ICD coding routines, health insurance funds, social security codes and reimbursement schemes.

A crucial condition for the application of this methodology is that hospital episodes are coded in accordance with ICD standards and that the primary diagnosis codes refer to mental and behavioural disorders related to the use of psychoactive substances. If the ICD code attributed to a given client entering hospital treatment corresponds to the hospital discharge diagnosis, the sum of expenditure per client comprises all related medical interventions (e.g. treatment of wounds or injection site infections), included in the total cost of the episode.

Interventions at medical emergency units for drug-related problems, without an overnight hospital stay, are not included in the present methodology. However, according to medical hospital staff and specialised treatment agencies, these interventions generally lead to subsequent inpatient episodes in national hospitals. Thus, the costs not accounted for are deemed to be limited in Luxembourg, although the situation might be different in other countries or settings and should be assessed beforehand.

For the sake of completeness, it should be noted that recent research has also addressed public spending estimations of drug treatment based on information provided by international institutional-based databases as well as their inherent limitations (Lievens et al., 2014).

Annual costs of outpatient opioid substitution treatment (COST)

Applied methodology

OST might be provided by different channels and services according to national policies and legislations. It is therefore important to draw up an inventory of national OST offers and determine their financing schemes before estimating costs. For instance, in Luxembourg a structured multidisciplinary OST programme exists, run by a specialised agency and financed by the Ministry of Health via a direct convention, and the reimbursement of costs is related to substitution drugs prescribed in the framework of the programme. The list of medicines that may be prescribed for OST at the national level is set by law.

A second channel is the provision of OST by specially accredited doctors in the framework of their medical practice. Occurring costs are, on the one hand, the medical consultation fees that may be partly or entirely reimbursed by national, public or private health insurance and, on the other hand, refer to prescribed OST drugs that might also be reimbursed to some extent.

Where other types of OST providers exist in the country of study (e.g. hospital-based OST), these programmes must also be included in the cost equation.

In order to determine annual costs of agency-run OST (C^{AGENCY}), operating costs and human resources expenses have to be accounted for. Where a formal contract between the state and the agency or NGO exists, the cost breakdown is recorded in the annual state budget lines or may be provided by the accounting department of the agency or any alternative financing source. This task is generally straightforward, in contrast to the assessment of annual public expenses on prescribed OST drugs. To this end, it is most relevant to be familiar with the national prescription routines and administrative rules.

Methodologically speaking, the best-case scenario is the prescription of OST medical products by means of specific prescription protocols (e.g. OST specific counterfoil carnet, multiple copy prescriptions programmes) and/or prescription drug monitoring programmes. These routines allow not only the running of prescription control mechanisms, but also the competent administrations to break down OST-specific costs and distinguish the latter from the prescription of other opioids or for other purposes (e.g. pain treatment). As previously described for the costs of hospital-based inpatient drug treatment, social security reimbursement schemes might vary according to different types of OST prescription drugs and individual contributions have to be subtracted from the final costs.

Public expenditure generated by OST provided by accredited doctors in private practice (C^{MD}) embrace medical consultation fees and related costs for prescribed OST drugs.

In the event that no hard data are available, expert opinions or OST prescribers' and clients' surveys might be used to compile representative average OST prescription figures. Alternative multipliers, estimators and calculations are presented in Table 5.2 and equation 5.6.

Information and data requirements

TABLE 5.2
Information and data requirements for the determination of annual C^{OST}

General preliminary information	Types of national OST providers ([a])	(e.g. OST^{AGENCY}, OST^{MD})
	List of doctors accredited for OST prescription ([b])	
	National prescription rules and regulations ([c])	
	Competent ministries and institutions ([b])	
	National state budget ([d])	
	National social security code ([e])	
	Nomenclature of medical treatment ([f])	
	Prescription medicines reimbursement schemes ([g])	
C^{AGENCY} data	Annual running and human resources costs ([h])	$C^{AGENCYOP}$
	Annual costs of agency-prescribed OST drugs ([h])	$C^{AGENCYDRUG}$
	% of medical consultation fees not reimbursed ([f])	$SHAREPAT^{OSTAGCO}$
	% of prescription OST drugs costs not reimbursed ([g])	$SHAREPAT^{OSTAGDRUG}$
C^{MD} data	Annual OST medical consultation fees ([i])	C^{MDCO}
	Annual costs of OST prescription drugs ([i])	C^{MDDRUG}
	% of medical consultation fees not reimbursed ([f])	$SHAREPAT^{OSTMDCO}$
	% of prescription OST drugs costs not reimbursed ([g])	$SHAREPAT^{OSTMDDRUG}$
Alternative C^{MD} expert data	*Total number of OST clients in year x ([b])*	N^{OSTPAT}
	Total number of OST prescribers in year x ([a,b])	N^{OSTMD}
	Average number of OST clients per prescriber ([l])	$AVRN^{OSTPAT/MD}$
	Average costs per OST client ([l])	$AVRC^{/OSTPAT}$
	Average frequency of medical OST consultations ([l])	$AVRF^{/OSTMDCO}$
	Fee for medical OST consultation ([e])	$FEE^{OSTMDCO}$
	Average annual doses (units/packages) of OST drugs prescribed per client ([l])	$AVRF^{/OSTMDDRUG/PAT}$
	Price of OST drugs per unit ([a,g])	$P^{OSTDRUG/UNIT}$

National data sources:
([a]) Ministry of Health, National Surveillance Commission on Opioid Substitution Treatment.
([b]) Ministry of Health, National Opioid Substitution Treatment Register.
([c]) National legislative database: http://www.legilux.lu
([d]) Ministry of Finance.
([e]) Social security code: http://www.legilux.public.lu/leg/textescoordonnes/codes/code_securite_sociale/code_securite_sociale.pdf
([f]) Ministry of Health, Ministry of Social Security, Caisse Nationale de Santé (CNS) (Mandatory Health Insurance — Social Security Fund): http://www.cns.lu/employeurs/?p=121&lm=3-0-0&lp=125
([g]) Ministry of Health, Ministry of Social Security, CNS (Mandatory Health Insurance — Social Security Fund): http://cns.lu/files/listepos/16.01_Liste_pos_assures.pdf
([h]) Accounting department of prescribing agency: e.g. annual cost breakdown.
([i]) Ministry of Health, Ministry of Social Security, CNS.
([l]) Expert opinions, prescribers' and patients' surveys.

Calculation formulae

The formulae to calculate C^{AGENCY} and C^{MD} are the following:

$$C^{AGENCY} = (C^{AGENCYOP} + C^{AGENCYDRUG}) - (SHAREPAT^{OSTAGCO} + SHAREPAT^{OSTAGDRUG}) \quad (5.4)$$

and

$$C^{MD} = (C^{MDCO} + C^{MDDRUG}) - (SHAREPAT^{OSTMDCO} + SHAREPAT^{OSTMDDRUG}) \quad (5.5)$$

or (alternative equation)

$$C^{MD} = (N^{OSTPAT} \times AVRC^{/OSTPAT} - (SHAREPAT^{OSTMDCO} + SHAREPAT^{OSTMDDRUG}) \quad (5.6)$$

Optional estimators for $N^{OSTPAT} = N^{OSTMD} \times AVRN^{OSTPAT/MD}$

and for $$AVRC^{/OSTPAT} = (AVRF^{/OSTMDCO} \times FEE^{OSTMDCO}) + (AVRF^{/OSTMDDRUG/PAT} P^{OSTDRUG/UNIT})$$

The total public expenditure generated by OST (C^{OST}) is the sum of C^{AGENCY} and C^{MD}:

$$C^{OST} = C^{AGENCY} + C^{MD} \quad (5.7)$$

Requirements, strengths, weaknesses and limitations of applied methodology

The described method demands that researchers are familiar with the national OST prescription routines and administrative rules.

A clear distinction in recording and control routines between OST and other opioid-based treatments (e.g. pain treatment) is required in order to determine the exact number of clients and prescription parameters, regardless of the methodology that is used. If hard data are available and specific data breakdowns can be calculated — for instance by means of national OST surveillance registers or by other competent authorities — the accuracy of the cost estimation is higher.

The alternative method requires a large set of mostly aggregated data, based on average multipliers and provided by different data sources and tends to be less reliable.

Annual treatment costs of HIV infections and AIDS caused by drug use ($C^{HIV/AIDS}$)

Applied methodology

Expenditure generated by the treatment of persons living with HIV and AIDS (both referred to as PLWHIV) is relevant in the present analysis, as the transmission of the HIV infections might occur through drug use, mostly via injection. Since previous drug use and route of infection are generally not recorded in diagnostic coding or accessible treatment data, and as medical consultations for HIV are generally not recorded specifically, often an indirect method has to be designed in order to estimate the number of PLWHIV alive at time x ($N^{PLWHIVALIVE}$), the proportion of PLWHIV who were infected via drug use (R^{HIVDU}), the number of PLWHIV infected via drug use (N^{HIVDU}), the number of the latter receiving HIV and AIDS treatment during the observation period ($N^{HIVDUTREAT}$) and the cost of treatment per PLWHIV infected via drug use and in treatment ($C^{HIVTREAT/DU}$).

According to national public health regulations and surveillance systems, data compilation might be facilitated insofar as HIV infections and AIDS are part of the medical conditions and diseases to be notified to public health authorities . Furthermore, specialised hospital departments, treatment units and retrovirology laboratories are important data sources to be addressed. These sources should allow the determination of the number of PLWHIV (cohort) recorded nationally. In addition, the route of infection is mostly assessed at some point of the diagnostic and treatment process. The rate (R^{HIVDU}) to be used in the annual final cost $C^{HIV/AIDS}$ equation depends on available data. The rate observed within cases diagnosed during the observation year can be applied, whereas it might be more accurate, if longitudinal data are available, to use an average rate based upon longer periods (ideally covering the entire registration period), as these rates can be subject to important yearly variations.

Given that the window of observation is set to one year, one has to determine the number of PLWHIV infected via drug use and who have been receiving HIV and AIDS treatment during the referred period. If the referred number ($N^{HIVDUTREAT}$) is available at the national level, this value can be used straightforwardly as a multiplier in equation 5.10.

If $N^{HIVDUTREAT}$ is unknown, the number of PLWHIV deceased since the beginning of HIV registration and surveillance ($N^{PLWHIVDEAD}$) has to be subtracted from the total number of recorded PLWHIV (N^{PLWHIV}) in order to obtain the estimated number of PLWHIV alive (and in need of treatment) ($N^{PLWHIVALIVE}$). Once this figure is known, one can apply R^{HIVDU} in order to obtain an estimation of the number of PLWHIV infected via drug use and alive ($N^{HIVDUALIVE}$) during a given year.

HIV and AIDS treatment coverage comes into play at this point, as not all recorded persons with an HIV/AIDS diagnosis are necessarily in treatment. The number of PLWHIV alive in treatment and the rate of PLWHIV infected by drug use, alive and in treatment might be provided by a central national body (as is the case in Luxembourg). National data sources used are listed in the footnotes of

Table 5.3, stressing, however, that competent bodies and the availability of these data might be country specific. In the event that the in-treatment rates of recorded PLWHIV alive and of PLWHIV infected via drug use is 100 %, $N^{PLWHIVALIVETREAT}$ equals $N^{PLWHIVALIVE}$ and $R^{HIVDUTREAT}$ equals R^{HIVDU}.

The present method requires a further variable: the annual cost of HIV treatment per client ($C^{HIVTREAT/DU}$). As noted, these figures (per client or total) are often not readily available from central health insurance or social security authorities. Specialised hospital departments might be able to provide aggregated average figures on the basis of in-house data processing on a sample of patients or expert opinions might be asked for. It is worth mentioning that, according to national experts, the costs generated by treatment of HIV or AIDS are, to a large extent, similar, as they primarily reflect expenses related to antiretroviral treatment drugs. Slight variations may be observed in cases with specific combinations of prescription medications. Finally, according to national social security reimbursement schemes, potential financial contributions from clients have to be subtracted from the final costs.

Information and data requirements

TABLE 5.3

Information and data requirements for the determination of annual $C^{HIV/AIDS}$

General preliminary information	List of national HIV treatment providers (a)	
	National public health regulations as regards notification of infectious diseases (a)	
	National social security code (b)	
	Nomenclature of medical treatment (c)	
	Prescription medicines reimbursement schemes (d)	
$C^{HIV/AIDS}$ data	Total, cumulative number of PLWHIV recorded nationally (a)	N^{PLWHIV}
	Number of PLWHIV deceased since HIV registration (a)	$N^{PLWHIVDEAD}$
	Number of PLWHIV alive at time *x*	$N^{PLWHIVALIVE}$
	Number of PLWHIV infected via drug use alive (a)	$N^{HIVDUALIVE}$
	Rate of PLWHIV infected via drug use (a)	R^{HIVDU}
	Rate of PLWHIV infected via drug use in treatment (a)	$R^{HIVDUTREAT}$
	Number of PLWHIV infected via drug use and in treatment	$N^{HIVDUTREAT}$
	Annual cost of treatment per PLWHIV infected via drug use and in treatment (e)	$C^{HIVTREAT/DU}$
	% of HIV/AIDS treatment costs not reimbursed to clients (c)	$SHAREPAT^{HIVTREAT}$

National data sources:
(a) Ministry of Health, National Surveillance Commission on HIV/AIDS, National Laboratory of Retrovirology. Luxembourg Institute of Health.
(b) Social security code: http://www.legilux.public.lu/leg/textescoordonnes/codes/code_securite_sociale/code_securite_sociale.pdf
(c) Ministry of Health, Ministry of Social Security, Caisse Nationale de Santé (CNS) (Mandatory Health Insurance — Social Security Fund): http://www.cns.lu/employeurs/?p=121&lm=3-0-0&lp=125
(d) Ministry of Health, Ministry of Social Security, Caisse Nationale de Santé (Mandatory Health Insurance — Social Security Fund): http://cns.lu/files/li-stepos/16.01_Liste_pos_assures.pdf
(e) Accounting department of hospital, expert opinions.

Calculation formulae

The formulae to calculate $N^{PLWHIVALIVE}$ and $N^{HIVDUTREAT}$ are the following:

$$N^{PLWHIVALIVE} = N^{PLWHIV} - N^{PLWHIVDEAD} \quad (5.8)$$

$$N^{HIVDU} = N^{PLWHIVALIVE} \times R^{HIVDU} \quad (5.9)$$

$$N^{HIVDUTREAT} = N^{HIVDU} \times R^{HIVDUTREAT} \quad (5.10)$$

The total public expenditure related to the treatment of PLWHIV infected via drug use ($C^{HIV/AIDS}$) is calculated as follows:

$$C^{HIV/AIDS} = (N^{HIVDUTREAT} \times C^{HIVTREAT/DU}) - SHAREPAT^{HIVTREAT} \quad (5.11)$$

Requirements, strengths, weaknesses and limitations of applied methodology

A first methodological limitation of this multiplier method, which applies equally to 'hard data' methods, is related to the issue of coverage. National records of PLWHIV in treatment do not necessarily represent the total number of current PLWHIV in a given country. That said, from a purely public expenditure perspective, the cost estimation is valid, as PLWHIV not in treatment do not generate direct treatment-related public expenses. That said, everything should be attempted to get PLWHIV into treatment as soon as possible, which may eventually also generate public expenditure (e.g. prevention and early detection campaigns). It should be added that even persons with a diagnosed HIV infection might not be involved in any treatment programme. HIV and AIDS treatment coverage of PLWHIV infected via drug use should thus be thoroughly assessed according to nationally available data when applying the present method.

Moreover, a fairly important number of variables are at play in the model and some values have to be estimated or are subject to important annual variability (e.g. R^{HIVDU}), which makes the use of cross-sectional data for estimators questionable. Furthermore, the total cost of HIV and AIDS treatment is highly dependent on the price of retroviral drugs. These known important variations and the changes in therapeutic combinations of these drugs need to be accounted for within any longitudinal analysis and such analysis is, therefore, subject to caution.

This model exclusively addresses the medical treatment costs of PLWHIV infected via drug use. However, PLWHIV may also be in need of psychosocial care and housing. In Luxembourg, these offers are provided by specialised NGOs, financed by the state and, as such, the related costs are part of labelled public expenditure, easily retrievable and therefore not addressed here.

Conclusions

It is of note that the sum of public expenditure in a given area, besides its value in terms of trend analysis, if serial comparable estimates are available, is genuinely an abstract figure. Indeed, absolute cost estimations do not reflect the magnitude of the financial burden to be borne by a given community (e.g. national population), nor do they reveal how much is spent for a given purpose.

In addition, they do not take into account the relevance of invested resources to the prevalence of the drugs problem dealt with, nor do they allow public expenditure to be situated in a supranational context. Therefore, comparable, proportional indicators are needed.

Costs can be presented in relative measures. First, in order to consider the size of the population at stake, the expenditures per inhabitant should be calculated. Second, irrespective of the size of the target population, the prevalence of drug use, and in particular problem and injecting drug use within the total, it is an important factor when it comes to comparing relative expenses per drug user at national and international levels. Third, since public expenditures have to be borne by the state, federal, regional or local government budget, a public expenditure breakdown might be of use. Finally, economic parameters and performances of countries are diverse and international country comparisons could be partially based upon indicators taking into account the expenses in relation to the country's GDP.

Table 5.4 summarises distribution indicators and cost breakdowns that may be applied in the framework of drug-related expenditures studies in a serial and internal comparability perspective (Origer and Cloos, 2002). According to national definitions of drug demand reduction, categories may vary. It might be useful, for instance, to also include expenses related to risk and harm reduction in the analysis.

TABLE 5.4

Distribution and yearly breakdown indicators of public expenditures related to drug demand reduction

Distribution of expenses by domain of action
A. Expenses related to drug prevention
B. Expenses related to drug treatment and treatment of associated diseases
C. Expenses related to aftercare measures (e.g. rehabilitation and socioeconomic reintegration)
T. Total expenses dedicated to drug demand reduction

Expenses per person
Expenses A, B, C, T per inhabitant
Expenses A, B, C, T per problem illicit drug user (according to results of national prevalence studies)

Percentage of collective resources
Percentage of the GDP applied to expenses A, B, C, T
Percentage of the state budget applied to expenses A, B, C, T
Percentage of the social budget applied to expenses A, B, C, T

Source: Origer and Cloos, 2002.

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6

CHAPTER 6

Estimating the costs of treating drug-related health problems in the United Kingdom

Charlotte Davies

Introduction

This chapter describes the methods used to estimate public expenditure on treating drug-related health problems in the United Kingdom as part of a wider 2012 study estimating drug-related public expenditure. The study formed part of the 2012 national reporting to the EMCDDA (Davies, 2012) and built on methods first developed in a similar 2007 study (Davies, 2007). Although these two studies were stand-alone exercises, the framework within which they were carried out, forming part of reporting from national drug monitoring systems, means that the methods were developed with the aim of identifying data sources that could be used to monitor drug-related expenditure rather than as a research study. Thus a pragmatic approach to the choice of data and methods was taken. In addition, all elements of drug-related public expenditure were included, in order to ensure that expenditure data would be useful in ultimately assessing the cost-effectiveness of drug policy and funding decisions.

Background: institutional framework and drug treatment expenditure data

The National Health Service (NHS) in the United Kingdom is a publicly funded healthcare system free at the point of delivery. As healthcare is a devolved responsibility, each of the four UK countries runs its NHS independently and therefore has a separate drug treatment system and way of accounting for expenditure. While there are private hospitals and drug treatment centres, the vast majority of services for drug users are publicly provided.

Data on specialised drug treatment public expenditure were available for the United Kingdom in 2012 covering outpatient, inpatient, low-threshold and prison treatment (Davies, 2012). The level of detail and nature of the expenditure data, however, differed across the United Kingdom. In each country, expenditure data were available covering labelled, central government drug treatment allocations, although in Wales and Northern Ireland (where there are combined drug and alcohol strategies) this also included elements of alcohol expenditure. The expenditure data were recorded in administrative systems, and labelled expenditure reflects budget allocations rather than actual expenditure.

Expenditure estimates for drug treatment from local mainstream funding sources are unlabelled forms of expenditure and were calculated in different ways across the United Kingdom's constituent countries. For England, aggregated expenditure from local mainstream budgets such as general healthcare and police was estimated using annual local treatment plans representing a bottom-up estimation exercise. In Scotland, a one-off study carried out by Audit Scotland (2009) estimated the expenditure on drug treatment services in 2007/08 by collecting expenditure data from each health board. This was used to create an attributable fraction to be applied to the total healthcare budget in subsequent years. In Wales, an internal exercise estimating expenditure on substance misuse services from NHS mainstream allocations was carried out and, based on the findings, the Welsh Government ring-fenced 0.4 % of local health boards' future mainstream budgets for substance misuse services. The annual value of this is used to estimate additional mainstream expenditure, although local health boards may spend more. In Northern Ireland, no estimate was available for unlabelled mainstream expenditure.

The expenditure data on drug treatment were, therefore, generated through both a top-down and a bottom-up approach, and represented both labelled and unlabelled expenditure and a mixture of actual expenditure and budget allocations. The methods for estimating unlabelled expenditure differed, with each UK country adopting

a pragmatic approach based on the information it had available.

While the United Kingdom has been able to estimate expenditure on drug treatment services across all countries, it has focused on specific drug services rather than the wider healthcare costs related to drug use. This restricts the ability of public expenditure data to be used in a way that is relevant to policymakers, namely in assessing the full cost-effectiveness of policy and financial decisions. It does not allow an assessment of the impact of changes in healthcare spending in one area on other areas of healthcare. Being able to demonstrate how investment in one area will provide savings in others is vital in an era of tight healthcare budgets. One of the aims of the 2007 and 2012 public expenditure studies was to identify relevant drug-related health costs and to explore methods of estimating these that could be replicated in order to monitor a wider range of drug-related healthcare treatment costs. This paper describes the methods used to do this for the health conditions set out in Table 6.1.

TABLE 6.1
Health conditions included in the 2012 UK estimate

Health condition	Wholly attributable to drug use	Source of attributable fraction and year	Attributable fraction used	ICD-10 code
Infectious disease				
HIV	No	HPA data on transmission route of those diagnosed with HIV (2010)	0.018	B20-B24
Viral hepatitis B	No	HPA laboratory data (2003)	0.18	B16, B18.0, B18.1
Viral hepatitis C	No	HPA risk information data from laboratory reports (1996-2010)	0.88	B17.1, B18.2
Neuropsychiatric conditions				
Mental and behavioural disorders due to use of psychoactive substances	Yes	N/A		F10-F12, F14-F17, F19
Cardiovascular diseases				
Acute and subacute endocarditis	No	Single et al. (1996)	0.14	I33
Maternal drug use				
Low birthweight and short gestation; neonatal conditions	No	Author calculation using data on births recording drug misuse and outcome in Scotland (2008/09) and prevalence of problem drug misuse (2009/10)	0.009-0.030 depending on condition	P02.0-P02.2, P04.8, P05-P07
Fetus and newborn affected by maternal use of drugs	Yes	N/A		P04.4, P96.1
Pregnancy complications	No	Author calculation	0.009-0.030 depending on condition	O35.5, O36.5, O44-O46, O67
Unintentional injuries				
Motor vehicle accidents	No	Adjusted odds ratio from DRUID study (Hels et al., 2011) and 2010/11 last month drug use estimate (UK focal point, 2011)	0.063	Various V codes excluding non-traffic accidents; Y85
Accidental poisoning and exposure to illegal drugs	Yes	N/A		T40.0-T40.5, T40.7, T43.6
Intentional injuries				
Suicide	No	Degenhardt et al. (2004), Australia	0.09	X60-X84
Assault	No	Author re-analysis of Arrestee Survey data (2005/06)	0.022	X85-Y09

Note: HPA, Health Protection Agency.

Identification of drug-related health costs

Estimating public expenditure on drug-related healthcare services ideally requires the following three elements: first, identification of relevant drug-related health conditions; second, a drug-related attributable fraction for those health conditions not wholly attributable to drug use; third, the health service expenditure by health condition. In reality, the last is rarely available; therefore, for a bottom-up estimation exercise, a fourth element, health service utilisation data, is required along with compatible unit cost data. The identification of the relevant drug-related health conditions was the first step in the estimation exercise and was informed by research on the association between drug use and health.

While many studies have shown an association between drug use and health harms, causality is rarely demonstrated and it is recommended that studies that demonstrate only association are not used (Single et al., 2003). Causal inference implies that temporality should be established in a study, and some cost studies have used further criteria. In their Canadian cost of substance abuse study, for example, Rehm et al. (2006a) specify four conditions for inclusion: (1) consistency across several studies; (2) established experimental biological evidence of biological mechanisms; (3) strength of the association; and (4) temporality.

Given the complexities of determining causality, a decision was made to use only the conditions identified by Rehm et al. (2006b) based on the WHO's 2000 Global Burden of Disease Study (Mathers et al., 2002). This list of conditions is used in existing substance misuse cost studies in Canada (Rehm et al., 2006a) and is almost identical to the conditions used in an Australian study (Collins and Lapsley, 2008). Table 6.1 is partly adapted from these studies and uses the International Classification of Diseases (ICD-10) ([1]) to identify relevant conditions.

Methods

Calculating drug-related attributable fractions

Many of the health conditions identified in Table 6.1, however, are not wholly attributable to drug use and, in order to estimate public expenditure on treating drug-related health conditions, it is necessary to determine the proportion that are. The calculation of an attributable fraction is one method of achieving this. This can be calculated by using the relative risk, which approximates the causal relationship between exposure to the risk behaviour and the health condition, and the prevalence of the risk behaviour in the studied population (Chikritzhs et al., 2002). Relatively few case-control studies exist that estimate the relative risk of drug use and health conditions — where such studies do exist, they include a limited number of conditions and are predominantly from countries outside the United Kingdom such as Australia (English et al., 1995) and Canada (Single et al., 1996). Using relative risks derived from a population different from the one being studied can be problematic, as differences in the prevalence of drug use and the extent of the harm associated with use can affect the applicability of the relative risk and the validity of the attributable fraction derived from it (Riddell et al., 2008). Nevertheless, this is the approach that was taken when calculating alcohol-attributable fractions in England (NWPHO, 2008).

The lack of population-specific drug-attributable fractions and research that could underpin the calculation of attributable fractions creates a barrier to estimating drug-related expenditure. In order to overcome this, in addition to published epidemiological research studies, various official data sources were interrogated to see whether or not they provided data that could be used to calculate drug-related attributable fractions. Data used in the study included published monitoring data from the Health Protection Agency on known transmission routes for HIV (Health Protection Agency, 2011a, 2011b) and the re-analysis of a large dataset from a government research study, the Arrestee Survey for England and Wales (National Centre for Social Research, 2011) to provide an attributable fraction for injuries due to assault ([2]). The preferred source for estimating drug-related attributable fractions was case-control studies providing relative risks or an odds ratio from which relative risks could be approximated. Where such studies were available concerning non-UK populations, they were used where no other data were available. If other data were available on which to base calculations, a decision was made on which method was most appropriate. The reasons for the choices made were set out in an unpublished technical document ([3]). This flexible approach allowed as wide a range of health conditions as possible to be included in the estimate, based on the estimator's judgement.

([1]) See http://apps.who.int/classifications/icd10/browse/2016/en

([2]) This involved estimates based on self-reporting of the effect of drug use on individuals' criminal behaviour.

([3]) Available from the author on request.

Table 6.1 shows the source of the attributable fraction for various health conditions, the year of data for the underlying data and the value used. The use of regular monitoring data sources allows annual calculation of attributable fractions, but the majority were calculated from one-off studies that would require periodic updates. Assigning appropriate ICD-10 codes to each health condition allows calculation of the drug-attributable proportion using a common classification of disease system.

Example: Using administrative data to calculate an attributable fraction for maternal drug use

No UK research studies could be found that provided a drug-attributable fraction for birth problems or the relative risk of these occurring among drug users. Administrative data, however, were available on all births in Scotland, whether the infant was born prematurely or with a very low, low or normal birthweight and the number of these recording drug misuse (ISD Scotland, 2012). This allowed the calculation of relative risks for the different birth outcomes recorded. The national estimate on the prevalence of drug misuse provided data on prevalence (ISD Scotland, 2011), from which a drug-attributable fraction was calculated. The relative risks and attributable fractions for each condition are shown below.

Outcome	Relative risk	Attributable fraction
Very low birthweight	1.958	0.009
Low birthweight	4.042	0.030
Very low and low birthweight	3.669	0.026
Pre-term	2.076	0.011
Pre-term and low birthweight	2.743	0.017

Data on health service utilisation

The next step to estimate the impact of drug use on health services required data on health service utilisation. While aggregated data were available for many levels of the health service — GP visits, accident and emergency (A&E) department visits, outpatient hospital attendance and inpatient stays — there were minimal data available at a disaggregated level by health condition. This means, for example, that there were no data available on the reason for a GP visit, although individual practices or areas may carry out audits. Consequently, for large parts of the health service, it was not possible to estimate public expenditure on treating drug-related health conditions. Hospital inpatient stays were the exception. Primary diagnosis data are available across the United Kingdom broken down by ICD-10 code, although the extent to which these data are made publicly available differs.

Annual Hospital Episode Statistics are published in detail for England, allowing access to data on individual ICD-10 codes, which are matched to the health conditions in Table 6.1. Scotland, Wales and Northern Ireland publish data at various aggregated levels. It was not possible, therefore, to get activity data for some health conditions in all UK countries using routinely published data. The data for England include the number of episodes and number of bed-days and the percentage that were emergency cases. These activity data can then be combined with the drug-attributable fraction to estimate drug-related hospital activity associated with the treatment of drug-related problems. Having detailed data on hospital activity provides greater opportunity to estimate expenditure, as there is a greater likelihood of a measure of activity being consistent with available cost data.

Health service cost data

The main source of unit cost data for England was National Health System reference cost data. Published annually, they give unit costs of providing NHS treatment broken down by health resource group (HRG) (Department of Health, 2011a). This is a method of grouping together clinically similar treatments, which use common levels of healthcare resources. The data are also the reference unit costs on which the national tariff payment system is based. For inpatient stays, an HRG is derived based on diagnosis codes (ICD-10) and procedure codes (OPSC-4 ([4])) for each spell of treatment. In order to gain consistency with the published activity data (based on ICD-10 codes), it was necessary to map the relevant conditions to the published HRGs. The corresponding cost per episode could then be used. If more than one HRG was mapped to the relevant condition, the weighted average cost was calculated as per the method set out in the NHS cost manual. One issue was the fact that HRG-4, unlike previous versions, moved to a spell rather than an episode basis. This may introduce an element of double counting when using episode-based activity data. However, given that the vast majority of spells have only one consultant episode (Monitor and NHS England, 2013) and the change was not mandated

([4]) The Office of Population, Censuses and Surveys Classification of Surgical Operations and Procedures (4th revision) is a classification system used in the UK to assign codes to surgical operations, interventions and procedures. The OPCS-4 classification is reviewed annually and updated to reflect changes in clinical care.

in 2010/11 (Department of Health, 2010), this should not have affected the 2012 estimate.

The reference cost data are collected on a full absorption basis including costs relating directly to the delivery of client care (e.g. staffing costs), other costs related to the delivery of care, but not able to be identified at individual level (e.g. catering and linen), and overhead costs for the overall running of the service (e.g. payroll). They use a top-down methodology where costs are apportioned to HRGs from pooled costs ([5]).

For some services, such as mental health inpatient services, cost data were available on a bed-day basis, drawn from the unit costs of health and social care publication (Curtis, 2011). Therefore, a different unit of activity, one compatible with this method of calculating cost data, was used, namely the number of bed-days.

Combining data to calculate drug-related expenditure

For most of the health conditions, the expenditure calculation consisted of the product between the number of hospital episodes and the attributable fraction for each disease considered multiplied by the unit cost for each condition.

In some instances, however, a more specific source of cost data was available and hospital inpatient data were not used. For example, in England HIV/AIDS treatment has its own budget line in programme budget reporting, which includes the costs of outpatient treatment as well as inpatient. Therefore using the overall expenditure data and applying the attributable fraction, it was possible to produce a more comprehensive estimate of expenditure.

In other instances, additional elements of expenditure were added to the calculation. For example, information on prescription costs was available ([6]) that allowed estimates of expenditure on hepatitis B and C medicines in addition to expenditure on inpatient stays.

Example: Using research findings to underpin estimates — treating infection site wounds

A UK research study identified a further element of drug-related treatment expenditure that had not been included: the cost of treating infection site wounds. The research asked injecting drug users whether they had had an injection site wound, whether they had sought treatment for it and where they had sought treatment. By applying these findings to the latest estimate of injecting drug use in the UK (n = 133 112; Davies et al., 2012) an estimate of healthcare activity can be calculated. The unit cost of a GP visit including direct care staff and the national average unit cost of accident and emergency (A&E) attendance was used (Curtis, 2011), with the adjusted average unit cost for non-elective hospital stays related to intermediate and minor skin conditions used for hospital admissions (Department of Health, 2011a).

Healthcare	Number	Unit cost (GBP)	Total cost (GBP)
GP visit	16 791	30	503 730
A&E no admittance	3 276	106	347 256
A&E admitted	11 614	1 267	14 714 938
Total	31 681	–	15 565 924

Limitations

There will always be limitations on how expenditure studies can be interpreted. Estimates can reflect only what is currently known about drug use and its impact on health. They are based on assumptions and on other estimates, so they rely on the accuracy of these. The quality and availability of the data and research for each of the four elements varies: (1) identification of relevant health conditions; (2) calculation of drug-related attributable fractions; (3) data on health service utilisation; and (4) available cost data. Research on which to base assumptions is mainly restricted to individual studies, and it may be old or from a different country. Administrative data also rely on accurate recording, but the accuracy of ICD-10 coding has been questioned (Monitor, 2012), as it is primarily carried out by dedicated coding staff using case notes rather than by health professionals. As coding affects financial reimbursement, there may also be an incentive to code the primary condition as the one that attracts the highest reimbursement rather than the most appropriate for the case.

([5]) The definition of 'direct' costs and 'indirect' costs used in the NHS Costing Manual differs from that commonly used in economic terms. Full details on the definition can be found in the publication (Department of Health, 2011b).

([6]) See http://digital.nhs.uk/catalogue/PUB02274 and http://content.digital.nhs.uk/pubs/hospre10

Furthermore a recent audit of costing in the NHS found that across NHS trusts 'the accuracy of costs is variable, and only a small handful of trusts had good quality costing' (Capita, 2014). The report also highlighted the importance of accurate underlying data for the calculation of unit costs, stating that 'no matter how detailed and accurate costing methodologies are, if the activity data is incorrect, then so will be the unit costs.'

Owing to the absence of detailed data on health service utilisation for many levels of the health system, such as GP visits and non-admitted hospital care, estimates are unlikely to provide a true reflection of total expenditure on treating drug users. Given this fact, a decision was made to choose different data sources and methods of estimating based on what would provide the most comprehensive estimate. Therefore, it is not possible to compare healthcare costs between conditions, as they may include different elements. However, even if only inpatient hospital expenditure was calculated, it may not be possible to compare expenditure between conditions, as the setting in which treatment occurs could differ substantially between them, as well as their costs. For example, some conditions may be more likely to be treated in outpatient settings than inpatient settings.

Conclusion

Given the limitations of public expenditure estimates and the immaturity of the subject area for drugs, global estimates of expenditure are unlikely to prove accurate and may have limited use. However, identifying data sources on which estimates of expenditure for various drug-related health conditions can be calculated may allow these relevant areas of expenditure to be factored into local funding decisions and allow a wider assessment of the benefits of treating drug users.

In England, the removal of the ring-fenced budget for drug treatment and the mainstreaming of funding into a wider public health grant has meant that there is a greater need to demonstrate return on investment. Identifying wider drug-related healthcare costs, and costs in other areas such as social care, allows a wider assessment of the impact of treating drug users. Using routinely collected data reduces the time and resources required to produce estimates and should enable changes over time to be monitored.

While the use of a pragmatic approach and wider definition of drug treatment allows for a more comprehensive identification of drug-related healthcare expenditure at a national level, it is not exactly replicable in other countries. There is no reason, however, that the underlying steps cannot be performed in each country. That is, a common set of drug-related health conditions are agreed upon, sources of data for the calculation of drug-related attributable fractions are identified for these, and sources of data for healthcare costs and healthcare activity are identified. While the absence of data for any of these components may mean that an estimate is not possible, mapping out what is available is a useful exercise in itself and can identify research gaps and new data sources and inform improvements to data collection and reporting.

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7

CHAPTER 7

Public expenditure on drug treatment and associated comorbidities: a case study of Bergamo

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Introduction

The burden and cost of substance use in market economies and public health systems are huge. In the *World Health Report 2004*, the WHO estimated the impact of risk factors on the burden of disease. The results showed that substance-attributable burden of disease across developed sub-regions was high, with tobacco accounting for 12.2 % of all disease burden in the year 2000 in market economies (highest burden of all 26 risk factors examined), alcohol accounting for 9.2 % (third most important risk factor) and illicit drugs accounting for 1.8 % (eighth most important risk factor). One of the differences between these three categories of substance is the fact that they inflict their disease burden on different age groups. The use of illicit drugs inflicts its mortality burden earliest in life and alcohol mainly before the age of 60, while tobacco-related deaths occur mostly after the age of 60 (WHO, 2004, 2013; Rehm et al., 2006a).

Notably, both total deaths and age-standardised death rates due to alcohol use disorders significantly dropped between 2005 and 2015, falling by 12.6 % (range from 7.0 to 16.7) and 29.2 % (range from 24.7 to 32.4), respectively. However, drug use disorders accounted for an increasing number of deaths, resulting in a rise of 31.8 % (range from 20.4 to 39.4) since 2005. Deaths due to opioid use disorders accounted for 71.9 % (range from 69.5 to 73.3) of these drug-related deaths in 2015, increasing by 29.6 % (range from 18.2 to 37.2) (GBD 2015 Mortality and Causes of Death Collaborators, 2016).

Cohort studies show that, with respect to the general population, illicit drug users have a higher risk of morbidity and premature death caused by overdose, HIV and AIDS, suicide and trauma (World Health Organization, 2004; Degenhardt et al., 2006; Mathers et al., 2013; Kennedy et al., 2015). Unlike tobacco and alcohol use, other adverse health effects of illicit drug use have been less widely explored. Three factors may account for this knowledge gap: (1) the relatively recent undertaking of research on the effects of illicit drug use in many countries; (2) the low prevalence of use of drugs in the population compared with alcohol and tobacco; and (3) the fact that its illicit nature encourages users to conceal or deny their drug use, hence inhibiting research on the effects on morbidity and mortality.

At the European level, the EMCDDA estimated in 2013 that at least 1.6 million individuals received some kind of treatment for illicit drug use (EMCDDA, 2015). Data also show that, in the same year, there were more than 172 000 hospital discharges for mental and behavioural disorders due to the use of psychoactive substances, including nicotine (Eurostat, 2015). By just looking at the total number of people in treatment, it appears clear that drug abuse treatment has a significant cost for European healthcare systems.

Furthermore, drug use imposes a burden on wider healthcare services. A Canadian study found that, in 2002, 'hospital diagnoses attributable to use of illegal drugs were dominated by mental and behavioural disorders due to psychoactive substance use', which accounted for 63 % of all illicit drug-attributable diagnoses in acute care hospitals. Among mental and behavioural disorders due to psychoactive substance use, multiple drugs and other psychoactive substance use was the largest specific cause of hospital diagnoses (29 %), followed by cocaine (24 %), cannabinoids (24 %) and opioids (17 %). The second major contributor (17.7 %) was opiate and cocaine poisoning (non-fatal overdoses). The third and fourth largest categories of hospital diagnoses attributable to illicit drug use were HCV (7.6 %) and non-fatal suicide (6.7 %) (Rehm et al., 2006b, 2007).

Taking account of this complex scenario, the aim of this study was to estimate the direct and indirect healthcare

costs of hospitalisation, outpatient specialised treatment and prescription drugs incurred over the 2013-14 period by illicit drug users taken in charge in 2012 by the addiction treatment services (SERT) of the city of Bergamo (a province of northern Italy). This will also take into account the potential comorbidity profile of each client.

The healthcare system in Italy

To understand the meaning of data and results, it is necessary to describe the structure and organisation of the healthcare provision system in Italy, as well as its funding and information processes.

Healthcare services are provided to all Italian citizens and residents in the framework of a mixed public-private system. The public part is provided by the National Health Service (Sistema Sanitario Nazionale, SSN), which is organised under the Ministry of Health and is administered at regional level through the local health authorities (Azienda di Sanità Locale, ASL). Until 1998, the SSN was funded directly by central government. The SSN provides hospital stay and treatment (including tests, surgery and medication during hospitalisation), territorial medical assistance (mental health, drug addiction, services for people with disabilities, and others) and coordinates GPs' activities and the other territorial health structures (Health Ministry, 2012).

Prescribed drugs can be purchased only under practitioners' prescription. If prescribed by the GP, they are generally subsidised, requiring only a co-payment (ticket) that depends on the type of medicine and the patient's income. Visits to specialist doctors or diagnostic tests are provided by public hospitals and health structures or by private ones (under a specific agreement indicating costs co-financed by the public authorities), and, if prescribed by a GP, require only a co-payment. However, patients can opt for private healthcare services provided by both public and private hospitals, which are paid out of their own pockets and generally have much shorter waiting lists. Surgery and hospitalisation services provided by public hospitals or by private ones (under a specific agreement whereby costs are co-financed by public authorities) are completely free of charge for everyone, regardless of income level.

Some particular circumstances (disability, chronic diseases, drug addiction, incapacity of generating a minimum level of income that guarantees survival, low income or age-related reasons) entitle patients to co-payment exemptions.

Collection, processing and treatment of data relevant to the statutory healthcare system and to citizens' health status fall within the mandate of the Ministry of Health, which in 1984 established the Health-care Information System (Sistema Informativo Sanitario, SIS) to this end. Regions collect data from the ASLs of their territory and transmit them to the Health Ministry.

Common and interoperable languages have been specifically developed for the SSN's sub-components (hospitalisation; outpatient specialised treatment; monitoring of care networks; information system on mental health; national information system on addictions; traceability of pharmaceuticals; emergency; home care; residential and semi-residential care; others), allowing these different informatics systems to interact. Consequently, specific data flows with the information required were collected (individual characteristics, treatments/drugs, tariffs, co-pay fee exemption) generated by citizens' contacts with the SSN.

Patients are identified by the same code across all data flows: only the data provider (ASL) can link the code to the real identity of patients.

Methods

The anonymised list of clients that attended the addiction treatment service (SERT) of Bergamo province in 2012 was linked to all the administrative data flows, registering clients' interaction with the national healthcare system (hospitalisations, outpatient visits and treatments excluding GPs, drug prescriptions, co-payment fee exemption). This information system has allowed the development of an individual electronic health record for each individual client concerning the period 2013-14.

Information about drug use was extracted from SERT registries, while information about healthcare treatments, comorbidities and costs came from administrative data flows.

Data flows were integrated in the data warehouse through a linkage procedure based on the anonymised numerical code originally assigned to each client by the data provider, in compliance with the requirements of Italian Legislative Decree 196/2003 on privacy.

This procedure was used to build a database, which includes the demographic characteristics of each client, the diagnosis of illicit substance use disorders (e.g. information concerning the use of heroin and opioids, cocaine, cannabis, hallucinogens, synthetic drugs such as amphetamines, and pharmaceutical drugs such as

benzodiazepines or barbiturates as primary drug) and the comorbidities.

Individual information was classified according to the diagnosis code ICD-9-CM (from the hospital discharges data flow), the outpatient specialised treatment code (from the outpatients data flow), the co-payment exemption and drug classes, using the anatomical therapeutic chemical (ATC) classification index and the defined daily dose (DDD, from the drug prescriptions data flow).

The DDD is the given average maintenance dose per day for a drug used for its main indication in adults. It should be emphasised that the DDD is a unit of measurement and does not necessarily reflect the recommended or prescribed daily dose. Doses for individual patients and patient groups often differ from the DDD and have necessarily to be based on individual characteristics (e.g. age and weight) and, for instance, pharmacokinetic considerations. Therefore, drug consumption data indicated in DDDs give only a rough estimate of consumption and not an exact estimate of actual use. Nevertheless, the DDD provides a fixed unit of measurement independent of price and dosage form (e.g. tablet strength and purity) and enables the researcher to assess trends in drug consumption and to perform comparisons between population groups.

Information collected in the data warehouse have been used to identify patients' comorbidity profile (Franchini et al., 2015, 2016) by means of a classification method that defines the groups of conditions that the individual patient belongs to. This method, originally developed by the University of Pavia (Cerra and Lottaroli, 2004), defines 17 classifications with different orders of severity. For instance, a patient is considered type 2 diabetic if (1) he or she has drug prescriptions of insulin or analogues (ATC 3 group code A10A) with at least 10 % DDD and/or (2) he or she has drug prescriptions for oral hypoglycaemic agents (ATC 3 group code A10B) with at least 30 % DDD and/or (3) he or she has a diagnosis of diabetes mellitus type 2 at hospital discharge (ICD-9-CM code 250).

In the final version, each patient's record contains information about gender, age class, substance of abuse and comorbidity macro-classifications [1]. Furthermore, a number of specific conditions have been identified through a specific algorithm: illicit substance disorder 'Drug_addict', alcohol use disorder 'Alcohol_addict', HIV/AIDS diagnoses 'HIV_AIDS' and, more specifically, HCV, non-fatal suicide and overdose. Then, individual comorbidity profiles were created by linking each patient to his or her specific conditions.

Healthcare costs were estimated using the tariff associated with each treatment (Health Ministry, 2012): in particular the DRG's reimbursements for hospitalisation, the tariff rates for outpatient treatments and the reimbursement price for drug prescriptions. Healthcare costs were differentiated either as overall costs or by type of healthcare treatment provided (hospitalisation, outpatient specialised treatment and drug prescriptions), substance of abuse and comorbidity profile.

In some cases, costs were tabulated separately into two years of observation, to highlight possible changes in the patient's health status. Furthermore, average per capita estimates were calculated by the staff of the territorial SERT on the basis of the costs borne for the inpatient treatments for drug addiction (residential and semi-residential), outpatient treatments and laboratory tests directly provided by the territorial service itself referring to internal tariffs defined at local level.

Results

Treatment population

The cohort of clients treated for illicit substance use by SERT in 2012 amounts to 2 737 subjects. Of these, 2 372 clients had at least one contact with the SSN (other than SERT) in 2013 and/or 2014 and were captured through the linkage procedure among data flows. Men accounted for 82.7 % of all clients and were slightly older than women (men 38.1 years on average, standard deviation (SD) ± 9.9 years; women 36.7 years on average, SD ± 9.8 years) (Figure 7.1).

(1) Type of comorbidity classifications are severely disabled 'Disability', psychiatric disorders 'Mental_dis', chronic renal insufficiency 'Renal_ins', transplantation 'Transplant', neoplasms 'Neoplasm', cardiovascular diseases 'Cardiovascular', chronic obstructive pulmonary disease 'COPD', gastro-enteropathy 'Gastro', neuropathy 'Neuro', autoimmune 'Auto-imm_dis', endocrine and metabolic diseases 'Endometabol_dis', diabetes 'Diabetes', rare diseases 'Rare_dis', pregnancy 'Pregnancy', other health conditions that cannot be classified as chronic disease or pregnancy 'Residual'.

FIGURE 7.1

Distribution of the cohort of 2 372 clients by age and gender, 2012

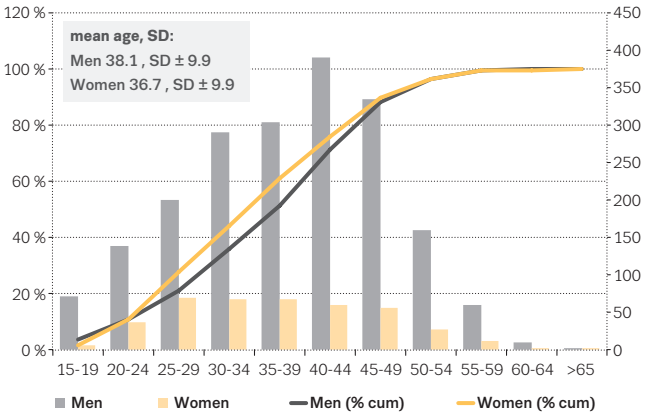

Table 7.1 shows the distribution of the 2 372 clients by the primary drug used, as indicated by SERT. Heroin, morphine and other opioids were the most frequently used drugs among both men and women, followed by cocaine and crack, used by slightly younger clients. Cannabis and synthetic cannabinoid users were the youngest clients with respect to both genders. Furthermore, SERT indicated that methadone was the primary drug for 11 clients, probably as a consequence of their long history of drug addiction.

Healthcare costs of individuals receiving drug treatment

The overall cost of healthcare services provided in terms of hospitalisation, drug prescriptions and outpatient treatments amounted to EUR 10 million over two years, with the reimbursement price for drug prescriptions being the most expensive (48.2 % of the total costs). Women generated the highest cost per client for all items (Table 7.2).

In general, heroin, morphine and other opioid users generated the highest per capita cost across genders, and women generated higher costs than men. The second group of clients in terms of healthcare consumption costs was the one using neuroleptics, hypnotics, benzodiazepines and barbiturates. These clients in particular had the highest costs of hospitalisation (Table 7.2).

Among drug users, the distribution of costs by age did not follow a clear trend, contrary to what generally happens in the general population, where, the older clients are, the higher the costs (Alemayehu and Warner, 2004).

TABLE 7.1

Distribution of clients by primary drug and gender, 2012

	No of clients	%	Mean age	SD
Men	**1 961**	**100**	**38.1**	**9.9**
Other drugs	3	0.20	34.0	13.7
Cannabis, synthetic cannabinoids	184	9.40	24.4	8.8
Cocaine, crack	468	23.90	36.1	8.2
Heroine, morphine, other opioids	1 296	66.10	40.8	8.8
Methadone	6	0.30	40.8	13.6
Neuroleptics, hypnotics, benzodiazepines, barbiturates	4	0.20	41.8	9.5
Women	**411**	**100**	**36.7**	**9.9**
Other drugs	3	0.70	40.0	12.8
Cannabis, synthetic cannabinoids	19	4.60	24.6	8.9
Cocaine, crack	82	20.00	34.1	9.4
Heroine, morphine, other opioids	289	70.30	37.7	9.1
Methadone	5	1.20	39.6	10.7
Neuroleptic, hypnotics, benzodiazepines, barbiturates	13	3.20	47.1	11.3
Total	**2 372**		**37.9**	**9.9**

Source: SERT.

TABLE 7.2

Distribution of healthcare cost (per capita) by type of item, year of observation, gender and substance of abuse

	Average cost, per capita (EUR)						
	Other substances	Cannabis, synthetic cannabis	Cocaine, crack	Heroin, morphine, other opioids	Methadone	Neuroleptics, hypnotics, barbiturates, benzodiazepines	All substances
Men							
Number of clients	**3**	**184**	**468**	**1 296**	**6**	**4**	**1 961**
Hospitalisation costs (2013)	623	733.9	654.2	663.3	0	1 311.3	667
Drug prescription costs (2013)	31.7	156.6	282.3	1 306.80	302	518.8	947.7
Outpatient specialised treatment costs (2013)	117.7	334.8	251.5	329.8	300.5	22.3	310.6
Total average cost, per capita (2013)	**772.3**	**1 225.3**	**1 188.0**	**2 299.9**	**602.5**	**1 852.3**	**1 925.3**
Hospitalisation costs (2014)	0	556.8	597.1	678.6	229.3	783.8	645.6
Drug prescription costs (2014)	2	185.7	391.7	1 379.80	1 305.8	431.8	1 027.70
Outpatient specialised treatment costs (2014)	56.3	383.5	218.1	427.1	589.2	7.3	372.2
Total average cost, per capita (2014)	**58.3**	**1 126.0**	**1 206.9**	**2 485.5**	**2 124.3**	**1 222.8**	**2 045.4**
Annual average costs, per capita (2013-14)	**415.3**	**1 175.6**	**1 197.4**	**2 392.7**	**1 363.4**	**1 537.5**	**1 985.3**
Women							
Number of clients	**3**	**19**	**82**	**289**	**5**	**13**	**411**
Hospitalisation costs (2013)	480.7	290.6	922.9	1 377.20	300.2	806.8	1 198.60
Drug prescription costs (2013)	232	112.6	592.4	1 440.80	871	472.6	1 163.80
Outpatient specialised treatment costs (2013)	406.7	151.8	331	518.7	587.4	231.8	455.2
Total average cost, per capita (2013)	**1 119.3**	**555.1**	**1 846.3**	**3 336.8**	**1 758.6**	**1 511.2**	**2 817.7**
Hospitalisation costs (2014)	734	244	694.2	1 062.40	630.8	1 660.80	962.3
Drug prescription costs (2014)	301.3	195.1	677	1 523.00	296.6	1 026.30	1 253.30
Outpatient specialised treatment costs (2014)	217.3	94.6	385.2	662.7	323	636.7	572.9
Total average cost, per capita (2014)	**1 252.7**	**533.7**	**1 756.3**	**3 248.1**	**1 250.4**	**3 323.8**	**2 788.5**
Annual average costs, per capita (2013-14)	**1 186.0**	**544.4**	**1 801.3**	**3 292.4**	**1 504.5**	**2 417.5**	**2 803.1**
Men + Women							
Number of clients	**6**	**203**	**550**	**1 585**	**11**	**17**	**2 372**
Hospitalisation costs (2013)	551.8	692.4	694.2	793.5	136.5	925.5	759.1
Drug prescription costs (2013)	131.8	152.4	328.6	1 331.20	560.6	483.5	985.2
Outpatient specialised treatment costs (2013)	262.2	317.7	263.3	364.3	430.9	182.5	335.6
Total cost, per capita (2013)	**945.8**	**1 162.5**	**1 286.1**	**2 489.0**	**1 128.0**	**1 591.5**	**2 079.9**
Hospitalisation costs (2014)	367	527.5	611.6	748.6	411.8	1 454.50	700.4
Drug prescription costs (2014)	151.7	186.6	434.3	1 405.90	847.1	886.4	1 066.80
Outpatient specialised treatment costs (2014)	136.8	356.4	243	470	468.2	488.6	406.9
Total cost, per capita (2014)	**655.5**	**1 070.5**	**1 288.8**	**2 624.5**	**1 727.1**	**2 829.5**	**2 174.1**
Annual average cost, per capita (2013-14)	**800.7**	**1 116.5**	**1 287.5**	**2 556.7**	**1 427.5**	**2 210.5**	**2 127.0**

Source: administrative data flows.

Comorbidity profiles

Each client's comorbidity profile was created by chaining all the conditions to which he or she belongs.

Those conditions were identified according to the diagnosis code ICD-9-CM (from the hospital discharges data flow), the outpatient specialised treatment code (from the outpatients data flow), the co-payment fee exemption and the drug classes, by making use of either the ATC classification index or the DDD (from the drug prescriptions data flow) of the WHO.

As shown in the Methods section, this algorithm defines 17 classifications with different orders of severity that were combined to define the comorbidity profile of each client. In particular, out of the 2 372 clients in drug treatment, only 1 373 clients were identified as drug addicted ('Drug addiction' label, alone or combined with other classifications) on the basis of their contacts with the SSN in 2013 and/or 2014. The remaining clients in drug treatment were identified as belonging to one or more of the other comorbidity classifications.

We hypothesise that the distribution of clients by comorbidity profile could be a possible explanation for the variability of costs in the same age class among men and women and within the same class of illicit drug used.

As shown in Table 7.3 [2], the most frequent profiles in both men and women were the 'Residual' (health conditions non-classified as chronic disease or pregnancy [3]), the 'Drug addiction [4]' (as identified by some specific ICD-9-CM codes or DRGs, drug prescriptions and the co-payment

TABLE 7.3
Distribution of clients by comorbidity profiles

Co-morbidity profile (a)	Men	%	Rank men	Women	%	Rank women
Residual	605	30.9	*1*	106	25.8	*1*
Drug_addict-	361	18.4	*2*	58	14.1	*3*
Drug_addict-Residual	299	15.2	*3*	73	17.8	*2*
Drug_addict-HIV_AIDS-Residual	45	2.3	*4*	15	3.6	*4*
Drug_addict-Cardiovascular-Residual	42	2.1	*5*	6	1.5	*9*
Neuro-Residual	35	1.8	*6*	12	2.9	*5*
COPD-Residual	30	1.5	*7*	10	2.4	*6*
Gastro-Residual	30	1.5	*8*	7	1.7	*7*
Drug_addict-Gastro-Residual	25	1.3	*9*	5	1.2	*11*
Drug_addict-Neuro-Residual	24	1.2	*10*	7	1.7	*8*
Cardiovascular-Residual	20	1.0	*11*			
Drug_addict-Cardiovascular-Gastro-Residual	17	0.9	*12*			
Drug_addict-COPD-Residual	14	0.7	*13*			
Drug_addict-Alcohol_addict-Residual	12	0.6	*14*	3	0.7	*15*
Cardiovascular-Gastro-Residual	11	0.6	*15*	3	0.7	*16*
Neuro	11	0.6	*16*			
COPD	10	0.5	*17*			
Drug_addict-HIV_AIDS-Gastro-Residual				6	1.5	*10*
Pregnancy-Residual				5	1.2	*12*
Drug_addict-Endometabol_dis-Residual				4	1.0	*13*
HIV_AIDS-Residual				4	1.0	*14*
Total	**1 591**	81.1		**324**	78.8	
Other profiles	**370**	18.9		**87**	21.2	

(a) See note 1 on page 85 for the definition of each category that co-occurs within each comorbidity profile.

(2) In Table 7.3 each subject is counted only once.
(3) Among the comorbidity profiles listed in Table 7.3, the only profiles that do not indicate chronic conditions are 'Residual' and 'Pregnancy-Residual'. In the first case, patients were suffering from health conditions not classified as chronic disease, while, in the second, they had some contact with SSN because of pregnancy and other non-chronic health conditions.
(4) In Table 7.3, where a patient is classified as 'Drug_addict', it means that the algorithm of classification applied to administrative data flows identified the patient as drug addicted.

fee's exemption code for drug addiction) and a combination of both. This indicated that the majority of clients with substance use disorders did not have other chronic conditions.

From the fourth position onwards, clients had comorbidity profiles that included HIV and AIDS, cardiovascular disease, neurological disorders and others.

Effect of comorbidity on healthcare costs

The distribution of costs by comorbidity profile followed a different order. The first 10 profiles, sorted on the basis of per capita costs (Table 7.4), included 0.7 % of men who generated 7.8 % of costs (per capita value up to EUR 23 000/year) and 2.9 % of women who generated 27 % of costs (per capita value about EUR 26 000/year). The ranking of comorbidity profiles differed between men and women.

To verify if the 'Drug_addict' label generated by the algorithm of classification could be efficient in identifying the real costs related to drug addiction condition, we focused on the drivers of costs among clients with and without the 'Drug_addict' label in their comorbidity profile.

Among men, the highest costs were associated with a single client aged 25, identified by SERT as a cannabis

TABLE 7.4

Distribution of per capita costs (2013-14) by comorbidity profiles (first 10 sorted profiles) and gender

	Rank	Comorbidity profile	No of clients	Total costs 2013 + 2014	Average annual costs per capita ([a])
Men	1	Renal_insuf-Cardiovascular-Gastro-Residual	1	87 900	43 950.0
	2	Drug_addict-Alcohol_addict-Cardiovascular-Gastro-Neuro-Endometabol_dis-Residual	2	11 341	28 585.3
	3	Drug_addict-HIV_AIDS-Neoplasm-Cardiovascular-COPD-Gastro-Residual	1	50 877	25 438.5
	4	Mental_dis-Drug_addict-HIV_AIDS-Cardiovascular-Gastro-Neuro-Residual	1	49 203	24 601.5
	5	Drug_addict-HIV_AIDS-COPD-Gastro-Neuro-Residual	1	45 714	22 857.0
	6	Alcohol_addict-Cardiovascular-Gastro-Neuro-Endometabol_dis-Residual	1	41 446	20 723.0
	7	Drug_addict-HIV_AIDS-COPD-Gastro-Residual	1	41 067	20 533.5
	8	HIV_AIDS-COPD-Gastro-Neuro-Residual	1	36 235	18 117.5
	9	HIV_AIDS-Neuro-Endometabol_dis-Residual	2	70 353	17 588.3
	10	Drug_addict-HIV_AIDS-Diabetes-Residual	2	66 705	16 676.3
	Profiles 1-10		**13 (0.7 %)**	**603 8410 (7.8 %)**	**23 224.7**
	Other profiles		**1 948**	**7 182 591**	**1 843.6**
	All profiles (2013 + 2014)		**1 961**	**7 786 432**	**1 985.3**
Women	1	Transplant-HIV_AIDS-Diyabetes-Cardiovascular-Gastro-Endometabol_disResidual	1	124 967	62 483.5
	2	Drug_addict- Renal_insuf-HIV_AIDS-Cardiovascular-Gastro-Neuro-Endometabol_disResidual	1	116 096	58 048.0
	3	Drug_addict-HIV_AIDS-Cardiovascular-COPD-Residual	1	96 740	48 370.0
	4	Drug_addict-HIV_AIDS-Neoplasm-Gastro-Neuro-Residual	1	48 401	24 200.5
	5	Drug_addict-HIV_AIDS-COPD-Residual	1	37 127	18 563.5
	6	Drug_addict-Alcohol_addict-Cardiovascular-Gastro-Residual	1	36 114	18 057.0
	7	Mental_dis-Neuro-Residual	2	61 370	15 342.5
	8	Drug_addict-HIV_AIDS-Cardiovascular-COPD-Gastro-Neuro-Residual	1	25 914	12 957.0
	9	Drug_addict-HIV_AIDS-Cardiovascular-Gastro-Residual	2	51 338	12 834.5
	10	HIV_AIDS-Cardiovascular-COPD-Neuro-Residual	1	24 495	12 247.5
	Profiles 1-10		**12 (2.9 %)**	**622 562 (27 %)**	**25 940.1**
	Other profiles		**399**	**1 681 585**	**2 107.2**
	All profiles (2013 + 2014)		**411**	**2 304 147**	**2 803.1**

([a]) Costs per capita are expressed as 'average annual costs' and were estimated by summing costs generated across two years (2013, 2014). This is possible because in Italy tariffs are fixed by law and did not change between 2013 and 2014.

user, who belonged to the 'Renal_insuf-Cardiovascular-Gastro-Residual' profile. His profile did not include the 'Drug addiction' classification.

Table 7.5 shows the specific drivers of cost by year for this client. In this case, hospitalisation costs, drug prescriptions and outpatient specialised treatments were clearly generated by the client's comorbidities (other than cannabis disorders). This is in line with the absence of indications in data flows regarding his drug addiction status.

In contrast, the two clients in second position with the 'Drug_addict-Alcohol_addict-Cardiovascular-Gastro-Neuro-Endometabol_dis-Residual' profile showed drivers of costs more strictly related to their toxicological history (Table 7.6a,b). Moreover, those clients, although sharing the same comorbidity profile, had very different per capita costs, due to the declining health status of the younger client.

TABLE 7.5

Focus on the client with the highest per capita cost among men: one client, male, 25 years old, cannabis

Type of costs	Cost	DRG code and description
Hospitalisation costs (2013)	2 548	089_ Simple pneumonia & pleurisy age > 17 with CC
	233	145_ Other circulatory system diagnoses with CC
	2 781	
Drug prescription costs (2013)	**782**	
Outpatient specialised treatment costs (2013)	**37 639**	
Changed health status	None	
Hospitalisation costs (2014)	165	317_ Admit for renal dialysis
	2 761	479_ Other vascular procedure without CC
	2 761	479_ Other vascular procedure without CC
	500	187_Dental extractions and repairs
	3 208	315_ Other interventions on kidney & urinary tract
	9 395	
Drug prescription costs (2014)	**32**	
Outpatient specialised treatment costs (2014)	**37 271**	
Overall costs 2013 + 2014	**87 900**	

TABLE 7.6a

Focus on the clients with the second highest per capita cost among men: one client, male, 42 years old, heroin

Type of costs	Cost	DRG code and description
Hospitalisation costs (2013)	3 977	202_ Cirrhosis and alcoholic hepatitis
	3 310	089_ Simple pneumonia & pleurisy age > 17 with CC
	3 977	202_ Cirrhosis and alcoholic hepatitis
	11 264	
Drug prescription costs (2013)	**7 146**	
Outpatient specialised treatment costs (2013)	**459**	
Changed health status	+ Transplant-Diabetes-	
Hospitalisation costs (2014)	73 756	480_ Liver and/or intestine transplantation
	73 756	
Drug prescription costs (2014)	**11 485**	
Outpatient specialised treatment costs (2014)	**5 526**	
Overall costs 2013 + 2014	**109 636**	

TABLE 7.6b

Focus on clients with the second highest per capita cost among men: one client, male, 55 years old, cocaine

Type of costs	Cost	DRG code and description
Hospitalisation costs (2013)	2 838	523_ Abuse or dependence on alcohol/drugs without rehabilitation therapy, without CC
	2 838	
Drug prescription costs (2013)	255	
Outpatient specialised treatment costs (2013)	872	
Changed health status	None	
Drug prescription costs (2014))	320	
Outpatient specialised treatment costs (2014)	420	
Overall costs 2013 + 2014	4 705	

Substance use-related comorbidity healthcare costs

As a consequence of the possible overestimation of costs due to a limited correlation between addiction status and the healthcare demand generating the costs in Table 7.2, we decided to focus our analysis on those clients with a profile, from data flows, that included the 'Drug addiction' label (*n* = 1 424) alone or combined with other diagnoses such as alcohol disorders and/or HIV and AIDS and/or HCV or non-fatal suicide and/or overdose.

This choice derives from the assumption that, if clinicians put an indication of drug addiction status in the client's medical record ('Drug addiction' label), which consequently appears in the data flows, the morbidity profile of that client will be highly related to the illicit drug use.

Table 7.7 shows the comparison of the costs associated with all clients in drug treatment (*n* = 2 372) and the costs related to those clients with a profile, from data flows, that include the 'Drug addiction' label. This last group of clients amounts to 60 % of total clients (59.4 % of men and 63 % of women) and their costs amount to 82 % of the overall cost of all clients under treatment.

Furthermore, per capita costs of clients with drug addiction as a diagnosis were 36.5 % higher than the average per capita costs of all clients. The distribution of costs by comorbidity profile is characterised by a high variability (mean per capita value: EUR 2 493 men, EUR 2 762 women; range: EUR 26-28 585 men, EUR 66-62 483 women).

Substance use-related direct costs

As mentioned above, the costs attributable to substance use disorders also include the direct cost incurred by the territorial service, SERT. As shown in Table 7.8, these costs concern inpatient treatments for drug addiction (residential and semi-residential), outpatient treatments and laboratory tests directly provided by SERT.

Based on the analysis of medical records directly collected and managed by SERT, it is estimated that average per capita costs amounted to approximately EUR 660 for outpatient treatments, EUR 99 for laboratory tests and up to EUR 22 000 for inpatient treatments (Table 7.8).

TABLE 7.7

Comparison between the overall costs and those related to patients with a profile, from data flows, including 'Drug addiction' classification

	All clients								Clients with drug addiction classification			
	Overall costs (EUR) [A]	Average costs (EUR) [B]	Other substances	Cannabis, synthetic cannabis	Cocaine, crack	Heroin, morphine, other opioids	Methadone	Neuroleptics, hypnotics, benzodiazepines, barbiturates	All substances [C]	Average costs (EUR) [D]	[C]/[A]	([D] – [B])/ [B]
Men												
Number of clients		**1 961**	**1**	**10**	**52**	**1 095**	**6**	**1**		**1 165**	**59.4 %**	
Hospitalisation costs (2013)	1 307 956.0	667.0	0.0	14 053.0	106 815.0	817 160.0	0.0	3 827.0	941 855.0	808.5	72.0 %	21.2 %
Drug prescription costs (2013)	1 858 500.0	947.7	95.0	10 980.0	54 218.0	1 634 061.0	1 812.0	828.0	1 701 994.0	1 460.9	91.6 %	54.2 %
Outpatient specialised treatment costs (2013)	608 997.0	310.6	23.0	2 740.0	22 581.0	366 338.0	1.803.0	23.0	393.508.0	337.8	64.6 %	8.8 %
Overall costs (2013)	**3 775 453.0**	**1 925.3**	**118.0**	**27 773.0**	**183 614.0**	**2 817 559.0**	**3 615.0**	**4 678.0**	**3 037 357.0**	**2 607.2**	**80.5 %**	**35.4 %**
Hospitalisation costs (2014)	1 265.925.0	645.6	0.0	20 739.0	116 328.0	854 526.0	1 376.0	3 135.0	996 104.0	855.0	78.7 %	32.4 %
Drug prescription costs (2014)	2 015 237.0	1 027.7	0.0	15 785.0	52 389.0	1 660 077.0	7 835.0	354.0	1 736 440.0	1 490.5	86.2 %	45.0 %
Outpatient specialised treatment costs (2014)	729 817.0	372.2	0.0	8 834.0	22 956.0	488 224.0	3 535.0	0.0	523 549.0	449.4	71.7 %	20.8 %
Overall costs (2014)	**4 010 979.0**	**2 045.4**	**0.0**	**45 358.0**	**191 673.0**	**3 002 827.0**	**12 746.0**	**3 489.0**	**3 256 093.0**	**2 794.9**	**81.2 %**	**36.6 %**
Average annual costs (2013 + 2014)	**3 893 216.0**	**1 985.3**	**59.0**	**36 565.5**	**187 643.5**	**2 910 193.0**	**8 180.5**	**4 083.5**	**3 146 725.0**	**2 701.1**	**80.8 %**	**36.1 %**
Per capita annual costs (2013 + 2014) by substances			**59.0**	**3 656.6**	**3 608.5**	**2 657.7**	**1 363.4**	**4 083.5**				
Women												
Number of clients		**411**	**0**	**2**	**14**	**235**	**4**	**4**		**259**	**63.0 %**	
Hospitalisation costs (2013)	492 642.0	1 198.6	0.0	0.0	22 418.0	362 822.0	1 501.0	5 137.0	391 878.0	1 513.0	79.5 %	26.2 %
Drug prescription costs (2013)	478 313.0	1 163.8	0.0	0.0	33 525.0	404 395.0	4 321.0	822.0	443 063.0	1 710.7	92.6 %	47.0 %
Outpatient specialised treatment costs (2013)	187 104.0	455.2	0.0	211.0	8 760.0	134 598.0	2 333.0	1 437.0	147 339.0	568.9	78.7 %	25.0 %
Overall costs (2013)	**1 158 059.0**	**2 817.7**	**0.0**	**211.0**	**64 703.0**	**901 815.0**	**8 155.0**	**7 396.0**	**982 280.0**	**3 792.6**	**84.8 %**	**34.6 %**

	All clients								Clients with drug addiction classification			
	Overall costs (EUR) [A]	Average costs (EUR) [B]	Other substances	Cannabis, synthetic cannabis	Cocaine, crack	Heroin, morphine, other opioids	Methadone	Neuroleptics, hypnotics, benzodiazepines, barbiturates	All substances [C]	Average costs (EUR) [D]	[C]/[A]	([D] – [B])/ [B]
Hospitalisation costs (2014)	395 525.0	962.3	0.0	1 780.0	37 770.0	301 630.0	952.0	7 847.0	349 979.0	1 351.3	88.5 %	40.4 %
Drug prescription costs (2014)	515 106.0	1 253.3	0.0	299.0	33 754.0	419 114.0	1 483.0	6 852.0	461 502.0	1 781.9	89.6 %	42.2 %
Outpatient specialised treatment costs (2014)	235 457.0	572.9	0.0	449.0	7 414.0	173 268.0	1 033.0	2 273.0	184 437.0	712.1	78.3 %	24.3 %
Overall costs (2014)	**1 146 088.0**	**2 788.5**	**0.0**	**2 528.0**	**78 938.0**	**894 012.0**	**3 468.0**	**16 972.0**	**995 918.0**	**3 845.2**	**86.9 %**	**37.9 %**
Average annual costs (2013 + 2014)	**1 152 073.5**	**2 803.1**	**0.0**	**1 369.5**	**71 820.5**	**897 913.5**	**5 811.5**	**12 184.0**	**989 099.0**	**3 818.9**	**85.9 %**	**36.2 %**
Per capita annual costs (2013 + 2014) by substances			**0.0**	**684.8**	**5 130.0**	**3 820.9**	**1 452.9**	**3 046.0**				
Men + women												
Number of clients		**2 372**	**1**	**12**	**66**	**1 330**	**10**	**5**		**1 424**	**60.0 %**	
Hospitalisation costs (2013)	1 800 598.0	759.1	0.0	14 053.0	129 233.0	1 179 982.0	1 501.0	8 964.0	1 333 733.0	936.6	74.1 %	23.4 %
Drug prescription costs (2013)	2 336 813.0	985.2	95.0	10 980.0	87 743.0	2 038 456.0	6 133.0	1 650.0	2 145 057.0	1 506.4	91.8 %	52.9 %
Outpatient specialised treatment costs (2013)	796 101.0	335.6	23.0	2 951.0	31 341.0	500 936.0	4 136.0	1 460.0	540 847.0	379.8	67.9 %	13.2 %
Overall costs (2013)	**4 933 512.0**	**2 079.9**	**118.0**	**27 984.0**	**248 317.0**	**3 719 374.0**	**11 770.0**	**12 074.0**	**4 019 637.0**	**2 822.8**	**81.5 %**	**35.7 %**
Hospitalisation costs (2014)	1 661 450.0	700.4	0.0	22 519.0	154 098.0	1 156 156.0	2 328.0	10 982.0	1 346 083.0	945.3	81.0 %	35.0 %
Drug prescription costs (2014)	2 530 343.0	1 066.8	0.0	16 084.0	86 143.0	2 079 191.0	9 318.0	7 206.0	2 197 942.0	1 543.5	86.9 %	44.7 %
Outpatient specialised treatment costs (2014)	965 274.0	406.9	0.0	9 283.0	30 370.0	661 492.0	4 568.0	2 273.0	707 986.0	497.2	73.3 %	22.2 %
Overall costs (2014)	**5 157 067.0**	**2 174.1**	**0.0**	**47 886.0**	**270 611.0**	**3 896 839.0**	**16 214.0**	**20 461.0**	**4 252 011.0**	**2 986.0**	**82.5 %**	**37.3 %**
Average annual costs (2013 + 2014)	**5 045 289.5**	**2 127.0**	**59.0**	**37 935.0**	**259 464.0**	**3 808 106.5**	**13 992.0**	**16 267.5**	**4 135 824.0**	**2 904.4**	**82.0 %**	**36.5 %**
Per capita annual costs (2013 + 2014) by substances			**59.0**	**3 161.3**	**3.931.3**	**2 863.2**	**1 399.2**	**3 253.5**				

TABLE 7.8

Estimated overall and per capita costs (EUR) including the item directly incurred by the territorial service, SERT

			2013	2014
Costs directly incurred by the territorial service	Inpatient treatments for drug addiction (residential and semi-residential)	**Number of clients**	**258**	**269**
		Overall costs	5 834 951.0	5 931 206.0
		Per capita costs	22 616.0	22 049.0
	Outpatient treatments directly provided by the territorial service	**Number of clients**		**2 372**
		Overall costs	1 709 126.4	1 898 051.6
		Per capita costs	720.5	800.2
	Laboratory tests	**Number of clients**		**2 372**
		Overall costs	264 063.7	270 114.6
		Per capita costs	111.3	113.9
Health administrative data estimate		**Number of clients**		**1 424**
		Hospitalisation costs (per capita)	936.6	945.3
		Drug prescription costs (per capita)	1 506.4	1 543.5
		Outpatient specialised treatment costs (per capita)	379.8	497.2
		Subtotal	2 822.8	2 986.0
Total per capita costs excluding inpatient treatment			**3 654.6**	**3 900.0**
Total per capita costs including inpatient treatment			**26 270.6**	**25 949.0**

As shown in Table 7.8, the estimated per capita costs include a number of healthcare services. The total per capita cost depends on the combination of healthcare services provided, the individual addiction treatment of each client, and his or her pathological profile. As general values, the per capita costs (direct and indirect costs) ranged from EUR 3 544 to EUR 3 800 for those clients who did not benefit from inpatient treatments, while it ranged from EUR 25 827 to EUR 26 160 for those clients who entered an inpatient addiction treatment programme.

Conclusions

Public expenditure on treatment for illicit drug disorders is an emerging field of investigation. In Italy, an estimation of the total amount of public resources spent on this specific field has become crucial, particularly in the light of the spending review imposed by the current economic situation. If, on the one hand, most of the national (Dipartimento Politiche Antidroga, 2014) and EU (Lievens et al., 2014) estimates produced in this area concern the costs borne for the treatment of individuals affected by drug use disorders, on the other hand, the analysis of the costs associated with the diagnostic profile of these subjects has not been examined in depth. Regional addiction treatment services (as well as central services) usually have a clear picture of costs directly related to their clients (staff costs, laboratory tests and others), while they have limited information about the total expenditure that their clients generate within the healthcare system for pathologies related to substance use disorders.

This study aimed to identify a method for estimating the healthcare costs of hospitalisation, outpatient specialised treatment and prescription drugs, attributable to a population of illicit substance users, taking into account the comorbidity profile of each client. The study provides interesting results on various levels.

First, as highlighted in previous studies (Lievens et al., 2014), in order to be able to monitor public spending on treatment for substance use, it is essential to have a systematic and consistent registration of inpatient and outpatient data. In fact, the availability of high-quality administrative data of a complementary nature and collected in a standardised manner improves the completeness of information.

Second, this study establishes criteria for identifying clients with substance use disorders, providing a method for isolating the comorbidity profiles that are best correlated with illicit drug use.

Applying these criteria showed that, although clients with evidence of drug addiction amount to 60 % of the total clients seen by addiction services, their costs add up to 82 % of the costs of all clients in treatment. By inference, this amount could be considered the added financial burden on the healthcare system of comorbidities related to drug use.

Third, the translation of data and algorithms into meaningful information in the present study is inspired by the principle of efficiency (use of available data sources and semiautomatic querying activity).

A global analysis of the healthcare costs associated with treatments provided to illicit drug users, which includes client characteristics (age, gender and substance used) and their comorbidity profiles, is essential for a comprehensive evaluation and identification of more efficient pathways of care, which goes beyond only addiction treatment services activity. In particular, the inclusion of comorbidity in the analysis needs to be considered as a key element to better identify public expenditure attributable to substance use. By addressing an information gap still existing today, this could lead to a more comprehensive evaluation of treatment for substance abuse, thus allowing better planning and implementation of evidence-based policies, at both national and European levels.

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8

CHAPTER 8

Public expenditure on opioid substitution treatment in Italy

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Introduction

This study aims to estimate the costs of opioid substitution treatment (OST) in Italy, in 2012 and 2013, and to suggest a method that could be used to design macro-studies on the costs of these treatments, in order to provide input to cost-benefit and cost-effectiveness analyses. The study provides an example of a method to estimate public expenditure on OST, which may be used by researchers in other countries to provide a better understanding of the cost structure of OST in Europe, to improve the allocation of resources to more cost-effective therapies and, in the long term, to facilitate the evaluation of public policy in Europe. Last but not least, the costs of OST are a component of the social costs of opioid use.

Background and context

In Italy, in 2013, 77.4 % of the total health spending was paid by the public sector ([1]). The public sector provides healthcare to people who use illicit substances free of charge. In 2013, drug-related healthcare was provided by a network of 645 public outpatient services, spread all over the national territory, and by 960 social rehabilitative public facilities accredited to provide semi-residential and residential care.

The reasons for focusing on OST in this analysis are four-fold. First, opioid use is responsible for a disproportionate amount of morbidity and mortality related to drug use, in Italy and in Europe (EMCDDA, 2013). The literature confirms that opioids (mainly heroin) were the primary drug taken by more than 170 000 individuals accessing drug treatment in Europe in 2013: this represents 41 % of all reported treatment entrants (EMCDDA, 2015). Second, OST is the most commonly used and effective therapy for treating opioid dependence, as flagged by the EMCDDA's Best practice portal ([2]). Third, costs are a crucial component of treatment. Fourth, currently, there is still neither an updated estimate for these costs nor an agreement on a consistent method to estimate them either in Italy or in other European countries.

Medication for opioid dependence is an important part of chronic and comprehensive care. Substitution therapy in the management of opioid dependence is defined as 'the administration under medical supervision of a prescribed psychoactive substance — pharmacologically related to the one producing dependence — to people with substance dependence, for achieving defined treatment aims (usually improved health and well-being)' (WHO, 2004).

According to the EMCDDA's best practice portal ([3]) and to the US Food and Drug Administration (FDA) (Chalk et al., 2013), methadone and buprenorphine are the most common medications used to treat opioid dependence, being used both as detoxification medications, which can suppress symptoms and curb cravings, and as maintenance medications, whereby the suppression of withdrawal and craving helps to reduce non-medical opioid use.

Since 1991, the most frequently prescribed OST medication in Italy was methadone — a full synthetic opioid agonist that acts on the same receptors as opiate drugs and therefore blocks the effects of heroin (Colombo et al., 2003; Ministry of Health, 2008). Methadone maintenance treatment is safe and very effective in helping people to stop taking heroin, especially when combined with behavioural therapies or counselling and other supportive services (Colombo et al., 2003; World Health Organization, 2004; Serpelloni et al., 2013). Buprenorphine was also introduced in Italy in 2000 — a partial agonist at μ-opioid receptors. Buprenorphine stops the compulsive need

([1]) https://data.oecd.org/healthres/health-spending.htm

([2]) http://www.emcdda.europa.eu/best-practice/treatment/opioid-users

([3]) http://www.emcdda.europa.eu/best-practice/

to use opioids and has a longer duration of action than methadone but without the side effects of the full agonists, i.e. the risk of respiratory depression, which is the primary cause of overdose (Colombo et al., 2003; WHO, 2004; Serpelloni et al., 2013).

At the European level, the economic evaluation of OST programmes has received increased attention recently. Understanding costs is important to policymakers because decisions about the provision of treatment, and its design, are best taken with a good understanding of the range of costs that public services may incur. Since the 2008 economic recession and the public austerity that followed, public expenditure on health has been substantially reduced in many European countries and there are concerns about the capacity to reduce costs further (EMCDDA, 2014). Addressing this information gap will have benefits for both decision-makers and treatment providers: the latter need accurate information on the costs of treatment provision in order to plan the allocation of resources, while decision-makers can use such information as a means of cost control (EMCDDA, 2011).

Over the period 2012-13, around 70 % of drug users in treatment in Italy (approximately 85 000 per year) were outpatients being treated for opioid abuse (as the primary drug) ([4]). Of these, over 90 % (approximately 80 000 per year) were receiving pharmacological treatment, which accounts for a large proportion of the total cost of outpatient care. To date, the literature has focused mainly on the clinical aspects of these treatments, investigating their effectiveness and adverse drug reactions and interactions with other prescribed drug therapies (anti-HIV, anti-HCV) (Colombo et al., 2003).

A brief review of the literature summarises previous attempts to estimate these costs. In 1997, a study estimated the social costs of drug abuse, based upon a French population of drug users (Fenoglio et al., 2003). The authors used the 'cost of illness' method to estimate the economic cost of alcohol, tobacco and illicit drugs. Between 1995 and 2000, the National Treatment Outcome Research Study (NTORS) investigated treatment outcomes among drug users in the United Kingdom. It estimated costs and revealed detailed information on the pre-treatment behaviours, problems and social circumstances of the cohort, and the operational characteristics of the treatment programmes and the interventions and, in particular, provided information about outcomes of treatment across a range of measures (Godfrey et al., 2004). More recently, a study evaluated OST provided in Greece (Geitona et al., 2012), using the Greek Organization Against Drugs' (OKANA's) data for 2008. In Lithuania, an economic analysis of methadone substitution treatment was performed in the first six months of 2004, and the costs of providing outpatient methadone maintenance to opioid-dependent persons were estimated for the first time (Vanagas et al., 2010). In Spain, another study evaluated the economic impact of combined buprenorphine and naloxone, as an agonist opioid treatment for opiate dependence, on clients in different opioid treatment programmes (OTPs) (Martínez-Raga et al., 2010). These studies used different methodological approaches, data sources, cost definitions and inclusion criteria, which limits their comparability.

Method

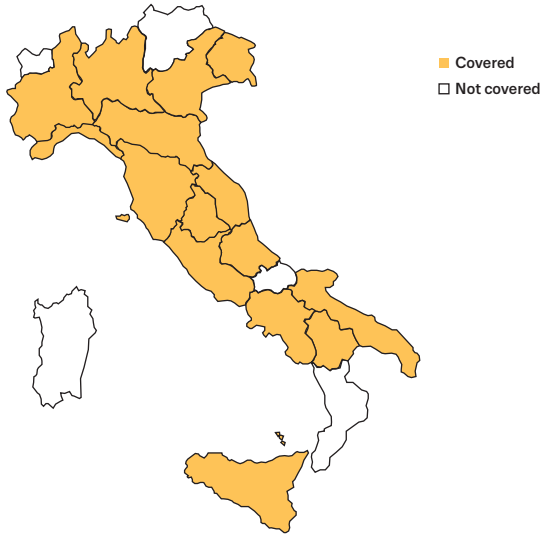
This study aims to present a method and to estimate the total annual health costs of OST for clients receiving methadone and buprenorphine during opioid treatment in Italy, paid by the general government. It neither estimates the 'cost of illness', because it does not estimate total costs incurred by society (the social costs), nor is it a cost-benefit analysis, because it does not estimate the benefits of OST or compare it with alternative interventions.

Estimates for the healthcare costs of OST can take two approaches: the 'bottom-up' or the 'top-down' approach. The top-down approach disentangles from the total costs of a broad treatment programme the costs of a particular component of this programme (e.g. it isolates the costs of the OST from the total costs of treating alcohol, drugs and gambling). An advantage of using the top-down method is that it guarantees that all known costs attributable to the service are considered (EMCDDA, 2011). However, using this method may often make it difficult to differentiate some specific components of costs for similar types of treatment.

The bottom-up approach, conversely, is based on the unit cost of services provided. It starts by estimating the cost of each unit of service provided and then estimates these costs applied to the whole population treated. The bottom-up method usually allows a detailed analysis of the specific components of costs, but it also requires extensive information systems that are not always available (EMCDDA, 2011).

([4]) DAP, 2014. Note that there are significant differences between the number of clients who entered treatment for the first time and the number of clients who were already in treatment at the beginning of the year (40 % entered treatment for the first time, while 80 % were already in treatment at the beginning of the year).

FIGURE 8.1
Italian regions and autonomous provinces included in the study



In this study, the authors applied a top-down approach. This option was based on a pragmatic analysis of the available data. Data on both total public expenditure on health addiction services and treatment provision (allowing disaggregation of expenditure on different types of treatments) were available for the majority of the Italian territory. As remarked by Vander Laenen et al. (2009), a repartition key is commonly used to isolate a specific component of costs. Therefore, the authors disentangled public expenditure on OST from public expenditure on broad addiction services (drugs, alcohol and gambling) using a repartition key based on data for expenditure on different types of treatments (pharmacological, integrated, psychosocial).

Data sources and information flows

In order to define the 'repartition key system', out of the 21 Italian regions, data referring to 15 Italian regions and autonomous provinces were used over the period 2012-13 (Figure 8.1). Data were available for the total number of clients of the Italian addiction services ([5]) and public health expenditure on addiction treatments.

Data on the number of clients treated by the addiction services

In Italy, outpatient addiction services treat drug and alcohol users, as well as clients with problem gambling. There are different types of treatment available for drug users: pharmacological treatment (substitution treatment with methadone or buprenorphine), psychosocial treatment and integrated treatment (pharmacological and psychosocial). For alcohol users and clients with gambling problems, psychosocial or integrated treatments are usually provided.

Over the period 2012-13, all clients of the addiction services (217 493 clients in 2012 and 216 130 clients in 2013) were classified by type of treatment received (pharmacological, integrated or psychosocial). Data and the classification of clients treated for drug misuse were provided by the National Information System for Drug Dependencies, Sistema Informativo Nazionale per le Dipendenze (SIND, 2010; Department for Anti-Drug Policies, 2011). The classification of clients treated for alcohol misuse was provided by the Ministry of Health, and data were available for the period 2010-12 (Ministry of Health, 2012). There were no data available for alcohol users in 2013, so the number of treated alcohol users was estimated based on the data from the previous three years (2010, 2011 and 2012). Finally, data on gamblers undergoing treatment (representing fewer than 5 % of all clients of the addiction services) were not available by treatment typology, and the results of a national pilot study conducted in 2007 were used (Rascazzo and Reynaudo, 2007).

Data for public expenditure on addiction treatment

In Italy, public healthcare expenditure is reported in accordance with national legislation ([6]) and, therefore, data on public expenditure are collected according to the criteria defined by local health authorities and hospitals ([7]). The data include six main macro-categories of annual costs: (1) consumption of goods and services; (2) personnel; (3) depreciation; (4) other operating expenses; (5) extraordinary expenses; and (6) other costs. Data for public health expenditure on outpatient treatment of addictions were provided by the authorities of the regional and autonomous provinces to the Department for Anti-drug Policies (2013, 2014). The strengths of these data are that, first, they apply a uniform classification of costs (standard criteria) and, second, datasets are complete. The main weakness is that the data are not disaggregated by type of addiction. Furthermore, in Italy not all addiction services supply information to the Department for Anti-drug Policies. In two regions, such services report to the Departments of Psychiatry. In these cases, the drug-related healthcare expenditure was extracted from the public healthcare

([5]) In 2012 and 2013, these regions treated close to 85 % of the total number of clients of the Italian addiction services.

([6]) Ministry of Health, 2007. See D.lgs. 502/92 and the 'Intesa Stato Regioni' of 23/03/2005, article 3, subsection 7.

([7]) http://www.salute.gov.it

accounts of psychiatric centres, based on the personnel employed, for psychiatric patients and pathological addiction patients.

Modelling repartition keys

The data available are total public health expenditure on the treatment of addictions (drug use, alcohol and gambling) ([8]). Therefore, the authors modelled a repartition key to isolate spending on OST from public expenditure on health. The approach used had four main steps. The first step aimed to estimate public expenditure on OST by person a year (per person-year), namely the average number of days spent by the public health system treating each type of addiction client. The average time estimated took into account both the different types of OST provided — pharmacological, integrated or psychosocial — and the type of medicine — methadone or buprenorphine. Second, the authors computed the average cost of personnel and purchase costs of drugs administered, in person-years, by type of client (drug user, alcohol user, gambler), by type of treatment and by medicine. The third step estimated the repartition keys that were applied to each Italian region to extrapolate the public expenditure on OST from the total expenditure on addictions. Finally, the authors estimated the average costs of treating drug users (in person-years) by type of client (drug user, alcohol user, gambler), type of treatment (pharmacological, integrated or psychosocial) and type of medicine (methadone or buprenorphine). These four steps are detailed in the following sections.

The model

The four steps applied to estimate the costs of OST are depicted here.

Step 1 — Average length of treatment per client per year

The study estimated the average annual public expenditure on OST (methadone and buprenorphine in either pharmacological or integrated treatment) per outpatient client, over the period 2012-13. To compute these averages, clients were defined by a standard unit (treatment per year and per person).

For each type of client (addicted to drugs, alcohol or gambling) and for each treatment typology (pharmacological, integrated, psychosocial), the number of clients was converted into person-years by applying the following formula:

$$t_{ijv} = \frac{\sum_{s=1}^{nijv} d_{sijv}}{365} \qquad (8.1)$$

where:

t = person-year by client and by treatment;
i = type of client (drug user, alcohol user, gambler);
j = type of treatment (pharmacological, integrated, psychosocial);
v = type of pharmacological treatment (methadone or buprenorphine), only if j is equal to pharmacological or integrated;
d = duration of the treatment, in days;
s = client $(1, \ldots, n_{ij})$.
n_{ijv} = number of client by type of client (i) type of treatment (j) and type of pharmacological treatment (v).

Data for the duration of drug and alcohol treatment come from the SIND (109 427 drug clients in 2012 and 118 443 in 2013; 4 524 alcohol clients in 2012 and 5 525 in 2013). The data show that the average length of treatment (integrated and psychosocial) of alcohol users does not differ much from that of drug users (integrated 25.0 days versus 26.4 days, respectively; psychosocial 38.4 days versus 37.2 days, respectively). Concerning pathological gamblers, specific information on the average duration of treatment is not available. Therefore, coefficients were estimated as the arithmetic mean of the average length of alcohol and drug treatment. Given the small percentage that gamblers represented of the total number of clients treated (close to 5 %), the uncertainty introduced into estimates by this assumption is acceptable.

Table 8.1 presents data for the average time and unit 'partial costs' of different types of services (medical, nursing, psychological, etc.) provided to drug users. The SIND (2010) provided data for the number of consultations that drug and alcohol clients received in the period 2012-13, for each type of drug treatment and client.

([8]) Information on public expenditure on the treatment of addictions was provided by the Italian regional governments (from local health authorities' accounts).

TABLE 8.1

Types of drug treatment: services, length of service provision and 'partial costs' (2012-13)

Pharmacological treatment			Integrated treatment			Psychosocial treatment		
Services provided	Average time (minutes) [a]	Average unit cost (EUR per minute) [b]	Services provided	Average time (minutes) [a]	Average unit cost (EUR per minute) [b]	Services provided	Average time (minutes) [a]	Average unit cost (EUR per minute) [b]
Clinical clients' reports	40	0.55	Clinical clients' reports	40	0.55	Clinical clients' reports	40	0.55
Visits	45	0.55	Visits	45	0.55	Visits	45	0.55
Examinations and clinical procedures	10	0.40	Prevention meetings	30	0.55	Prevention meetings	30	0.55
Drug administration	7	0.40	Assistance meetings	60	0.55	Assistance meetings	60	0.55
			Prevention interventions	30	0.40	Prevention interventions	30	0.40
			Examinations and clinical procedures	10	0.40	Examinations and clinical procedures	10	0.40
			Drug administration	7	0.40	Psychotherapeutic intervention	60	0.55
			Psychotherapeutic intervention	60	0.55	Socio-educational intervention	60	0.40
			Socio-educational intervention	60	0.40	Psychological examination	90	0.55
			Psychological examination	90	0.55	Transferring clients	120	0.40
			Transferring clients	120	0.40	Preparation of the therapeutic programme	45	0.55
			Preparation of the therapeutic programme	45	0.55			

Sources: [a] Ministry of Health and Ministry of Welfare, Regions and Autonomous Provinces, 2004; [b] Ministry for Employment, 2013.

Step 2 — Average costs, per client per year

Based on these data, the product of the average cost of each type of service and the length of service provided gives the average 'partial cost' of different types of consultation. By adding the 'partial costs' of services, the authors obtain the average 'partial cost' of drug treatment:

$$_{d,a}c_j = \frac{\sum_{s=1}^{nj}\sum_{k=1}^{m}\left(p_{sjk} * e_k * f_k\right)}{t_j} \qquad (8.2)$$

where:

c = average cost of personnel, in person-years, by treatment typology;
p = number of consultations provided;
e = average duration of consultations provided, in minutes;
f = average cost (per minute) of personnel by type of consultation provided;
t = person-year by treatment typology;
j = type of treatment (pharmacological, integrated, psychosocial);
k = type of consultation provided $(1, \ldots, n)$;
s = drug, alcohol user $(1, \ldots, n_j)$;
d = drug user;
a = alcohol user
n_j = number of clients by type of treatment (j)
m = total number of consultations.

The costs of treating gamblers were extrapolated. The costs of drugs (methadone and buprenorphine for drug users and disulfiram for alcohol users) administered in the pharmacological treatment and the integrated treatment were added, as shown in Table 8.1. The average cost per millligram of drugs administered (Colombo et al., 2003; Williams, 2005; Hunter and Ochoa, 2006; Serpelloni and Gomma, 2006) was multiplied by the average number of doses for each administration and by the number of administrations, in the reference period:

$$_{d,a}\gamma_{jv} = \frac{\sum_{s=1}^{njv}\left(u_{sjv} * y_{sjv} * z_v\right)}{t_{jv}} \quad (8.3)$$

where:

γ = average cost of drugs administered in person-years, by treatment typology;
u = number of administrations by type of drug;
y = mean dose of drug administered, by type of drug;
z = average cost (per mg) of drug administered, by type of drug;
t = person-years by treatment typology;
j = type of treatment (pharmacological, integrated);
v = type of drug administered (methadone, buprenorphine);
s = drug, alcohol user $(1, \ldots, n_j)$;
d = drug user;
a = alcohol user.
n_{jv} = number of client by type of treatment (j) and type of drug administered (v).

This method was not applied to the costs of treating pathological gamblers, because the data available were aggregated. Therefore, the average cost of personnel and purchase costs of drugs administered, in person-years, by type of client and treatment typology, was defined as:

$$w_{ijv} = c_{ijv} + \gamma_{ijv} \quad (8.4)$$

where:

w = weight for costs (by type of client, treatment typology, type of pharmacological treatment);
c = average personnel cost in person-years by type of client, treatment typology, type of pharmacological treatment;
γ = average drug administration cost in person-years by type of client, treatment typology, type of pharmacological treatment;
i = type of client (drug user, alcohol user, gambler);
j = type of treatment (pharmacological, integrated, psychosocial);
v = type of pharmacological treatment (methadone or buprenorphine), only if j is equal to pharmacological or integrated treatment.

Step 3 — The repartition key

The repartition key applied to each Italian region, to disentangle public expenditure on OST from total public expenditure on addictions, is obtained by applying the weights for each type of addiction treatment (equation 8.4) to the clients in treatment in each region (in person-years) using the following formula:

$$_R\delta_{ijv} = \frac{_Rt_{ijv*}\ \ w_{ijv}}{\sum_{i=1}^{3}\sum_{j=1}^{3}\sum_{v=1}^{2}\ _Rt_{ijv*}\ \ w_{ijv}} * 100 \quad (8.5)$$

and v≠0 if j equal to pharmacological or integrated

where:

δ = percentage of the cost relative to the client's treatment, i, for the treatment, j, and the pharmacological treatment, v;
w = weight of the cost of treatment;
t = person-years by type of client and treatment typology;
i = type of client (drug user, alcohol user, gambler);
j = type of treatment (pharmacological, integrated, psychosocial);
v = type of pharmacological treatment (methadone or buprenorphine), only if j is equal to pharmacological or integrated treatment;
R = region (1, ..., 15).

Step 4 — The top-down methodology

Based on the repartition key, it is possible then to estimate total costs of treating drug users (in person-years), separately for methadone and buprenorphine, using the following formula:

$$_Rc_{ijv} = \ _RC * \ _R\delta_{ijv} \quad (8.6)$$

and $v \neq 0$ if j is equal to pharmacological or integrated treatment

where:

c = average treatment cost in person-years, by type of client and type of pharmacological treatment, if j is equal to pharmacological or integrated treatment;
C = total cost of the addiction services by region and reference year (2012 and 2013);
δ = percentage of the cost relative to the client's treatment, i, for the treatment, j, and the pharmacological treatment, v;
i = type of client (drug user, alcohol user, gambler);
j = type of treatment (pharmacological, integrated, psychosocial);
v = type of pharmacological treatment (methadone or buprenorphine), only if j is equal to pharmacological or integrated treatment;
R = region (1, ..., 15).

Results

In this section, the repartition key parameters are applied to the total public expenditure on addiction treatment, based on data on the total costs of treating addiction provided by the Italian regional and local governments. In this way, the authors estimate the average annual cost of the OST in Italy in 2012 and 2013.

Tables 8.2 and 8.3 present the data for the total number of outpatients by region, type of addiction (drugs, alcohol or gambling) and type of treatment (pharmacological, psychosocial or integrated treatment) in 2012 and 2013. The data concern 15 Italian regions (out of 21), covering 92.5 % of drug users in treatment, 67.5 % of alcohol users in treatment and 87.7 % of gamblers in treatment. The last columns of Tables 8.2 and 8.3 show the 'partial public expenditure' on addiction services in 2012 and 2013 (these values include only public expenditure on personnel and medicines).

On average, the majority of addiction services' clients were receiving treatment for drug use (about 70 % of the total). However, there was considerable variability between regions (for instance, only 43.4 % of the total were drug users in Friuli-Venezia Giulia, while they represented 95.4 % of the total in Puglia). Large variability is observed also in the type of treatment provided to drug users: in six regions (Lombardy, Marche, Piedmont, Puglia, Sicily and Tuscany) drug users were treated mainly with psychosocial treatment, while in seven other regions (Abruzzo, Basilicata, Emilia Romagna, Lazio, Liguria, Umbria and Veneto) drug users were mainly in integrated treatment. Only in Campania were most drug users in pharmacological treatment.

TABLE 8.2
Number of clients and costs in 15 Italian regions, 2012

Region	Drug users				Alcohol users			Pathological gamblers			Total users	Partial costs (EUR)
	Pharmacological treatment	Integrated treatment	Psychosocial treatment	Total	Integrated treatment	Psychosocial treatment	Total	Integrated treatment	Psychosocial treatment	Total		
Abruzzo	519	1 911	1 564	3 994	215	883	1 098	63	44	107	5 199	11 000 000
Basilicata	260	734	410	1 404	122	397	519	12	8	20	1 943	6 259 000
Campania	10 640	2 991	2 306	15 937	870	1 874	2 744	273	189	462	19 143	49 026 089
Emilia Romagna	432	7 636	4 967	13 035	2 634	2 887	5 521	526	309	834	19 390	74 392 333
Friuli-Venezia Giulia	230	1 475	1 468	3 173	533	3 386	3 919	132	92	224	7 316	19 061 617
Lazio	1 249	7 837	6 067	15 153	534	1 438	1 972	140	97	237	17 362	55 000 000
Liguria	653	3 496	2 961	7 110	776	1 121	1 897	109	75	184	9 191	24 395 423
Lombardy	935	4 327	12 926	18 188	2 538	8 895	11 433	871	606	1 477	31 098	67 505 000
Marche	355	1 315	3 323	4 993	354	1 075	1 429	70	49	119	6 541	16 352 000
Piedmont	518	1 350	7 879	9 747	2 069	5 455	7 524	700	486	1 186	18 457	70 000 000
Puglia	3 872	4 682	6 631	15 185	75	320	395	197	137	334	15 914	55 178 000
Sicily	772	4 624	5 545	10 941	816	2 027	2 843	352	244	596	14 380	60 000 000
Tuscany	1 252	6 391	10 305	17 948	1 885	3 441	5 326	124	177	301	23 575	58 544 000
Umbria	890	1 492	701	3 083	418	2 145	2 563	31	11	42	5 688	17 237 690
Veneto	1 808	5 598	4 453	11 859	2 512	7 264	9 776	389	271	660	22 295	50 892 861
Total	**24 385**	**55 859**	**71 506**	**151 750**	**16 351**	**42 608**	**58 959**	**3 989**	**2 795**	**6 784**	**217 493**	**634 844 013**

TABLE 8.3

Number of clients and costs in 15 Italian regions, 2013

Region	Drug users				Alcoholics			Pathological gamblers			Total users	Partial costs (EUR)
	Pharmacological treatment	Integrated treatment	Psychosocial treatment	Total	Integrated treatment	Psychosocial treatment	Total	Integrated treatment	Psychosocial treatment	Total		
Abruzzo	59	2 601	1 233	3 893	204	948	1 152	103	71	174	5 219	11 084 766
Basilicata	309	726	330	1 365	107	411	518	42	30	72	1 955	7 421 566
Campania	8 746	3 757	2 756	15 259	1 038	2 274	3 312	354	246	600	19 171	48 381 061
Emilia Romagna	501	7 493	5 041	13 035	1 572	1 804	3 376	1 101	718	1 819	18 230	70 401 810
Friuli-Venezia Giulia	314	1 788	1 170	3 272	280	1 989	2 269	188	131	319	5 860	16 336 033
Lazio	1 764	8 011	8 524	18 299	631	1 701	2 332	182	126	308	20 939	59 245 699
Liguria	327	3 050	2 669	6 046	811	1 064	1 875	130	90	220	8 141	21 667 527
Lombardy	2 296	4 087	13 436	19 819	2 208	8 084	10 292	1 115	774	1 889	32 000	71 248 014
Marche	243	903	2 282	3 428	262	837	1 099	142	99	241	4 768	13 202 546
Piedmont	649	1 693	9 367	11 709	2 076	5 728	7 804	888	618	1 506	21 019	82 556 513
Puglia	3 305	4 615	7 412	15 332	70	320	390	316	219	535	16 257	54 524 230
Sicily	570	3 643	3 413	7 626	732	1 800	2 532	619	430	1 049	11 207	49 788 495
Tuscany	1 281	6 580	10 552	18 413	2 330	5 033	7 363	194	163	357	26 133	65 988 601
Umbria	918	1 440	686	3 044	465	2 439	2 904	46	10	56	6 004	18 425 388
Veneto	2 329	5 369	4 043	11 741	1 464	4 687	6 151	788	547	1 335	19 227	44 989 402
Total	**23 611**	**55 756**	**72 914**	**152 281**	**14 250**	**39 119**	**53 369**	**6 208**	**4 272**	**10 480**	**216 130**	**635 261 651**

Average cost by type of addiction and treatment (costs of personnel and medicines only)

Taking 'partial costs' per client into account, Table 8.4 shows that integrated pharmacological treatment is always more expensive (comparing dependence on drugs, alcohol or gambling), while pharmacological treatment is the cheapest. In 2012 and 2013, within pharmacological treatment, the average costs of methadone treatment ranged between EUR 360 and EUR 1 384 per client per year compared with an average of EUR 482 to EUR 1 432 for treatment with buprenorphine, as shown in Figure 8.2. Indeed, comparing the average cost of pharmacological treatments shows that the costs of administering methadone are, most of the time, lower than those of administering buprenorphine, although this is not statistically significant. This corroborates the results of previous studies (Colombo et al., 2003; Serpelloni and Gomma, 2006).

However, within integrated treatment, methadone therapy has higher average 'partial costs' that are more variable than those for buprenorphine therapy (Table 8.4). The higher average 'partial cost' is attributable to the greater number of methadone administrations and the greater number of medical and psychological services (psychotherapeutic interventions and psychological examinations) provided to clients treated with methadone. On the contrary, clients treated with buprenorphine received a greater number of prevention services and socio-educational interventions. These facts, first, reveal the more clinical complexity of clients treated with methadone resulting in a greater variability in the average 'partial costs' estimated in person-years and, second, reflect the propensity to administer buprenorphine to the youngest clients (Serpelloni et al., 2013), who are better engaged in re-employment assistance programmes.

Table 8.4 shows also that expenditure on treating alcohol-related problems is higher than that on treating drug-related problems — on average, per client, taking only the costs of medicines and personnel into account. This difference is more marked in integrated therapy. This is due to the higher costs of the medicines used to treat alcohol users than those used to treat drug users, as the costs of the other services provided as part of integrated treatment are almost identical.

FIGURE 8.2

'Partial costs' per person-year, type of addiction and treatment typology (euros), 2012-13

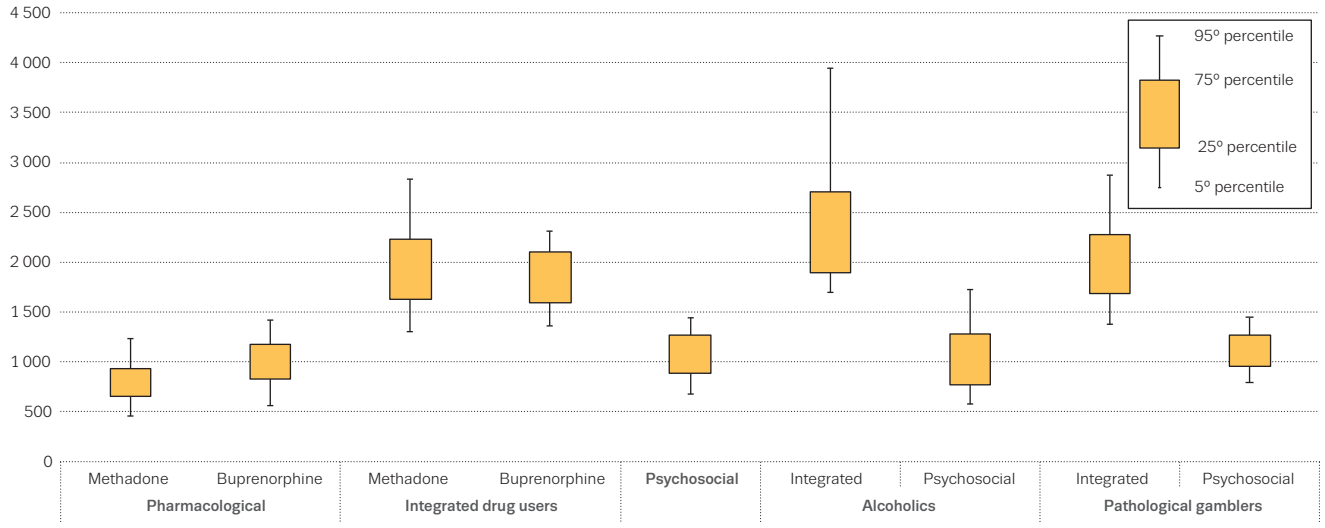


TABLE 8.4

'Partial costs' per client, by type of client and treatment typology (euros), 2012 and 2013

	Drug users					Alcohol users		Pathological gamblers	
	Pharmacological treatment		Integrated treatment		Psychosocial treatment	Integrated treatment	Psychosocial treatment	Integrated treatment	Psychosocial treatment
	Methadone	Buprenorphine	Methadone	Buprenorphine					
Total	822	853	1 973	1 721	1 092	2 359	1 035	2 004	1 092
Minimum	360	482	1 206	1 343	632	1 421	354	1 252	632
Maximum	1 384	1 432	3 443	2 502	1 697	4 000	2 001	3 477	1 697
SD	277	302	553	343	280	792	421	557	280

Total costs

In 2013, in the 15 Italian regions considered, public expenditure on OST represented about half of the spending on addiction services (55.8 % in 2012 and 55.1 % in 2013 – Table 8.5). The high proportion of spending on OST is due to the greater number of drug users in treatment and, in particular, to the greater number of drug users receiving pharmacological integrated treatment than alcohol users.

In order to estimate public spending on OST for the whole Italian territory, it was assumed that the clients from the six regions (excluded from the available database) had an average total cost per person-year that was not significantly different from the average cost for the 15 Italian regions with data. Table 8.6 presents estimates for public expenditure in Italy in 2012 and 2013.

TABLE 8.5

Total costs by type of client (percentage of total and cost in euros), 2012-13

	OST (drug users)	Other treatments (drug users)	Alcohol users	Gamblers	Total
Costs (% of the total cost of addiction treatment)					
Total 15 regions (2012)	55.8	15.0	25.1	4.1	100
Total 15 regions (2013)	55.1	16.0	22.5	6.4	100
Costs (EUR)					
Total 15 regions (2012)	354 495 749	95 438 545	159 086 976	25 822 743	634 844 013
Total 15 regions (2013)	349 843 517	101 996 094	143 058 050	40 363 991	635 261 651

TABLE 8.6

Public expenditure in Italy (euros and percentage of GDP)

Year	GDP [a]	ADD Addiction treatment	OST	Addiction treatment	OST	Drug law offenders in prison [b]	Drug-related public expenditure [c]
	EUR (million)			(% GDP)			
2012	1 566 911.6	683.8	371.8	0.044	0.024	0.041	0.105
2013	1 560 023.8	688.5	368.1	0.044	0.024	0.047	0.099

Sources: [a] Eurostat; [b] EMCDDA (2014), data concern 2009 and 2010; [c] Relazione al Parlamento sullo stato delle tossicodipendenze in Italia — Presidency of the Council of Ministers (data 2011-12).

In Italy, public expenditure on outpatient care for clients with addiction problems was EUR 683.8 million and EUR 688.5 million in 2012 and 2013, respectively. These costs represented 0.044 % of the Italian GDP in both years. Estimated public expenditure on OST amounted to EUR 371.8 million in 2012 and EUR 368.1 million in 2013 (0.024 % of GDP in 2012 and 2013). These estimates may be compared with a set of totally different estimates, namely those for public expenditure on drug law offenders in Italian prisons. Although they are not comparable, they may provide a benchmark for the proportion of the GDP that different drug-related interventions represent. For instance, the EMCDDA (2014) estimates that public expenditure on drug law offenders in prison represented between 0.041 % and 0.082 % of GDP over the period 2000-10. As shown in Table 8.6, the 2009-10 data related to the public expenditure on drug law offenders in prison increased (0.041 % of GDP in 2009; 0.047 % of GDP in 2010), whereas, over the period 2011-12, drug-related public expenditure fell (0.105 % of GDP in 2011; 0.099 % of GDP in 2012).

Conclusions

Efforts to quantify expenditure on drug treatment in Europe are still at an early stage (EMCDDA, 2011). This study constitutes the first detailed analysis that aimed to disaggregate public expenditure on OST in Italy from total expenditure on addiction services. In Italy, the majority of the addiction services treat different types of users (drug users, alcohol users, gamblers). It is not always possible to calculate costs for each client type, because of the absence of analytical accounting systems. In this study the authors present a methodology for extracting the costs of OST, applying a common method to isolate a specific component of the costs: the repartition key (Vander Laenen et al., 2009). Therefore, the authors disentangled public expenditure on OST from public expenditure on broad addiction services (drugs, alcohol and gambling), using a repartition key based on data for the expenditure on different types of treatments (pharmacological, integrated, psychosocial).

The availability of reliable data, compiled with a well-defined methodology across most of the country, and the use of a consolidated and transparent methodology are essential tools to estimate public spending. However, until now, in Europe, there have been relatively few attempts to provide this type of estimate. Consequently, comparing our results with other European studies is not possible. The few other studies available used a different methodology and type of data and their definitions of expenditure and inclusion criteria were too different to allow a meaningful comparison.

This study estimated Italy's public expenditure on OST. To achieve this, first, the study estimated public expenditure on OST per client per year, taking into account the 'partial costs' accounting for spending on medicines and personnel (because there are detailed cost data only for these items). Second, the study took into account other available studies on the costs of treating alcohol dependence. Third, the study assumed average parameters to estimate the costs of treating clients dependent on gambling. Based on these, the proportions of total public spending on addiction treatment that was spent on drug, alcohol and gambling treatment was estimated for each of the 15 Italian regions for which data were available. These proportions were then applied as key coefficients to total public spending on the treatment of addictions by region to the 15 regions with data — representing 85 % of clients being treated for addiction. Taking into account the annual average cost per client from these 15 regions and the number of clients in the other six regions (with no data on costs), the authors estimated public spending for the whole country.

Estimates suggest that public spending on OST amounted to EUR 371.8 million and EUR 368.1 million, in 2012 and 2013, respectively, in Italy. Public expenditure on OST represented 0.024 % of the Italian GDP and close to 50 % of the total spending on addiction in Italy, in those years.

A more detailed analysis of the results shows that different types of OST implied different costs. Estimates suggest that, per client, public spending on integrated OST (using either methadone or buprenorphine) is, on average, higher than public spending on pharmacological treatment for any of the three addictions analysed. The average public spending on pharmacological treatment (per person per year) is about half of the spending on integrated OST (for both methadone and buprenorphine).

These results are in line with those obtained for Spain by Martínez-Raga et al. (2010). Those authors concluded that integrated psychosocial and pharmacological treatment (combined buprenorphine and naloxone) treatment was significantly more expensive than agonist opioid treatments. There are not many other studies in Europe comparable to the current one because most of the economic evaluations of OST focused on economic benefits, related to the reduction of either criminal behaviours or social harms inflicted on the victims of drug-related crime (Godfrey et al., 2004; Vanagas et al., 2010; Geitona et al., 2012).

This study also concluded that the costs of pharmacological OST, using either methadone or buprenorphine, do not significantly differ. An economic evaluation of methadone versus buprenorphine in OST in the United Kingdom (Maas et al., 2013) also found that the covariate-adjusted mean of total costs did not differ significantly in a pharmacological treatment with either methadone or buprenorphine.

Finally, this study also estimated the percentage of Italy's GDP that the total costs of addiction treatments (drugs, alcohol and gambling) represented in the period 2012-13. These costs represented 0.04 % of Italy's GDP in both years. Postma (2006) found that, in some European countries (Belgium, Spain, France and Austria), the total costs of drug treatment represented between 0.07 % (in Spain) and 0.09 % (in Belgium) of the GDP. Notwithstanding the fact that these European studies used different methods to estimate costs and concern different years, our findings seem to be in line with them.

The main strengths of this study are its wide data coverage and the availability of national standards for data collection. The annual availability of data on types of treatment and services provided, as well as socio-demographic data, the primary drug used, and other information for 175 000 clients, for two consecutive years allowed a detailed analysis of the structure of the costs of providing addiction treatment. Furthermore, the large size of the samples allowed the calculation of reliable and robust estimates for the average costs of treatment by type of treatment. Another strength is the availability of detailed data on public expenditure on healthcare for the addiction services.

The main limitations of this study are also related to data. The first concerns some recently introduced restrictions on the use of clients' information by the Italian addiction services. This limitation has reduced the degree of data coverage and therefore of data completeness. Another limitation is the absence of an identical information system for alcohol users and gamblers, which requires estimation of parameters and may reduce the accuracy of estimates. The third limitation concerns the fact that not all of the Italian addiction services are organised in separate departments; in some regions these services are part of the Departments of Psychiatry. In these cases, healthcare expenditure on clients receiving addiction treatment was estimated with data from expenditure on psychiatric patients.

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9

CHAPTER 9

A methodology for an EU cross-country comparison? Public expenditure on drug treatment in hospitals

Delfine Lievens and Freya Vander Laenen

Introduction

Drug policy interventions can be studied within a single country (e.g. prevention interventions in different secondary school classrooms) and many important dimensions of policy operate at the national level. Nevertheless, making cross-national comparisons of policies and problem severity is important and there is a growing body of literature on cross-country comparisons of health policy (Cacace et al., 2013). Undertaking a cross-country comparison in health policy serves three purposes: learning *about* national policies; learning *why* they take the forms they do; and learning lessons *from* these policy analyses (for application in other countries) (Marmor et al., 2005). These comparative studies have also gained attention from drug policy analysts. Nevertheless, public expenditure studies on drug policy are confronted with a set of generic problems such as lack of available data, differences in methodology and comparability problems between countries (EMCDDA, 2014a; Lievens et al., 2012; Reuter, 2006; Ritter, 2007).

In order to move the study of public expenditure on drug policy forward, this chapter investigates the possibility of conducting an EU cross-country comparison of government spending on drug treatment using a uniform methodology. Given the paradigm of drug policy as a resource allocation problem (Caulkins, 2004), the focus lies on public expenditure. For McDonald (2011), this resource allocation is the most powerful instrument of government policy. Moreover, public expenditure analysis has been acknowledged as an important step for the economic evaluation of drug policy (EMCDDA, 2008; Vander Laenen et al., 2008). A cross-country comparison makes it possible to view the different options in drug policy and explore the correlation between different drug policies and public expenditure on the various options. Furthermore, a comparison could stimulate individual countries to measure the cost-efficiency of public policy, for example, if the treatment expenditure per problem drug user is much higher in one country than other countries (Reuter, 2006).

Since the beginning of the 21st century, public expenditure studies on drug policy (including drug treatment) have been conducted in Australia, Belgium, France, Germany, Luxembourg, the Netherlands, and Sweden, among other countries (De Ruyver et al., 2004, 2007; Kopp and Fenoglio, 2003, 2006; Moore, 2008; Mostardt et al., 2010; Origer, 2002; Postma, 2004; Ramstedt, 2006; Rigter, 2006; Ritter et al., 2015). These single-country studies used different concepts and definitions to define the term 'public expenditure', and the conceptual framework influences what counts as public expenditure for drug policy (Vander Laenen et al., 2008). The main objective of drug-related public expenditure is to finance drug policy interventions directly. Some public expenditure studies (e.g. Mostardt et al., 2010; Postma, 2004; Ramstedt, 2006; Rigter, 2006), however, include a certain degree of expenditures related to the consequences of drug use. For example, Mostardt et al. (2010) includes spending on treatment of infections contracted through the use of contaminated needles. Moreover, methodological differences, for example using a top-down or bottom-up approach (EMCDDA, 2011), and differences in the healthcare systems in the countries might also influence the estimation of public expenditure. Consequently, a cross-country comparison with single-country public expenditure studies can be of only limited value for decision-makers because of conceptual and methodological differences. It seems that a common conceptual and methodological framework is indispensable for a valid cross-national comparison on drug-related public expenditure. The current study developed a methodology that can be applied across all the EU Member States, which allows a valid cross-country comparison. In order to suggest a method, first, this paper is based upon a systematic review previously published by the authors

(Lievens and Vander Laenen, 2013) ([1]). In that paper, the authors reviewed the methods used in public expenditure studies and assessed the best possible method to use for a European estimate, taking into account datasets published by international organisations (WHO, Eurostat, EMCDDA, OECD, etc.). Datasets published by international organisations were analysed to identify a feasible method to estimate healthcare expenditure on drug treatment. The current paper presents a method to estimate public expenditure on treatment for illicit drug misuse in hospitals in European countries. Moreover, the factors that influence the interpretation of the public expenditure and drug treatment policies are discussed.

Methods

Calculation methods for the estimation of public expenditure

Lievens and Vander Laenen (2013) distinguished three main methodologies to estimate public expenditure on drug treatment: drug-specific budgets; a proration technique; and unit expenditure (Lievens et al., 2012). For the drug-specific methodology, no further calculations are necessary. The proration technique and unit expenditure methods are used to estimate spending on drug programmes that are embedded within broader budget categories. This means that a process must be followed to ascribe the portion of that broader budget category to the drug programme (Van Malderen et al., 2009). The proration technique requires a repartition key to isolate public expenditure on illicit drugs from the global budget. For instance, a possible criterion could be the proportion of treatment visits for illicit drugs in the total number of treatment visits. The unit expenditure starts by estimating the cost of a unit of service provided, which is then multiplied by the total number of similar services provided. An example of how this approach can be applied is by estimating the cost of each drug treatment during a hospitalisation, per day, which is then multiplied by the number of days a drug user is hospitalised.

The methodology to measure public expenditure or costs of drug treatment (outpatient or inpatient) varies between studies. Each method has advantages and disadvantages. However, the choice of a calculation method is mainly driven by the availability and quality of data ([2]). The literature review revealed that many studies use the unit expenditure technique to measure hospital expenditure. These studies multiplied the number of hospitalisation days attributable to illicit drugs or substances (depending on the scope of the study) by the unit cost of a hospitalisation day. This formula takes into account the time (i.e. hospital days) spent on drug treatment.

International data sources for estimating public expenditure

An international database analysis was conducted to assess the possibility of applying these data sources for estimating public expenditure on drug treatment in Europe. The databases of eight international organisations or networks (OECD, WHO, Eurostat, EMCDDA, United Nations, EMA—European Medicines Agency, ECDC — European Centre for Disease Prevention and Control, and World Bank) were investigated to identify sources of reliable, timely, comparable, uniform and comprehensive data on government expenditure, taking the objective of expenditure on health as the main criterion, with data available for EU countries. These international databases should allow for a uniform cross-country comparison, since the data collection is based upon common concepts.

The main conclusion of the database survey was that the international databases provide limited data for estimating drug-related expenditure. It was only possible to estimate the drug-related public expenditure for inpatient hospital treatment based on the data available in one database, namely the Eurostat database. Eurostat provides hospital data for multiple European countries. Eurostat publishes data for the number of hospital days by diagnostic category, whereas one category corresponds to those hospital days for which the primary diagnosis was 'mental and behavioural disorders due to psychoactive substance use' (with the corresponding ICD-10 codes being F11-F19, e.g. acute intoxication, harmful use, dependence syndrome and withdrawal state) ([3]). Furthermore, Eurostat (together with OECD and WHO) reports financial data

([1]) This study was conducted for the EMCDDA. The objective of the study was to carry out a systematic literature review on the methods and data sources used to estimate public expenditure on treatment for users of illicit drugs, in Europe and beyond.

([2]) The proration technique is used if the government communicates in terms of global budgets, and the unit expenditure is used if unit costs are provided.

([3]) Hospital days for inpatients available at the Eurostat website: http://ec.europa.eu/eurostat/web/products-datasets/-/hlth_co_hosday.

with the SHA ([4]). These data are used to calculate the average cost per hospital day, by dividing the public health expenditure of hospitals by the total hospital days for treating all causes of diseases. Ideally, the international databases should provide hospital day prices according to DRG. DRG might be useful for cross-country comparisons, since the DRGs and the DRG-based hospital payment system have been adopted in many European countries. However, no cross-country comparison is possible at this moment because of significant variations in the design of the DRG systems across the EU countries (Busse et al., 2011) ([5]).

To sum up, a valid cross-national comparison with a uniform methodology across EU Member States is possible only for drug-related public expenditure on hospital treatment. Based on the data in the Eurostat database, government spending on illicit drug treatment in hospitals was identified using the following formula:

$$\textit{average cost per hospital day} \times \textit{hospital days for treating illicit drug disorders} \quad (9.1)$$

It should be noted that the hospital days are taken into account for mental and behavioural disorders due to psychoactive substance use. Other health problems related to illicit drugs, such as HIV or hepatitis, have been excluded in the current study.

Limitations of the Eurostat data(base)

The current cross-country comparison is restricted to inpatient hospital treatment (see Figure 9.1), as there were no Eurostat data for clients who were not admitted to hospitals (e.g. those treated in the Accident and Emergency Department without admission). Moreover, the number of inpatient treatment episodes in a community-residential setting (i.e. residential treatment facilities, such as therapeutic communities and crisis centres, within the community of clients with drug use problems), outpatient treatment episodes (e.g. substitution treatment by a GP ([6]) or treatment in a day care centre) and drug treatment services in prison were unavailable. As a result, hospital expenditure covers only part of treatment costs.

FIGURE 9.1
Registration of (drug) treatment in the Eurostat database

Included	Non-included
– Inpatient treatment in hospital setting	– Outpatient treatment: in and outside hospitals (e.g. emergency services, GP, day care centres) – Inpatient treatment in community setting (e.g. crisis centres, therapeutic communities, etc.) – Drug treatment in prison

In the current study, a formula based on hospital days was applied because it was assumed that hospital days capture the prevalence of recorded substance misuse and they take into account the time spent on treatment. Even so, this method has some data limitations (Lievens et al., 2014). The first is that the average cost per hospital day is calculated by dividing the public health expenditure of hospitals by the total hospital days for treating all causes of diseases. This methodology assumes that all diagnoses have the same unit cost of treatment, despite the common-sense notion that the cost per hospital day varies across diagnoses. Second, the hospital expenditure data used to calculate the average cost per hospital day includes inpatient, emergency and outpatient hospital services. The Eurostat (healthcare expenditure) database makes no distinction between these three types of hospital services. Consequently, the expenditure for outpatient and emergency services is attributed to inpatient activities and that leads to an overestimation of the average cost per hospital day. The third limitation is that Eurostat reports the hospital days for ICD-10 codes F11-F19 in one category, 'Mental and behavioural disorders due to psychoactive substance use'. Opioid-, cannabis- and cocaine-related disorders are included in this category. However, nicotine dependence and sedative-, hypnotic- or anxiolytic-related disorders are also reported in this category. Thus, the number of hospital days and public expenditure are overestimated because of this classification. Moreover, the Eurostat database reports the healthcare activities for the main condition diagnosed at the end of the

([4]) The 'health expenditure and financing' of SHA (Eurostat, 2015) sets the guidelines for health accounts, i.e. defines a classification system that allows the systematic reporting of financial flows associated with the provision of healthcare. These guidelines serve as the basis for the production of annual data in each country. The SHA adopts a tri-axial approach to healthcare expenditure: by healthcare function, by provider, and by financing scheme. The SHA is a collaborative activity by OECD, Eurostat and WHO (OECD/Eurostat/WHO, 2011).
Data for healthcare expenditure by financing agent are available for hospitals (HP1) at the Eurostat website: http://ec.europa.eu/eurostat/data/database (see metadata on healthcare expenditure at the Eurostat website: http://ec.europa.eu/eurostat/cache/metadata/en/hlth_sha11_esms.htm).

([5]) The EuroDRG project focused on comparative analyses of the building blocks of DRG systems across 12 European countries, which are embedded in various types of health systems (Germany, Estonia, Ireland, Spain, France, Austria, Netherlands, Poland, Portugal, Finland, Sweden and England (United Kingdom)) (Busse, 2012).

([6]) Eurostat reports the consultations of medical doctors (in private practice or as outpatient) per inhabitant; however, the number of consultations by diagnosis/treatment is not available.

hospitalisation ([7]). In the current study, hospital days with a primary diagnosis of mental and behavioural disorders due to psychoactive substance use are included. In the case of multiple diagnoses, the most severe and resource intensive of these diagnoses is recorded as the primary diagnosis. Consequently, public spending on substance misuse is underestimated because patients with a non-substance misuse-related primary diagnosis and a substance misuse disorder as a secondary diagnosis cannot be included in the calculation of expenditure.

Results

A cross-country comparison was conducted for 15 of the 27 EU Member States in 2012. The public health budgets for five EU Member States (Greece, Ireland, Italy, Malta and the United Kingdom) were not available and another eight EU Member States (Belgium, Denmark, Estonia, Greece, Spain, France, Cyprus and the Netherlands) reported incomplete data on the number of hospital days ([8]). Table 9.1 presents the countries that did register illicit drug treatment hospital days and expenditure for all types of hospital (general, mental health and specialty hospitals). The average hospital expenditure for illicit drug treatment in the EU-15 was EUR 5 per capita, and 0.013 % of GDP, in 2012.

Table 9.1 shows a large variation in public spending on illicit drug treatment in hospitals across the EU-15. Luxembourg invests the most in hospital-based illicit drug treatment (EUR 39.5 per capita and 0.056 % of GDP), primarily because the number of hospital days for illicit drug treatment (30 per 1 000 capita) appears to

TABLE 9.1

Hospital days and expenditure for illicit drug treatment (general, mental health and specialty hospitals), for 15 EU countries, 2012

Country	Public expenditure per hospital day (EUR)	Hospital days for illicit drug treatment per 1 000 capita	Proportion of hospital days attributable to illicit drug treatment (%)	Illicit drug treatment expenditure by hospitals (EUR million)	Illicit drug treatment expenditure by hospitals, per capita (EUR)	Illicit drug treatment expenditure by hospitals, as percentage of GDP ([a])
Luxembourg ([b])	1 328	30	2.38	21	39.5	0.056
Austria ([b])	634	16	0.75	86	10.2	0.030
Germany	416	17	0.74	577	7.2	0.022
Czech Republic	238	19	0.97	46	4.4	0.020
Slovenia	433 ([c])	8	0.64	7	3.5	0.016
Finland	518	6	0.33	18	3.4	0.011
Sweden	1 884	2 ([d])	0.24	41	4.3	0.013
Slovakia	164 ([c])	12	0.83	11	2.0	0.010
Poland	181	6	0.50	40	1.1	0.006
Hungary	110	8	0.43	9	0.9	0.005
Portugal	812 ([c])	0.7 ([d])	0.11	6	0.6	0.003
Latvia ([b])	112 ([c])	3	0.21	0.6	0.3	0.002
Bulgaria	76 ([c])	2	0.12	1	0.1	0.001
Lithuania	126	0.7	0.04	0.3	0.1	0.000
Romania	83	0.5	0.03	0.8	0.04	0.000
Mean	**474**	**9**	**0.55**	**58**	**5**	**0.013**

([a]) Illicit drug treatment expenditure is divided by the GDP at current prices — million purchasing power standards.
([b]) In contrast to the other countries, the live-born infants (Z38) of Latvia, Luxembourg and Austria are not included in total hospital days, and this could lead to an overestimation of hospital expenditure.
([c]) Bulgaria, Latvia, Portugal, Slovenia and Slovakia have no healthcare expenditure for the year 2012; therefore, the hospital expenditure for 2011 is used.
([d]) Sweden and Portugal have only data for hospitals days available for 2013. The Swedish hospital data for mental and behavioural disorders due to psychoactive substance use might be incomplete for the year 2013, because the hospital days for this diagnosis decreased from approximately 80 000 hospital days (2007-10) to 21 524 hospital days in 2013. This change cannot be explained by Swedish drug treatment policy, because no changes in treatment demand or responses have been reported (EMCDDA, 2015).

([7]) See metadata on the healthcare activities at the Eurostat website: http://ec.europa.eu/eurostat/cache/metadata/en/hlth_act_esms.htm. Eurostat reports the hospital days for general hospitals (HP.1.1), mental health hospitals (HP.1.2), and other specialised hospitals (HP.1.3). This ICHA-HP classification of the 2011 SHA does not distinguish between public and private hospitals (OECD et al., 2011).

([8]) Belgium, Spain, Cyprus, France and the Netherlands did not report hospital days for all hospital types (general, mental health and specialty hospitals). Estonia did not report data for the number of days patients spent in hospital because of mental and behavioural disorders associated with psychoactive substance use, and Denmark had this type of data published only for the year 2009. Greece did not report any hospital days.

be high. Moreover, the expenditure could be explained by its relatively high public expenditure for hospital care (EUR 1 328 per hospital day). Austria (EUR 10 per capita and 0.030 % of GDP) and Germany (EUR 7 per capita and 0.022 % of GDP) complete the top three because of a high number of hospital-based treatments for illicit drugs (16 and 17 per 1 000 capita respectively). A number of eastern European countries (Bulgaria, Latvia, Lithuania and Romania) reported low hospital expenditure per capita and in proportion to their GDPs. The cost per hospital day of these countries is less than one third of the average in the EU-15, and this is combined with rates of hospital-based treatment per 1 000 capita that are less than three.

As already indicated above, the main limitation of our study is that the cross-country comparison is restricted to hospitals, as data were unavailable for other types of treatment providers. It is not clear which proportion of the clients receive hospital treatment in a given country, let alone throughout the EU. The TDI ([9]) used in the EU cannot determine the proportion of clients treated in hospitals for substance use, as it only distinguishes between the proportion of illicit drug clients entering inpatient treatment ([10]) and outpatient centres, and no further detail is provided on the type of inpatient services (e.g. in hospital or in a therapeutic community). TDI data are not comparable to the data used in this study because, first, they are flow variables, i.e. they report data on clients entering treatment instead of showing the total number of clients attending treatment; second, because they report data on clients in inpatient treatment (which includes hospital treatment but also other residential treatment such as therapeutic communities and crisis centres). Nevertheless, it is useful to provide an idea of how variable the weight of hospital treatment costs can be in different countries. What we can tell from the TDI is that the proportion of reported clients entering inpatient centres for drug-related problems is around 11 % in Europe, and this proportion varies to a large extent by country: from 2 % in France to 79 % in Luxembourg. Furthermore, 2 500 residential treatment facilities are identified, of which 170 are hospital-based facilities (EMCDDA, 2014b). However, these data should be interpreted with caution because of variations in data coverage ([11]). In any case, no information is available on the size of these residential facilities. It is worth presenting and discussing hospital data, as many public expenditure studies (e.g. De Ruyver et al., 2004, 2007; Origer, 2002; Vander Laenen et al., 2011) have shown that hospital expenditure on illicit drug treatment is an important part of treatment expenditure, at least in some countries.

([9]) The TDI is a monitoring tool developed by the EMCDDA to gain insight into the characteristics, risk behaviours and drug use patterns of people with illicit drug-related health problems. To this end, data are collected on the number and profile of clients entering drug treatment during each calendar year. This tool is used by 30 countries (the 28 EU Member States, plus Norway and Turkey), which send national data to the EMCDDA (EMCDDA, 2012).

([10]) The inpatient centres include therapeutic communities, private clinics, units in hospitals and centres that offer residential facilities.

([11]) In 2011, the data coverage of clients entering specialist outpatient and inpatient treatment ranged from 14 % to 100 % (EMCDDA, 2014b).

Discussion

Multiple approaches can be taken to comparative drug policy analysis. During this study, the focus lay on public expenditure in view of the growing demands for accountability and evidence-based policy, and concerns about the unsustainability of rising healthcare costs (Ritter et al., 2015). A cross-national comparison makes it possible to view the different options in drug treatment policy and may enable the monitoring of drug policy interventions with benchmarking information on public spending. For a valid cross-national comparison on public expenditure, a common conceptual and methodological framework is indispensable. The previous literature review (Lievens and Vander Laenen, 2013) showed that the calculation methods for drug treatment expenditure vary between countries, treatment setting and type of treatment. More problematic is that the only international database providing detailed data on hospital expenditure is Eurostat. Moreover, data for other types of treatment (outpatient services, inpatient treatment services, treatment in prisons, harm reduction and social reintegration) are registered neither in Eurostat nor in any other international database.

The cross-national comparison we executed on hospital expenditure shows that a uniform method based on the costs per day of treating a drug user in hospital (the unit expenditure method) can be applied with data from international databases. However, we were confronted with the significant limitations of these databases. For instance, no hospital charges according to DRGs are available. Furthermore, in the Eurostat database, hospital days are limited to primary diagnosis, and hospital expenditure is not subdivided into inpatient, emergency or outpatient service. Next, the Eurostat data are sometimes incomplete: seven EU Member States (Belgium, Denmark, Greece, Spain, France, Cyprus and the Netherlands) did not provide data for all types of hospitals (general, mental health and specialty hospitals), and five EU Member States (Ireland, Greece, Italy, Malta and the United Kingdom) could not report health expenditure.

Databases should also be expanded to allow a cross-national comparison of public spending on other types of treatment such as nursing and specialised residential care facilities and providers of ambulatory healthcare.

This would require countries to systematically monitor and register this type of data. To this end, two options are possible: an expansion of either the EMCDDA's TDI or the Eurostat database. First, TDI, a database with information on the total number of treatment demand clients by type of treatment, could be used ([12]). This would, however, require an expansion of the current variables in order to determine the fraction of clients receiving drug treatment. For instance, the total number of clients (including non-drug-related clients) for each treatment service should be collected. Furthermore, this would require data on the total budget of the treatment services. Ideally, more detailed information should also be available for the cost calculation of drug treatment, namely the number of activities and the related unit cost per activity ([13]). Second, the Eurostat database could also be expanded to allow calculation of the drug treatment expenditure. Therefore, systematic data registration for in- and outpatient activities (e.g. inpatient or outpatient curative care, rehabilitative care, long-term care) by diagnosis should be included. This would allow estimation of the proportion of treatment for illicit drug disorders, and this could be multiplied by healthcare expenditure (by function, reported on the Eurostat website). Overall, even if the Eurostat database were not expanded, its data coverage could be improved to obtain more reliable results for each of the EU Member States (our analysis showed that only 15 of the 28 EU Member States provided sufficient data for the Eurostat database), as consistency of reporting is indispensable for international benchmarking of budget expenditure across countries.

All of these suggestions will improve the quality of cross-country comparisons and will allow analysis of the distribution of expenditure between types of treatment, as well as analysis of trends over time (EMCDDA, 2011). Based upon these estimates of public expenditure on drug treatment, one could develop country profiles compiling information on treatment organisation and budgetary impact. A comparison of funding for treatment of substance misuse in different countries provides important information for a full economic evaluation. By doing so, these country profiles might help policymakers reallocate drug budgets. Ideally, these efforts would lead to an evidence-based policy in which financial resources are assigned to cost-effective substance misuse treatment (Wood et al., 2010). However, the results of estimates of public expenditure must be used with caution in a cross-national comparison (even if national and international data registration is improved and a uniform methodology is systematically applied to measure expenditure). In particular, caution must be exercised when using the results of a free-standing public expenditure study for policy (decision-making) purposes. Indeed, other factors should be taken into account to contextualise the results of public expenditure studies, as countries differ in terms of their social security systems, institutional structures, cultural traditions, etc.

([12]) The following types of treatment centres are defined in the TDI out-patient treatment centres/programmes; inpatient treatment centres/programmes; treatment units in prison/programmes; general practitioners; low-threshold agencies/programmes; other types of treatment centres/programmes (with a specification of the type of treatment).

([13]) The average cost per day for inpatient centres and the average cost per treatment episode/contact for outpatient centres. The EMCDDA could retrieve these financial data from the national focal points.

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IV

SECTION IV

Other tools to measure the costs of drug-related harm

Overview

The focus of this section is to move from the methods available to estimate spending on drug treatment and provide examples of other types of methods applicable when the goals of the analysis change. Chapter 10 presents a tool that allows drug treatment providers to assess their own costs. Chapter 11 describes a method to estimate the changes in costs caused by changes in the level of service provision, according to the different types of drug treatment services available.

In Chapter 10, Virginia Musto describes a tool — a calculator — developed by Public Health England to support local authorities in their appraisal of their spending on drug-related specific interventions. The results are expected to allow estimates of the cost-effectiveness of interventions and the social return on public investment. Furthermore, national health authorities expect that this calculator will improve the annual report of drug-related expenditure to central government and national projections of unitary costs. This study provides an example of a tool that can be made available to treatment providers to support their own estimates of costs and to build on drug treatment providers' capacity to evaluate costs and analyse cost-effectiveness.

Ricardo Gonçalves and colleagues go a step further in Chapter 11, presenting a method to assess the cost sensitivity of activities carried out by substance abuse treatment networks deployed in Portugal. In this country, small drug treatment teams provide drug prevention, harm reduction, social reintegration and treatment. Therefore, the authors estimate the costs of providing these different services and how much costs would increase if each of these services increased its activity.

10

CHAPTER 10

The cost calculator: a tool for estimating public spending on drug treatment in England

Virginia Musto

Introduction

Since 1 April 2013, public service delivery and commissioning in England has undergone significant change. Spending on drug treatment is no longer ring-fenced by central government and is instead determined by a local assessment of local need. Previous drug-related spending estimates assumed that funding allocations equated to expenditure. However, with the removal of the ring-fence, actual expenditure reports are required from every local authority (LA) to estimate public expenditure on drug treatment in England.

In conjunction with an advisory group comprising cross-government economists, policy leads and local alcohol and drug treatment commissioners, Public Health England (PHE) developed a cost calculator to help local authorities break down their global substance misuse spending on specific interventions. The calculator is a first step to supporting local authorities to advance their understanding of local drug-related spending, as well as local cost-effectiveness and social return on investment. It is hoped that the calculator will help improve the validity of annual drug-related financial expenditure reports to government, as well as national estimates of unit costs generally.

This paper explains the methodology used in the calculator to disaggregate spend, the required local authority input in the context of the new commissioning environment, and the calculator's wider application and utility.

Institutional framework of expenditure on drug treatment

Specialised drug treatment in England comprises a range of services including OST and psychosocial interventions, which take place in community, inpatient and/or residential settings. Treatment is tailored following a comprehensive assessment of need, which is regularly reviewed with the client. As well as structured treatment programmes, drug users in England may access less formalised interventions — information, advice and other services related to substance misuse — provided in general and open-access services. Non-structured interventions (also known as low-threshold services) can be delivered alongside structured treatment, although they can also act as a gateway to structured treatment. Examples include needle and syringe programmes, street outreach, drop-ins, identification and brief advice, and recovery support interventions (such as help with employment and housing).

To provide a robust estimate of public expenditure on drug treatment in England, it is important to know the configuration of local treatment systems and the amount that local authorities are taking from centrally provided funding to spend on drug dependency. Since implementation of the Health and Social Care Act 2012 in April 2013, local authorities have received an annual ring-fenced public health grant; however, funding for specific services within the grant, such as drug treatment, is not ring-fenced. Previous UK focal point studies assumed that drug treatment expenditure equated to drug treatment planned budget; however, this is no longer a viable option,

as local health and well-being boards ([1]) determine expenditure allocation across a range of public health services following an assessment of local need.

Local authorities report their annual forecast and actual public health expenditure to the Department for Communities and Local Government (DCLG). In 2014/15, the national estimated expenditure on adult drug misuse services was GBP 541.3 million, with a further GBP 66.7 million being spent on drug and alcohol services for young people. However, as adult substance misuse services are mostly integrated, with providers typically treating both drug and alcohol clients, and drug users often presenting with both drug and alcohol problems, isolating the specific spend on drug treatment can be challenging. Not surprisingly, there have been issues with the financial returns to DCLG. For example, some areas reported their combined alcohol and drug treatment budgets rather than disaggregated spending, while others merely split their substance misuse budgets and allocated half to drugs and half to alcohol treatment.

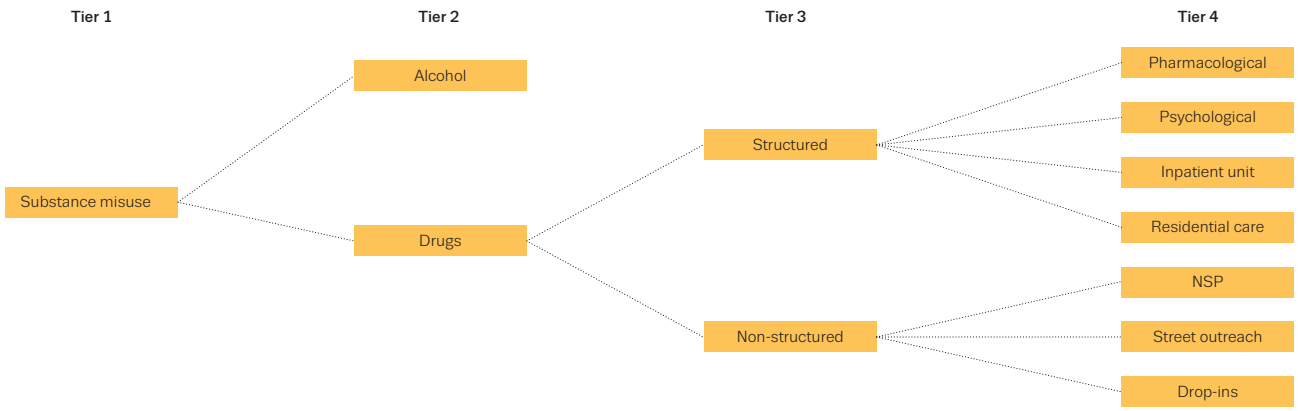
While disaggregating integrated substance misuse budgets by drugs and alcohol is difficult, disaggregating drug treatment spending by structured and non-structured types of intervention and/or setting is harder still. The DCLG does not require local authorities to report spending at this more detailed level, so we do not know how much local authorities spend on different types of services. This means that there are no up-to-date national or local unit costs.

The cost calculator

PHE, in conjunction with an advisory group comprising cross-government economists, policy leads and local alcohol and drug treatment commissioners, developed a cost calculator to help local authorities break down their integrated substance misuse spending into that on specific structured and non-structured services and interventions. The cost calculator is solely intended for alcohol and drugs commissioners in local authorities who want to understand their expenditure and improve the value for money achieved by the services they commission. The tool is based on Microsoft Excel and uses a mixture of already input local authority-level data from the National Drug Treatment Monitoring System (NDTMS) ([2]), publicly available unit costs data ([3]) and user-input spending data to calculate estimates of how much is spent locally on adult drug and alcohol interventions. The treatment data provided to the EMCDDA through the TDI are drawn from the NDTMS and is therefore compatible with the information provided on drug treatment utilisation services.

The pharmacological and psychosocial interventions outlined below occur in outpatient settings. Inpatient settings are disaggregated into detoxification in an inpatient unit and residential care. Non-structured (also known as low-threshold) services can occur in a variety of settings (see Figure 10.1).

FIGURE 10.1
Substance misuse treatment structure/categorisation



([1]) There is a minimum membership required for a health and well-being board: the local director of public health, a representative from each local clinical commissioning group, the local director of adult social services, the local director of children's social services, a representative nominated by NHS England, a local elected representative, and a representative from the local Healthwatch. Beyond this mandatory membership other interested local stakeholders may also be invited. These may include representatives of third-sector or voluntary organisations, other public services such as police and crime commissioners, or the NHS.

([2]) NDTMS is the English database of activity in the drug and alcohol treatment sector.

([3]) http://www.pssru.ac.uk/project-pages/unit-costs/2016/index.php

Steps to estimating expenditure

1. Drug and alcohol commissioners input their integrated substance misuse expenditure in a given financial year ([4]). This should include social care services and GP incentives, on all interventions aimed at addressing alcohol and drug use among adults. As a default, the cost calculator tool is prefilled with the DCLG revenue information: analysis and anecdotal evidence suggests that the sum of the drugs and alcohol components of the DCLG is more accurate than the disaggregated data (see Figure 10.2). Users of the tool are able to input more robust data into the tool if relevant.

2. Commissioners are then required to either input a monetary value or estimate the proportion of the integrated money spent on non-structured (low-threshold) alcohol and drug interventions.

3. Once the above values have been input into the Excel file, the calculator automatically updates and apportions the remaining spending into that on drug and alcohol structured treatment separately. This estimate is based on the number of drug and alcohol clients receiving treatment in a local authority in the specific year of interest and for how many days they receive treatment, as recorded on the NDTMS. The resulting estimate is fairly crude in that it does not account for different intensities of treatment for various clients and assumes the hourly cost of all interventions to be identical.

Public expenditure on structured drug treatment Exp_S^D is estimated as a proportion of public expenditure on total structured treatment – alcohol and drugs – ($Exp_S^{A,D}$), reflecting the total number of people and days spent in treatment (d_S^D), and the amount spent on non-structured (lower threshold) care (Exp_{NS}).

$$Total\ Exp_{S,NS} = Exp_S + Exp_{NS} \quad (10.1)$$

$$Exp_S^{A,D} = Total\ Exp_{S,NS} - Exp_{NS}$$

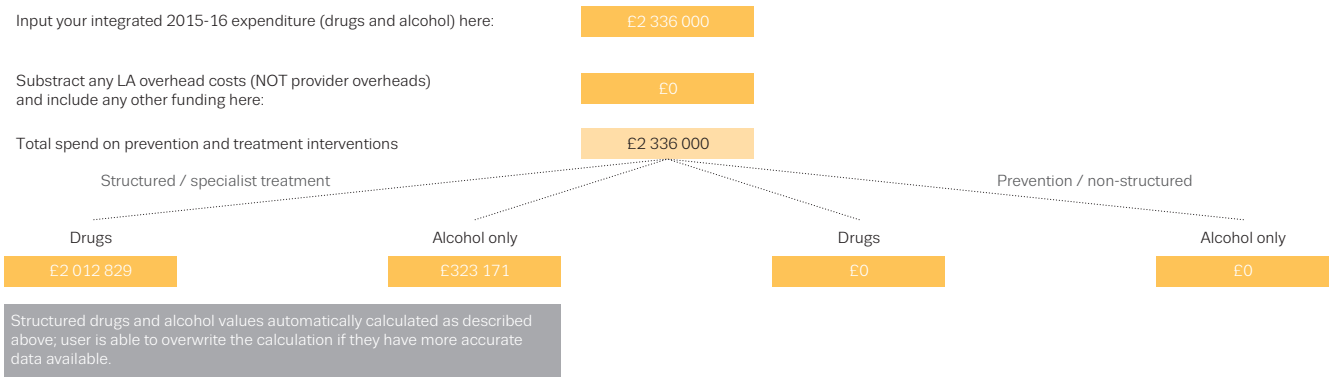
$$d_S^{A,D} = d_S^A + d_S^D \quad (10.2)$$

$$Exp_S^D = Exp_S^{A,D} * \left(\frac{d_S^D}{d_S^{A,D}}\right) \quad (10.3)$$

where

Exp = expenditure;
D = drug;
A = alcohol;
S = structured;
NS = non-structured;
d = days

FIGURE 10.2
Disaggregating integrated substance misuse spending



([4]) The current version is based on 2014/15; a 2015/16 and 2016/17 version will be available in autumn 2017.

Steps to estimating unit costs (spending per day)

For structured drug treatment, four types of mutually exclusive unit costs are estimated in the cost calculator ([5]):

1. community pharmacological treatment (outpatient intervention);
2. community psychosocial treatment (outpatient intervention);
3. inpatient treatment (inpatient aggregated setting);
4. residential rehabilitation (inpatient aggregated setting).

The groups are high-level interventions or settings recorded on the NDTMS. Inpatient and residential rehabilitation are settings in which pharmacological and/or psychosocial interventions could take place, but they have been aggregated to better reflect the way services are commissioned and therefore the type of expenditure that information commissioners are more likely to have at their disposal.

National estimates of daily expenditure derived from previous studies are presented in Table 10.1. These are publicly available data on national unit cost averages adjusted to today's prices using the GDP deflator to account for how much more or less expensive one intervention is than another ([6]). These unit costs are based on a 2007/08 data collection exercise ([7]) and so predate the current Drugs Strategy (2010) and the Health and Social Care Act 2012.

There are two approaches to estimating spending per day ([8]): top-down and bottom-up ([9]). The top-down approach is relatively straightforward: divide total expenditure by total units of activity. For example, the top-down calculation for the average cost of residential rehabilitation per day would be:

Total spend on residential rehabilitation services/
Total days in residential rehabilitation services

Commissioners are asked to enter expenditure on an intervention or setting; then, using local NDTMS data on people and days in treatment, the calculator automatically estimates the unit cost using the calculation above. If a local authority does not know its total spending on an intervention or setting, to ensure that the resulting estimates are as meaningful as they can be, the default calculations account for known relative differences in spending per day (see Table 10.1). Therefore, the calculator automatically assumes when disaggregating spend by interventions/settings that, all things being equal, the local authority spending per day associated with residential rehabilitation is 13 times as much as a pharmacological intervention in the community (GBP 100.86 versus GBP 7.96 respectively), for example.

If known, the expenditure on any of the interventions or settings can be overwritten. For example, some commissioners informed us that they would find it easier to report spending on residential rehabilitation and inpatient detoxification settings but not on individual pharmacological and psychosocial interventions, because the contract arrangements for residential and inpatient services, e.g. block contracts and spot purchases, facilitate this. This means that it is possible for the calculator to include a mixture of known and assumed costs based on user input and the parameters set; every time a new data item is included, the calculator adjusts the overall spending accordingly.

TABLE 10.1
Unit costs (2015/16 prices)

Intervention/setting	Cost per day (GBP)
Pharmacological intervention	7.96
Psychosocial intervention	9.92
Inpatient treatment	160.42
Residential treatment	100.86

([5]) The non-structured treatment component is very similar and so will not be discussed in detail here.
([6]) We apply the Department of Health market forces factor to national averages when estimating local costs to account for differential staff and premises costs across the country.
([7]) See the 2010 UK focal point report for more information: http://www.nta.nhs.uk/uploads/2010.pdf
([8]) A unit cost captures the total cost of providing one unit of a service, such as residential rehabilitation. Unit costs should include all service provision costs — direct costs, indirect costs (e.g. heating and lighting, time and travel costs) and overheads (e.g. human resources and finance); include 'intention to treat' costs — such as triage assessment costs for people who choose not to engage with a treatment provider, drop out of treatment, or are referred elsewhere; and add up to the total cost of service provision.
([9]) The bottom-up approach requires greater detail than the top-down method: all resources used to provide a service, such as staff, prescribed drugs and premises, need to be identified and a value assigned to each. To calculate the unit cost, the values are then summed and multiplied by the unit of activity. Breaking down costs in this way establishes transparent and more robust estimates and allows commissioners to explore drivers of variation, such as whether some service users account for a disproportionate share of the costs. This method is more reliable for forecasting how costs can change as a result of a reduction in service usage or demand. For more information, see *A Guide to Social Return on Investment for Alcohol and Drug Treatment Commissioners:* www.nta.nhs.uk/uploads/a-guide-to-social-return-on-investment-for-alcohol-and-drug-treatment-commissioners.pdf

Conclusion

Commissioners have welcomed PHE's support in disaggregating spending and using the data to estimate the social return on investment in drug treatment and explore the cost-effectiveness of different types of interventions. Some commissioners have submitted their completed calculators in the hope that enough local authorities follow suit, as that would allow PHE to include financial benchmarked information in future economic tools, thereby allowing local authorities to compare their spending and value for money with other similar authorities. In addition, the calculator can help to improve the accuracy of the revenue outturn submitted to the DCLG, as well as improving understanding of investment and estimates of national and local expenditure.

The cost calculator is still relatively new and, as use becomes more frequent, suggestions for improvement will inevitably come, which will result in changes to the approach over time. The current version is deliberately simple so as to introduce the technique and thinking to commissioners; over time as areas become experienced in disaggregating expenditure, it is expected that a bottom-up approach to estimating unit costs will be included, which will improve accuracy and be more conducive to identifying what actually drives costs, other than the number of clients and time spent in treatment.

In the meantime, while the assumptions and expenditure calculations may seem fairly crude, their effectiveness for economic analysis is sufficient. After all, the monetary values assigned to the social and economic benefits of drug treatment in economic modelling, e.g. improved health and reduced criminal activity, are proxies, not exact savings that a local authority can expect to receive should it invest in treatment. What is needed, therefore, are whole cost estimates that are generally comparable in accuracy with the benefit estimates. The cost calculator provides this.

11

CHAPTER 11

Empirical estimation of drug treatment costs in Portugal

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Introduction

Illicit drugs have a significant impact on users and society, and the burden of health-related problems resulting from their use is enormous. The approach to drug policy varies widely across countries and enforcement still consumes the bulk of public resources, even in countries with an element of decriminalisation such as the Netherlands (Rigter, 2006) ([1]). However, it is now apparent that drug abuse and addiction treatment is much less expensive than its alternatives (such as imprisonment), and it substantially reduces the associated health and social costs. For instance, in the United Kingdom, Gossop et al. (2001) estimated a return of GBP 3 for every additional GBP 1 spent on treatment, as a result of cost savings associated with lower direct and indirect crime-related costs.

Health and social policy programmes have a medical-response component (dealing with a medical need) and a policy-response component (measures aiming to change individual behaviour) (Pacula et al., 2009). It is estimated that around 25 % of Europe's adult population have ever used an illicit drug and that, in 2011, at least 1.2 million people received some kind of treatment for illicit drug use in the EU and its candidate countries (EMCDDA, 2013).

Health expenditure, which includes drug abuse and dependence treatment, is largely public in nature in the majority of OECD countries (OECD, 2015, p. 170). Providing good-quality services for drug users is therefore a significant challenge, particularly in a difficult economic climate, and governments face increasing pressure to monitor their costs.

Research is under way to estimate expenditure — and, in particular, public expenditure — on illicit drug treatment in several countries. However, most researchers are hampered by a lack of detailed data, as often data — when available — do not make a distinction between expenditure on drugs and on alcohol or mental disorders (Ramstedt, 2006; Rigter, 2006). There have also been attempts to make cross-country comparisons (Lievens et al., 2014), which are even more difficult, as data are often not available.

Portugal is an example of a country in which substance abuse and dependence are mostly treated with public funds. The National Strategy for the Fight Against Drugs, approved by the Portuguese government in 1999, is based on a health-oriented rationale and encompasses various policy measures, including, from 2000 onwards, the decriminalisation of illicit drug possession and consumption. In particular, it also includes an extension of the healthcare services network, a syringe exchange programme, an increase in scientific research funding and specialist training, and a significant financial budget increase for drug-related problems. It led to the setting up of the Portuguese Institute for Drugs and Drug Addictions (IPDT), a public organisation with several responsibilities. In particular, from 2005 onwards and after the merger of the IPDT with the SPTT ([2]), the Portuguese Institute for Drugs and Drug Addictions (*Instituto da Droga e da Toxicodependência*, known as IDT) became responsible for the drug-related healthcare treatment network and for the elaboration and implementation of the National Action Plan Against Drugs and Drug Addiction ([3]).

In order to pursue these objectives, an innovative organisational model was introduced. Small treatment teams, belonging to integrated response centres, provide services associated with prevention, harm reduction, social reintegration and treatment. Some of these services are outsourced (e.g. harm reduction, a significant percentage

([1]) EMCDDA (2014, p. 70) shows that a larger share of drug-related public expenditure is allocated to drug supply reduction activities (as opposed to demand reduction) in most of the 16 European countries that have detailed public expenditure breakdowns.

([2]) *Serviço de Prevenção e Tratamento da Toxicodependência.*

([3]) The 2005-12 national plan detailed policy objectives for specific periods in the following areas: prevention; harm reduction and risk minimisation; treatment; social reintegration; combating illicit drug trafficking and money laundering; research, statistical and epidemiological information; evaluation; international collaboration; legal regulation; and decriminalisation consumption.

of prevention- and treatment-related services), but those costs are allocated to the relevant treatment team (e.g. in the case of treatment services, the treatment team that has referred the patient) ([4]). In addition, some of these services are provided at the individual level (e.g. treatment), but others may be provided to larger groups (e.g. prevention activities targeting specific groups or communities) and, naturally, the associated costs may be very different. A major advantage of this organisational model, from a research perspective, is that it keeps track of costs at the treatment team level, thus generating a rich and useful database of treatment team costs and outputs or activities carried out.

Relying on this IDT cost and output data for its treatment network, during the years 2011 and 2012, we estimated a cost function that allowed us to calculate the costs associated with the various types of dependence-related activities carried out by the various treatment teams across different geographical areas within Portugal. We uncovered some interesting results: for example, the average cost of each prevention event (all substances) is EUR 2 330, while for treatment it is EUR 134 ([5]). Drug-related activities (including prevention, harm reduction, social rehabilitation and treatment) have an average event cost of EUR 128.

These estimates are quite relevant from a policy point of view. First, they provide an indication of how costly are the various types of activity carried out by treatment teams. Second, they allow for more informed decisions if some of these activities were to be further outsourced (e.g. to non-profit or private healthcare organisations) ([6]). In addition, although we did not pursue this line of research in this chapter, it also allows for an analysis of the (possible) existence of economies of scale or scope. This is relevant in terms of understanding the adequacy of the treatment network currently in place. More broadly, in the drug dependence field, this methodology can be used by other countries that have geographically decentralised treatment teams to carry out an estimation of their treatment costs. Naturally, depending on what costs are borne by each treatment team, the estimates may vary from country to country, reflecting not only cost differences, but also differences in each country's organisational structure for the treatment of addictive behaviour.

([4]) In the case of social reintegration, treatment teams are responsible for only some activities (and their underlying costs), e.g. social service appointments (social situation diagnosis and referral), targeted interventions, e.g. to increase social or other competences. Other concrete measures for social reintegration (e.g, housing, employment, etc.) are carried out by social security services and their costs are not included in the analysis.

([5]) As we will later clarify, the unit used for each type of activity is an 'event' or 'episode' registered in the treatment network database.

([6]) Law no 7/97 allows this outsourcing to occur and, indeed, as mentioned above, this possibility is already used for some activities (e.g. prevention, harm reduction or treatment).

The chapter is organised in the following way: a brief overview of cost functions, a description of the data used, a results section and a conclusion. Annex A provides a detailed, technical description of the methodology used.

Cost functions: a brief overview

In a nutshell, an organisation or a firm produces (possibly multiple) outputs (e.g. products or services) making use of inputs (for instance, staff or raw materials). For a given choice of output levels, the organisation or firm is typically expected to be economically efficient, that is, to choose the combination of inputs that minimises its costs. The concept of a cost function embodies this notion. In particular, the cost function allows the identification of the minimum possible costs that an organisation or firm must incur to produce a given level of outputs.

Estimating a cost function allows a researcher to understand how changes in output levels may change production costs. Therefore, it is a particularly important concept when organisations or firms wish to depart from their current production levels, as it allows the cost implications of such decisions to be calculated. Such functions can be estimated using data on total costs, output levels and input prices.

Data

Treatment teams report their costs on an annual basis to IDT, broken down into several cost categories, namely staff costs (including all relevant subsidies or additional remuneration on top of salary costs) and acquisition of services and supplies (clinical material — including methadone, for substitution therapies — food, communications, transport, insurance, security, etc.), which also includes patient referral costs within the drug treatment network, that is, the cost associated with treating a particular treatment team's client at another drug-related healthcare provider (e.g. inpatient treatment in therapeutic communities) ([7]). Therefore, once a client is admitted by a treatment team, the costs of all services provided to that client (either within the treatment team or, through referral,

([7]) Although a broader referral concept is legally possible — through which users under treatment could be referred to other health providers, e.g. for diagnostic examinations or other procedures — it was never adopted by IDT insofar as it would be questionable whether such referrals would be related to the addiction problem.

by other drug-related healthcare providers) are typically allocated to that treatment team.

Output levels were extracted from SIM ([8]), activity management software used by all treatment teams when registering their activity. This software registers a wide variety of information for each 'event', which is associated with a particular client, namely specific information on each service area (medical, psychological, nursing services) or the main substance to which it refers (alcohol, illicit drugs, tobacco, etc.) ([9]). In addition, event-specific information is also registered, namely whether or not it was scheduled, whether or not the event actually took place (e.g. not all scheduled events actually take place) and the type of activity to which it refers (e.g. prevention, harm reduction).

We collected this data for the years 2011 and 2012, as during that period the data collection procedure was broadly consistent. From 2013 onwards, IDT became SICAD ([10]) and its responsibilities changed significantly, which ultimately translated into significant differences in the functioning of treatment teams and particularly in the way costs were registered. An important implication of this change is that extending the analysis we carried out to subsequent years (2013 onwards) would not be straightforward and would (almost certainly) involve a lengthier and more intensive data collection exercise. Summary statistics for each of the main variables are presented in Table 11.1.

TABLE 11.1

Descriptive statistics of the main variables used in the regressions

Variable	No of observations	Mean	SD	Minimum	Maximum
Total costs (EUR)	83	1 170 063	912 894	22 594	4 649 957
Number of staff	73	15	9	1	42
Number of events	83	10 879	6 338	1 273	31 983
Number of treated individuals	83	799	455	166	2 611
Average event duration (minutes)	83	29	5	15	46
Model 1 outputs (number of events)					
Prevention	83	117	154	0	811
Harm reduction	83	124	672	0	6 070
Social rehabilitation	83	1 452	1 324	45	7 137
Treatment	83	9 157	5 765	143	30 786
Other	83	29	92	0	611
Model 2 outputs (number of events)					
Alcohol	83	1 098	908	69	4 382
Drugs	83	9 548	5 967	1 200	29 334
Tobacco	83	34	75	0	467
Other	83	200	226	0	1 273
Model 3 outputs (number of events)					
Alcohol	83	1 098	908	69	4 382
Opiates	83	6 478	3 699	848	17 910
Stimulants	83	454	410	0	1 786
Hallucinogens	83	5	10	0	45
Cannabis	83	302	231	12	1 081
Other drugs	83	2 309	2 706	65	15 372
Tobacco	83	34	75	0	467
Other	83	200	226	0	1 273

Note: 'Number of observations' refers to the number of treatment teams for which data were available; 'Mean' refers to the mean of a given variable across treatment teams; number of staff was not available for all 83 treatment teams.

([8]) *Sistema de Informação Multidisciplinar.*

([9]) An 'event' is the broad term we use to define an activity registered in SIM. For example, a treatment event is usually associated with face-to-face contact for a specific purpose (e.g, an appointment, a blood test, a psychological evaluation). Therefore, on a specific day when interacting with the treatment network, a client may trigger more than one event in SIM.

([10]) *Serviço de Intervenção nos Comportamentos Aditivos e nas Dependências.*

Results

We present the results of the cost function estimation (Annex A — equation A11.2) in Table 11.2 ([11]) ([12]). The cost elasticity of a given output (see Annex A) represents the percentage change in costs when that output level varies by 1 %. In other words, the cost elasticity shows how sensitive total costs are when a given output level changes by 1 %. Calculating the cost elasticities (at the sample means) using the results presented in Table 11.2 leads to the following conclusions:

TABLE 11.2

Estimation results

		Model (1) [5 outputs]	Model (2) [4 outputs]	Model (3) [8 outputs]			Model (1) [5 outputs]	Model (2) [4 outputs]	Model (3) [8 outputs]
Parameter	Variable	Coefficient (significance level)	Coefficient (significance level)	Coefficient (significance level)	Parameter	Variable	Coefficient (significance level)	Coefficient (significance level)	Coefficient (significance level)
β_1	Y_1	0.12 (*)	0.04	0.01	$1/2.\beta_{44}$	$Y_4.Y_4$	−0.17	0.02	0.01
β_2	Y_2	−0.13 (***)	0.73 (***)	−0.60 (**)	β_{45}	$Y_4.Y_5$	0.09 (***)		0.00
β_3	Y_3	0.12	0.03	0.71 (**)	β_{46}	$Y_4.Y_6$			0.00
β_4	Y_4	1.22 (***)	0.09 (*)	0.14	β_{47}	$Y_4.Y_7$			0.00
β_5	Y_5	−0.05		0.19	β_{48}	$Y_4.Y_8$			−0.02
β_6	Y_6			−0.20	$1/2.\beta_{55}$	$Y_5.Y_5$	0.00		−0.13
β_7	Y_7			−0.03	β_{56}	$Y_5.Y_6$			0.20
β_8	Y_8			0.03	β_{57}	$Y_5.Y_7$			0.13 (**)
$1/2.\beta_{11}$	$Y_1.Y_1$	0.01	0.05	0.42 (***)	β_{58}	$Y_5.Y_8$			0.28 (*)
β_{12}	$Y_1.Y_2$	−0.02	0.03	0.06	$1/2.\beta_{66}$	$Y_6.Y_6$			0.21 (**)
β_{13}	$Y_1.Y_3$	−0.04	0.00	−0.22	β_{67}	$Y_6.Y_7$			−0.08 (***)
β_{14}	$Y_1.Y_4$	0.18 (**)	−0.03	−0.03	β_{68}	$Y_6.Y_8$			0.00
β_{15}	$Y_1.Y_5$	−0.01		−0.02	$1/2.\beta_{77}$	$Y_7.Y_7$			0.00
β_{16}	$Y_1.Y_6$			0.43 (***)	β_{78}	$Y_7.Y_8$			−0.05 (*)
β_{17}	$Y_1.Y_7$			−0.06 (**)	$1/2.\beta_{88}$	$Y_8.Y_8$			0.06
β_{18}	$Y_1.Y_8$			0.16	γ_1	$ln(w_1)$	0.60 (***)	0.61 (***)	0.62 (***)
$1/2.\beta_{22}$	$Y_2.Y_2$	−0.01 (*)	0.00	0.99 (**)	γ_2	$ln(w_2)$	0.40 (***)	0.39 (***)	0.38 (***)
β_{23}	$Y_2.Y_3$	0.03	0.00	0.45	$1/2.\gamma_{11}$	$(ln(w_1))^2$	0.07 (***)	0.07 (***)	0.06 (***)
β_{24}	$Y_2.Y_4$	0.05	0.02	−0.12 (***)	$1/2.\gamma_{22}$	$(ln(w_2))^2$	0.07 (***)	0.07 (***)	0.06 (***)
β_{25}	$Y_2.Y_5$	−0.01 (***)		−2.04 (***)	γ_{12}	$ln(w_1).ln(w_2)$	−0.14 (***)	−0.13 (***)	−0.12 (***)
β_{26}	$Y_2.Y_6$			−0.55		D – Year 2012	−0.56 (**)	−0.25 (***)	−0.53 (***)
β_{27}	$Y_2.Y_7$			−0.08	α	Constant	14.02 (***)	14.02 (***)	14.02 (***)
β_{28}	$Y_2.Y_8$			−0.16					
$1/2.\beta_{33}$	$Y_3.Y_3$	0.05	0.00	0.02					
β_{34}	$Y_3.Y_4$	−0.07	−0.01	0.10 (***)					
β_{35}	$Y_3.Y_5$	−0.03 (**)		−0.07					
β_{36}	$Y_3.Y_6$			−0.04	Number of observations		75	75	75
β_{37}	$Y_3.Y_7$			0.03	r^2 (cost function)		0.69	0.51	0.83
β_{38}	$Y_3.Y_8$			−0.21	r^2 (*labour share equation*)		0.06	0.06	0.07

***Significant at the 1 % level; **significant at the 5 % level; *significant at the 10 % level.

([11]) All models exhibit a high r^2 and many individually insignificant t-ratios, a typical result when estimating flexible cost functions because of multi-collinearity (see, for example, Gonçalves and Barros, 2013). In this type of estimation, multicollinearity is normally associated both with non-linear explanatory variables (squared output levels and input prices) as well as the interaction variables. Although multicollinearity does not violate OLS assumptions (estimated coefficients remain unbiased), standard errors are typically larger, which leads to statistical insignificance of estimated coefficients.

([12]) We estimated equation A11.2 using other controls, such as geographical location or the integrated response centre to which each treatment team belonged. However, these were typically statistically insignificant and we chose not to include them.

- In model 1 (five outputs), as the number of prevention events increases by 1 %, cost increases by 0.12 %; for treatment events, the corresponding cost increase is 1.22 % — therefore, costs are rather sensitive to the number of treatment events.

- In model 2, only two outputs (out of four) have statistically significant cost elasticities. For example, the cost elasticity of illicit drug events is 0.73, while that of other substances is 0.09; therefore, costs are (in relative terms) more sensitive to illicit drug-related events;

- Results from model 3 are more difficult to interpret ([13]).

Two cost measures can be calculated using the estimates presented in Table 11.2 (see Annex A). First, we can calculate average incremental costs. These are equivalent, in this type of multi-output setting, to an average cost, that is, on average, how much it costs to produce each unit of a given output. This cost measure is a simple indicator of how much, on average, each unit of output costs to produce. Second, the marginal cost of an output tells us how much total costs change when (assuming all else is constant) an additional unit of a given output is produced. This is likely to be different from the average incremental cost, because in order to produce an additional unit it may be that the total cost increases by less than the average incremental cost. For example, it may be that this additional unit requires not a significant increase in fixed or quasi-fixed costs (e.g. number of staff) and only an increase in variable costs. Therefore, evaluating all variables at their sample means, we find that:

- In model 1, the average incremental cost of prevention events is EUR 2 330, while the marginal cost is EUR 1 206; for treatment events, the respective figures are EUR 134 and EUR 164.

- In model 2, the average incremental cost of drug-related events is EUR 128 while the marginal cost is EUR 93.

- In model 3, the average incremental cost of stimulant-related events is EUR 2 687 while the marginal cost is EUR 1 913.

([13]) Because of the significantly larger number of variables included in the regression, the results of model 3 are more difficult to interpret. For example, only two cost elasticities are statistically significant — opiates and stimulants — but only the latter is positive. In addition, the cost elasticities of alcohol or tobacco-related events are quite different from those obtained in model 2.

TABLE 11.3

Marginal cost estimates of models 1 and 2

	Output	Marginal cost (EUR)
Model 1	Prevention	1 206
	Harm reduction	–1 274
	Social rehabilitation	98
	Treatment	164
	Other	–2 076
Model 2	Alcohol	40
	Drugs	93
	Tobacco	941
	Other	563

Although these are most plausible results, we present all the marginal cost estimates for models 1 and 2 in Table 11.3 ([14]).

Conclusion

This paper has addressed a little-explored topic: the costs associated with the treatment of substance abuse. Owing to its particular characteristics — namely the fact that a geographically spread treatment network reports costs and output levels to a single public organisation, IDT — we carried out a cost function estimation that allowed us to empirically estimate the costs (average incremental costs and marginal costs) associated with the treatment of substance abuse. We found that prevention and especially treatment appear to be the most cost-sensitive activities (measured by their cost elasticities) carried out by the treatment network. Looking in particular at the treatment cost elasticity, we found that a 1 % increase in the number of treatment events would result in an overall cost increase of 1.22 %. In addition, illicit drugs have a relevant and significant cost elasticity — more so than other substances.

These estimates have (at least) three immediate practical uses. First, within each treatment team, they may be used as a tool for budgeting — that is, predicting yearly costs on the basis of expected output levels. Second, they may be used as benchmarks to identify inefficiency — for instance, if the observed average cost of an activity is much larger than that predicted, it may be because of inefficiencies in service provision, which may then be corrected immediately. Third, these estimates may also be used as benchmarks if some of these activities were to be further

([14]) Average incremental costs rely on evaluating the cost function far away from the approximation point (when one output level is evaluated at zero) and are thus more sensitive to estimation problems than marginal costs.

outsourced — they provide an indicator of how costly it is to provide a given service within the treatment network and, therefore, may be used as a cap or reference value when contemplating the possibility of outsourcing such services to not-for-profit or private sector providers.

Further research in this area is warranted. This methodology allows the analysis of economies of scale or scope within the treatment network, although we did not pursue it in this chapter. These data also allow a more detailed efficiency analysis, in which comparisons could be made of the outputs produced by each treatment team with the available inputs (e.g. staff). In addition, data for more years or additional variables that can explain the costs of the treatment teams would certainly improve the results of the estimation and thus provide a more accurate calculation of average incremental costs as well as marginal costs. These are likely to be the next steps in our research.

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Annex A
Methodology: cost function estimation

A firm's long-run cost function indicates the minimum cost at which a firm produces a given quantity of its various outputs (y_i) for given input prices (w_i). Under the assumption of n outputs and m inputs, a firm's long-run cost function is typically given by:

$$C = C(y_1, \dots, y_n, w_1, \dots, w_m) \tag{A11.1}$$

We assume that treatment teams operate in the long run, that is, we explicitly assume that they can change the quantity they use of all the production inputs in response to changes in input price or output level. This strikes us as a plausible assumption because (1) treatment teams are typically small and appear to make limited use of inputs that might be considered fixed in the short run (and hence whose quantity would not change in response to input price or output level changes), and because (2) treatment teams can refer clients to other drug treatment providers with relative ease, thus effectively allowing possible short-run input constraints to be easily bypassed.

We use the generalised translog cost function to represent the long-run cost function. This cost function is particularly suited when a significant number of observations contain zero values for some output categories. The main difference with respect to the translog cost function is that all output levels are subjected to a Box-Cox transformation instead of the log-transformation commonly used under the translog cost function, that is, all output levels y_i are transformed into $Y_i = \frac{y_i^{\lambda}-1}{\lambda}$ ([15]). In addition, prior to the Box-Cox transformation of the output data (y_i), we mean-scale all our variables ([16]).

The generalised translog cost function is a second-order Taylor approximation to the true (but unknown) functional form and it is given by:

$$\begin{aligned} lnC = \alpha_0 + \sum_{i=1}^{n} \beta_i Y_i + \frac{1}{2}\sum_{i=1}^{n}\sum_{j=1}^{n} \beta_{ij} Y_i Y_j + \sum_{i=1}^{m} \gamma_i ln(w_i) + \\ + \frac{1}{2}\sum_{i=1}^{m}\sum_{j=1}^{m} \gamma_{ij} ln(w_i) ln(w_j) + \sum_{r=1}^{n}\sum_{i=1}^{m} \delta_{ri} Y_r ln(w_i) \end{aligned} \tag{A11.2}$$

In line with the literature, we assume a symmetry constraint $\beta_{ij}=\beta_{ji}$, and $\gamma_{ij}=\gamma_{ji}$, as well as linear homogeneity in input prices (i.e. doubling the price of all inputs leads to a doubling of costs):

$$\begin{aligned} &\sum_{i=1}^{m} \gamma_i = 1 \\ &\sum_{i=1}^{m} \delta_{ri} = 0, r = 1, \dots, n \\ &\sum_{j\ 1}^{m} \gamma_{ij} = 0, i = 1, \dots, m \end{aligned} \tag{A11.3}$$

([15]) We assume that λ=0.1.
([16]) For each output (y_i (i=1,...,n)) and for each input price (w_j (j=1,...,m)), we divide each observation by the respective mean. Therefore, the mean of the mean-scaled variables is equal to 1.

The cost proportion equations are obtained through the logarithmic differentiation of the cost function (Shephard's lemma):

$$S_i = \frac{\partial lnC}{\partial w_i} = \gamma_i + \sum_{j=1}^{m} \gamma_{ij} ln(w_j) + \sum_{r=1}^{n} \delta_{ri} Y_r \, , i = 1, \dots, m \qquad \text{(A11.4)}$$

where $S_i = \frac{w_i x_i}{\sum_{i=1}^{m} w_i x_i}$ is the cost share of input i (x_i represents the quantity used of input i).

A key question in our estimation is the definition of outputs for the treatment teams. Indeed, treatment teams have various functions and their work covers a wide variety of areas. As such, it is not easy to define what their outputs are. Therefore, we have estimated three different models, each of which considers a different type of output for treatment teams:

- Model 1: outputs are considered to be activity based, namely we assume that treatment teams provide services in the areas of prevention, harm reduction, social rehabilitation, treatment or other areas.

- Model 2: outputs are considered to be substance based (in broad categories), that is, treatment teams are assumed to provide services associated with alcohol, illicit drugs, tobacco or addiction to other substances.

- Model 3: as in model 2, outputs are considered to be substance based, but illicit drugs are further broken down into opiates, stimulants, hallucinogens, cannabis or other drugs (alcohol, tobacco and other substances are considered, as in model 2, as broad categories).

It strikes us as plausible to assume that all treatment teams rely essentially on two inputs: staff and other costs (which include services and acquisition of supplies). Staff costs were calculated in the following way: for each treatment team, we know how many people in each staff category there are (doctor, nurse, administrative staff). Using the annual salary of each staff category for that year, we can compute an average salary per treatment team ([17]) ([18]). This is clearly an imperfect measure of staff unit costs. Ideally we would use total staff costs divided by the number of staff, but it appears as if several treatment teams have significant discrepancies in their overall staff costs when compared with the number of staff they report, possibly because of cost allocation errors. In the face of this problem, our proposed method appears more reliable.

Our second input — other costs — is essentially a composite of various input categories. As such, we assume that the price of this input is the result of the division of its total costs by the number of effective events registered by each treatment team (see below). Therefore, as in Garcia and Thomas (2001), this unit price is expressed as a cost per unit of output.

Equations A11.2 and A11.4 were estimated with the homogeneity restrictions of equation A11.3 using Zellner's seemingly unrelated regression (SUR) technique. Because the cost proportions add up to unity, only one of them is independent, and we have thus dropped the second cost proportion equation (associated with other inputs) from the regression. It is immaterial which cost proportion equation is dropped, but input prices are not readily available for the second input. In addition, given the relatively low degrees of freedom in some models (namely model 3), we have estimated all models under the assumption of homotheticity, that is, we assume that the cost-minimising mix of inputs is not affected by

([17]) Treatment teams' staff are public servants and, as such, their salaries are defined according to a payscale.
([18]) For a small number of teams, we did not have the staff mix. In this case, we have assumed these units to have the average staff mix in the sample.

the volume or mix of outputs, which implies that changes in input prices affect costs only by a scale factor (Smet, 2002). This implies that, in equation A11.2, input prices are not interacting with output levels.

In order to eliminate potential outliers, we excluded from the analysis observations whose event unit cost (total costs divided by the total number of effective events) was in the top or bottom 5 % (eight observations in total).

Define η_i as the cost elasticity of output:

$$\eta_i = \frac{\partial C}{\partial y_i^*}\frac{y_i^*}{C} \quad \text{(A11.5)}$$

That is, η_i represents the percentage change in costs when output i varies by 1 %. Following Vita (1990), the cost elasticity of output when we use the generalised translog cost function is given by:

$$\eta_i = \left(\beta_i + \sum_{j=1}^{n}\beta_{ij}Y_j + \sum_{j=1}^{m}\delta_{ij}ln(w_j)\right)y_i^{\lambda} \quad \text{(A11. 6)}$$

where y_i are the untransformed outputs and λ is the Box-Cox transformation parameter. Because all variables are mean-scaled, at the sample mean the cost elasticity of output is simply given by $\eta_i=\beta_i$.

The average incremental cost of output i is equivalent, in a multi-output setting, to an average cost. It provides an indication of how much, on average, each unit of output i costs to produce and it is calculated in the following way (see Grannemann et al., 1986, for example):

$$AIC_i = \frac{C(y_1, \ldots, y_n) - C(y_1, \ldots, y_{i-1}, 0, y_{i+1}, \ldots, y_n)}{y_i} \quad \text{(A11.7)}$$

It is based on the incremental cost of output i, that is, the difference in overall costs between producing all n outputs and producing all the outputs except i.

The marginal cost of output is the variation in total costs when (assuming all else is constant) an additional unit of output is produced and is given by:

$$MC_i = \frac{\partial C}{\partial y_i} = \frac{C}{y_i}\frac{\partial lnC}{\partial Y_i} = \frac{C}{y_i}\left[\beta_i + \sum_{j=1}^{n}\beta_{ij}Y_j\right] \quad \text{(A11.8)}$$

V

SECTION V

Contextualising costs

Overview

Section V shows that public spending on drug treatment is only part of the picture that explains costs and, therefore, should be set in the right context. Do methods to estimate spending on drug treatment vary if the private sector pays a significant part of the bill? What are the socioeconomic factors to analyse if one wants to contextualise the size and meaning of public spending on drug treatment? What other costs does society bear, besides the drug treatment bill?

In Chapter 12, Ervant Maksabedian and colleagues show how the costs of addiction treatment vary in the United States, according to the payer (public versus private payers), type of treatment (inpatient versus outpatient providers) and type of pharmacological treatment adopted (pharmacological versus behavioural therapy). Treatment options for any given client vary based on a whole host of factors, including the setting in which treatment is offered, the credentials or certification of the provider, geographic variation in access to therapies, and differences in what is covered by health insurers; these complicating factors, coupled with the lack of price transparency for most services, make calculation of the average cost of treatment a challenging task. In this context, this study provides an example of how bottom-up estimates for the costs of treatment for opioid addiction in outpatient settings in the United States may vary, for instance, because of the costs of pharmaceuticals.

In Chapter 13, Freya Vander Laenen and Delfine Lievens suggest a methodological framework for understanding and contextualising the size of drug treatment spending. The authors discuss the main factors contributing to this expenditure. In their view, three classes of factors explain public spending: (1) the type of healthcare policy; (2) the type of drug treatment policy; and (3) the socioeconomic context. To operationalise this model, taking a pragmatic approach, the authors base their analysis on data available in international databases. By focusing on these factors, the chapter moves the discussion forward from a pure analysis of public expenditure studies to a broader context that is more valid for a drug policy.

Completing the section, in Chapter 14, Pierre Kopp and Marysia Ogrodnik present a general methodology for computing the social costs of drugs. The authors show that drug-related public expenditure is only part of the costs associated with illicit drugs and borne by society. This chapter frames public expenditure in the context of other costs, borne by private entities, public entities or the members of society. To make this study more applicable to practice, the authors apply this method to France and estimate the social costs of illicit drugs in France for the year 2010.

12

CHAPTER 12

Estimating the costs of substitution therapy for heroin and opioid addiction in the United States: insights and challenges

Ervant Maksabedian, Rosalie Liccardo Pacula and Bradley Stein

Introduction

The enormous rise in the non-medical use of prescription opioids and heroin in the United States has concerned policymakers, researchers and the general public for several years. According to the National Survey on Drug Use and Health, in 2012, an estimated 2.3 million people suffered from opioid abuse or dependence in the previous year, with the vast majority not receiving any treatment (US Department of Health and Human Services, 2015). The number of fatal poisonings due to prescription pain medications quadrupled between 1999 and 2010, a rate of growth that was parallelled by the distribution of prescription pain medications during the same period (Centers for Disease Control and Prevention, 2011a). Opioid-related Accident and Emergency Department visits more than doubled, from 21.6 per 100 000 in 2004 to 54.9 per 100 000 in 2011, for a total of 1.24 million Emergency Department visits involving non-medical use of pharmaceuticals and pain relievers in 2011 (SAMHSA, 2013a). Opioid-related treatment admissions grew at an even faster rate, increasing nearly six-fold between 1999 and 2009 (Centers for Disease Control and Prevention, 2011b). Even today, despite modest declines in the total amount of opioids prescribed (Guy et al., 2017), more than 33 000 lives are lost annually to opioids (Rudd et al., 2016a). The decline in prescription opioid deaths between 2010 and 2012 would be more reassuring if heroin overdose deaths had not more than doubled during the same period (Rudd et al., 2016b), suggesting that some individuals may have shifted from prescription opioids to heroin. The magnitude of the 'opioid problem' (heroin and prescription opioids together) remains substantial, with opioid-related mortality now representing the leading cause of injury deaths in the United States, exceeding deaths from suicide, gunshot wounds and motor vehicle accidents (Kochanek et al., 2016).

The Obama Administration, acting through the Office of National Drug Control Policy (ONDCP) and the US Department of Health and Human Services (DHHS), viewed increasing access to treatment as one of the key strategies to address the prescription opioid epidemic in the United States. This included expanding private and public health insurance coverage for addiction services through a variety of policy levers. Historically, substance abuse treatment services were commonly separated both physically and financially from other healthcare services in the United States. Addiction treatment services were generally delivered in separate speciality facilities, with regulations frequently limiting the amount of information that could be shared with non-addiction (i.e. regular healthcare) providers. Many private health insurance carriers have traditionally provided little or no coverage for addiction treatment services, despite evidence that effective treatment reduces subsequent healthcare utilisation and patient costs (SAMHSA, 2009; Wickizer et al., 2012). This led to a situation in which for decades the largest payer for addiction services was the US government, through its block grants and then through health insurance coverage for the poor (Medicaid) and military veterans (the Veterans Health Administration) (Bohnert et al., 2014; Mark et al., 2011).

The 2008 Mental Health Parity and Addiction Equity Act and the Patient Protection and Affordable Care Act of 2010 changed the landscape for addiction treatment services by mandating that substance use disorder treatment be covered by insurance at a level similar to comparable medical treatments if it was offered and requiring that plans offered to private individuals on health exchanges include it as an essential covered benefit. A growing understanding and acceptance of opioid addiction as a treatable medical disorder by both the medical community and the American public made these insurance

expansions legislatively possible (McLellan et al., 2000; Humphreys and McLellan, 2011). The lack of accepted clinical guidelines for treatment pertaining to opioid addiction therapies among the broader medical community make it uncertain exactly what expanding coverage will mean in terms of treatments that are covered by insurers.

While both behavioural therapies and pharmacological treatments have been available in the United States, methadone was by far the primary replacement therapy for opioid use disorders until the mid- to late 2000s. Methadone, another form of pharmacotherapy, can be dispensed only through certified Opioid Treatment Programmes (OTPs), which in the majority of instances are based in stand-alone treatment centres separate from the healthcare system. Treatment protocols require that a client take the medication at an OTP clinic daily under supervision; take-home dosages from OTPs are available to patients only after they have been in a maintenance treatment programme for an extended period of time (SAMHSA, 2013a) ([1]). Given the separation of these programmes from medical services, the lack of geographic access in many regions (Dick et al., 2015), and the lack of prior coverage of these benefits among many insurers (Volkow et al., 2014; Burns et al., 2016), the majority of individuals with opioid use disorders do not receive this therapy, despite its demonstrated effectiveness and cost-effectiveness.

The 2002 FDA approval of buprenorphine for the treatment of opioid use disorders was an event welcomed by addiction providers because of the increase in access to treatment that was expected with this new drug therapy (Ducharme and Abraham, 2008; O'Brien, 2008). Unlike methadone, buprenorphine can be dispensed by both an OTP and a physician (either in their office or through a regular retail pharmacy with a prescription) if the physician has received a waiver from the Drug Enforcement Agency ([2]). Naltrexone is the only other current medication that can be prescribed by any US medical provider in the United States today. And, although it can be prescribed by any medical provider, even those without a waiver, it is primarily recommended for patients who have already undergone detoxification and have a relatively short or less severe history of addiction or who are also being treated for a co-occurring alcohol use disorder (SAMHSA, 2015a). In the light of these recommendations, few commercial insurance providers provide benefit coverage for those who wish to use this form of pharmacotherapy (Volkow et al., 2014).

While all of these medication-assisted therapies have been shown to be both cost-effective and safe, they remain underutilised in the United States (Chalk et al., 2013). Even today, fewer than 30 % of individuals with opioid use disorders have received opioid agonist therapy (Oliva et al., 2013; Gordon et al., 2015). Given the more recent availability of medication-assisted therapy (MAT) in traditional medical settings (i.e. physicians' offices), more attention is being paid to other barriers to access, including the cost of these treatments (Barry and Sindelar, 2007). Many of these medications and therapies have not been covered by public or private insurance carriers until fairly recently (Chalk et al., 2013; Stein et al., 2015). Even when the medications are covered by insurance, some public and private insurers often limit the coverage to a particular phase of treatment (e.g. detox, not maintenance). Because MATs are not consistently covered for all phases of treatment and because discounted prices through insurance companies apply only during the benefit-covered period, the financial cost of prolonged OST can become a real burden to the individual who must cover the cost when treatment exceeds the specified benefit period.

In this chapter we discuss the variation in the cost of treatment for opioid addiction in outpatient settings in the United States. To do this we must first provide a brief description of the US healthcare financing system, as the complex environment of private and public payers means that patients with different health insurance plans often face different prices for the same drug treatment, even within the same treatment setting. With this information as background, we then review the US literature identifying studies that have attempted to estimate the cost per daily dose of the three pharmacotherapies approved by the FDA for use in the regular settings in which they are administered. From the identification of our small set of studies we demonstrate the difficulty in trying to describe the cost of OST, because different definitions of 'treatment episodes' are used in addition to different standardised doses. We then show, through our own original analysis of multi-payer pharmacy data, how, even if we focus on a particular pharmacotherapy that is becoming more widely used in the United States (buprenorphine), a particular stage of treatment (maintenance), and a particular setting (outpatient), there are still big differences in the average cost per dose of this drug because of the different costs negotiated by different US health insurance payers.

([1]) While federal regulations passed in 1999 endorsed office-based methadone therapy, they required that physicians interested in doing so have addiction medicine training, be affiliated with a methadone clinic or be monitored by the medical director of a methadone clinic (CFR, 1999). Hence, delivery has remained largely in OTP settings.

([2]) To get a buprenorphine waiver, a physician must (1) be board certified in addiction medicine, (2) be board certified in addiction psychiatry or (3) have completed 8 hours of specialised training on addiction. Under the Drug Addiction Treatment Act of 2000 (DATA 2000), DEA-waivered physicians can prescribe buprenorphine in various settings, including community hospitals, health departments and even correctional facilities, which makes buprenorphine far more accessible in areas where physicians have waivers.

Background on the US health insurance system and its role in determining access to pharmacotherapies

In the United States, healthcare is financed through a mixed payer system. Potential payers for services include individuals (uninsured), private companies (e.g. employers and/or commercial health plans) and public entities (federal government, state government and other local government agencies). According to recent statistics reported by the Kaiser Family Foundation, the majority of Americans (56 %) in 2015 were covered by private insurance, mostly obtained through (and brokered by) employers (Henry J. Kaiser Family Foundation, 2015). Another 20 % in 2015 were covered by Medicaid, a shared federal-state public insurance programme covering individuals on low incomes and with disabilities. Medicare, the federal public health insurance system for the elderly and people with disabilities, provides insurance coverage to another 14 %, while other public insurance, including the Federal Children Health Insurance Plan (CHIP), TRICARE (which provides care for those active in the military and their families) and the Department of Veterans Affairs, which provides care for retired military personnel, provides insurance for another 2 % of the population. In 2015, approximately 9 % of the total population was without any healthcare insurance (Henry J. Kaiser Family Foundation, 2015).

Although the majority of the American population is covered by private insurance, it pays for less than 13 % of all national substance use disorder treatment expenditures (SAMHSA, 2016). State block grants and other local spending have covered the largest share of funding (69 %) historically (SAMHSA, 2016), although such funding is likely to diminish in importance in the era of healthcare reforms. State Medicaid, however, which had grown by 2014 to cover about 25 % of total national spending, is expected to rise substantially due to the expansion in eligibility for Medicaid that occurred under the Affordable Care Act (Buck, 2011; Mark et al., 2011). Therefore, state agencies remain an important payer of substance abuse services.

In the United States, it is health insurance carriers that commonly negotiate prices with pharmaceutical companies as part of the process of negotiating the inclusion of specific pharmaceuticals in the health insurance plan's drug formularies, using the size of their enrollee population as a negotiating tool in their bargaining. While insurance companies cannot withhold any particular medicine recommended by a provider from the patient, they do determine whether the insurance company covers some, half, most or all of the cost of a given medication by placing specific drugs in different 'tiers' in their drug formulary. Therefore, a drug that is being covered entirely by the health insurance company (e.g. vaccines such as flu vaccines), would be placed in the lowest tier (implying lowest cost to the patient). Generic versions of widely used branded prescriptions are also often available at much lower cost to the patient than the branded drug and generally placed in a low tier. Expensive drugs, particularly those still under patent, are often placed in higher tiers, requiring the patient to share more of the cost. Some medications, particularly new drugs that apply to only small patient groups, often do not get included on the insurance plan's drug formulary, in which case the patient is left to cover the full cost of the drug at the price listed by the pharmaceutical company.

The US government negotiates pharmaceutical prices only for patients covered by federal health insurance plans (i.e. Medicare, TRICARE, Veterans Affairs and the Federal Employees Health Benefit group). Separate state agencies negotiate prices for the patients they cover under state insurance plans, including Medicaid and state employee health programmes. Private insurance plans or large employers who self-insure negotiate directly with pharmaceutical companies to obtain prices for the prescription drugs that are most frequently used by their insured populations.

Given the substantial reforms that are taking place in the US healthcare system because of the Mental Health Parity and Addiction Equity Act and the Patient Protection and Affordable Care Act, access to MATs is expected to change dramatically in the United States, with public (Medicaid) and private insurance playing an even larger role in terms of its paying for MAT (Barry and Huskamp, 2011; Buck, 2011). This is due, for instance, to federal subsidies encouraging the expansion of eligibility criteria for the state Medicaid population, rules increasing the age at which parents can cover their adult children on their own health insurance (now includes adult dependent children up to age 25), and the required integration of medical and behavioural health services. Hence, regulations that state Medicaid agencies have passed related to access to MAT and the shared cost of the drugs are going to be important factors, and they are far from homogeneous (Burns et al., 2016). By 2013, most state Medicaid programmes covered methadone and/or buprenorphine (although some states still do not cover both for all Medicaid-enrollees more than a decade after buprenorphine's approval), and most listed buprenorphine on their preferred drug lists. However, other Medicaid regulations — related to prior authorisation, co-payments and counselling requirements — differ considerably across states and could potentially limit physicians' and clients' use of both these MATs (Mark et al., 2011; Stein et al., 2015; Burns et al., 2016).

Government estimates of the cost of opioid substitution therapies

In 2004, the Substance Abuse and Mental Health Services Administration's (SAMHSA's) Center for Substance Abuse Treatment developed a range of cost estimates considered 'reasonable' for the delivery of substance abuse treatment delivered in different treatment modalities to inform policymakers' funding decisions (SAMHSA, 2004b). However, these ranges were generated when buprenorphine and naltrexone were not widely available to clients and the range of cost estimates was so wide that little could be inferred from them, as French and colleagues (2008) pointed out in their update to SAMHSA's work. However, even French and colleagues' update does not provide a breakdown of the costs by type of pharmacotherapy treatment, nor does it clearly distinguish between treatments that are administered through a programme with supporting behavioural therapies and those that are delivered just as pharmacotherapies on an outpatient basis. While pharmacotherapies during induction and stabilisation are frequently provided as inpatient services in hospitals, OTPs or other residential locations, maintenance medications, particularly buprenorphine and naltrexone, may be administered as outpatient therapies, meaning that a doctor can simply prescribe the drug for clients to take at home as needed with no additional services. Thus, the cost per modality is not a good indication of the total cost per treatment, as a course of treatment commonly involves detoxification, induction and maintenance and different settings. Current estimates of the cost of treatment for substance abuse are not adequate to properly assess the cost of MAT or even the marginal cost of adding pharmacotherapy to an existing treatment regimen.

Nonetheless, SAMHSA does produce very reliable estimates of the total national spending on treatment of substance abuse disorders. SAMHSA's latest estimate on spending for all substance abuse treatment prescription drugs (including medications for the treatment of alcohol use disorders) was USD 887 million in 2009, or approximately 0.006 % of US GDP in 2009 dollars (SAMHSA, 2013b). Of this amount, almost USD 754 million, or 85 % of total expenditure on prescription drugs for treatment of substance abuse, was spent on combination buprenorphine/naloxone, and USD 62 million, or 7 %, on buprenorphine alone ([3]). Estimates for spending on methadone for drug addiction are captured as part of spending for specialty substance abuse centres where methadone is dispensed, rather than with substance abuse prescription drug spending, so it is not possible to identify how much the government spends on methadone vis-à-vis buprenorphine formulations for opioid addiction. So, while total expenditure in substance abuse specialty centres in 2009 was substantially greater than spending on prescription drugs, USD 8 397 million, SAMHSA's data do not permit disaggregation of methadone drug spending from other spending that occurs in these settings.

Despite all types of public and private payers being included in SAMHSA's report, such as Medicaid, Medicare, private insurance, out-of-pocket-spending, and state and local spending, it is not possible to construct an average costs per dose by payer in these data. However, we found that costs per dose estimates are available for some, though not all, types of payers in the United States. For example, per a 2007 study of the Veterans Health Administration (VHA), the average daily cost of methadone (60 to 80 mg/day) in the VHA was USD 0.36 to USD 0.48 (Goodman et al., 2007). Methadone, however, must be administered in an OTP, which is not necessarily available in all locations where buprenorphine is offered. Therefore, once buprenorphine started being offered in 2003, the VHA started providing typical daily doses (12 to 16 mg) — based on established national non-formulary guidelines for buprenorphine use in office-based practices — at a cost between USD 9.48 and USD 10.10 within the VHA system (Goodman et al., 2007). Consistent with this estimate, one study from 2006, when the VHA approved buprenorphine for formulary status and published criteria for its use, found that a day's supply of buprenorphine, defined as a mean daily dose of 14 mg, would cost USD 9.82 (Barnett, 2009).

Literature review of the cost of medication-assisted opioid addiction treatments in healthcare settings in the United States

Given the regulatory complexities regarding the distribution of different pharmacotherapies (i.e. where they can be distributed), and the variation in the willingness of payers to cover such medications, we were interested in seeing the extent to which the literature provides information on the average cost of treatment for each of the FDA-approved therapies in certain healthcare settings. There have been other reviews of the cost-effectiveness and/or cost-benefit of these pharmacotherapies, with a recent review by Chalk et al. (2013) concluding that methadone was the least expensive (USD 30-50 per month of treatment). Oral

([3]) Prescription costs reflect only the cost of the medication, not any overhead or indirect services associated with dispensing the drug given that they can be dispensed in a retail pharmacy.

naltrexone was also fairly inexpensive (about USD 60 per monthly dose). Buprenorphine/naloxone combinations were a bit more expensive at USD 140-160 per month of treatment. Injectable extended-release naltrexone, which had only recently become available at that time, was the most expensive (at about USD 700 per month of treatment). A limitation of this review, however, is that it included studies conducted all over the world, and hence the estimate of the average cost of treatment incorporated availability and cost in different healthcare systems, with different levels of cost sharing transferred to the patient. It does not necessarily reflect the cost of this treatment in the United States, which is what we hope to provide here.

We used the following specific criteria for our systematic review. To be included, studies had to be published in English and consider care delivered within the US healthcare system; the population had to be 18 years or older; the study had to be conducted in or after 2002 (when buprenorphine received FDA approval, as that also had an impact on the delivery of methadone); studies had to include estimations of average dose, estimate cost per dose or cost of treatment and specify the stage of treatment (induction, stabilisation or maintenance); and studies had to be a randomised controlled trial (RCT) or observational or simulation study on cost or cost-effectiveness. Studies could include any type of insurance or payer, provided the care was received in the US healthcare system. The studies could be about MATs that included buprenorphine in any of the following trade names in any formulation used to treat opioid use disorder: Suboxone, Buprenex, Butrans, Subsolve, Bunavail, and generic buprenorphine or buprenorphine HCl. Finally, the search terms used for this systematic analysis were 'medication assisted opioid treatment', 'medication assisted opioid therapy', 'medication assisted opioid detox', 'opioid treatment' and 'opioid therapy'.

Our inclusion criteria yielded a selection of 38 studies, the vast majority of which were studies presenting findings from an RCT. A more careful assessment of these 38 studies revealed that many did not in fact explicitly include acquisition costs for the pharmacotherapies employed. We also excluded studies that used price data prior to 2002 (before buprenorphine was available on the market) or used price data from outside the United States. Studies that did not provide costs per dose or treatment or that did not state the phase of treatment — induction or maintenance — were also excluded from the final sample. Imposing these criteria reduced our discussion to only five papers that presented findings relying on observational or administrative data. While several relevant cost-effectiveness studies that assessed the cost-effectiveness between MAT and MAT plus behavioural therapy might appear to be excluded (e.g. Sindelar et al., 2007), the problem with these studies is that they did not report the price of the pharmacotherapy, as it was being held constant between the treatment and control conditions. However, it is the price of the pharmacotherapy that we are focused on in this study.

This exercise demonstrated to us that, in the past 13 years, very few rigorous real-world analyses of the cost of buprenorphine, methadone or naloxone have been carried out, as indicated by the relatively small number of included studies. Policymakers looking at these data would have a difficult time understanding exactly what the cost of a daily (or monthly) dose of any of these pharmacotherapies would be for a typical US patient. Table A12.1 in Annex B provides a snapshot of the key features of each of the five included studies. A quick glance at the results in the table reveals that the dosages of methadone, buprenorphine and naltrexone administered vary quite a bit across studies and for individuals over time, and they depend on each individual's stage of treatment. Importantly, the perspective of cost also changes from study to study, sometimes reflecting the cost to a state agency, sometimes the client and sometimes the commercial payer. The studies we identified had more or less arbitrary lengths of study period for assessing the maintenance stage of treatment. As a consequence, each study would generate a different cost of treatment, because dosages can and do change over the maintenance period.

An important takeaway from this systematic review is that, while any given study might be able to provide an estimate of the cost of pharmacotherapy, it is important to pay attention to the phase of therapy for which the drug is being used (which is directly tied to the amount being prescribed), the setting of that therapy (inpatient, OTP or other outpatient) and the differential prices negotiated by payers. To date, most presume that the biggest source of variation in cost is associated with the setting in which therapy is given. However, the duration of therapies covered by insurance in each of these settings varies considerably across payers, which suggests that it is important to pay attention to the cost per phase of treatment in a manner that considers the client's costs as well as the agency's cost. The cost (and presumably cost-effectiveness) of what appears to be the same pharmacotherapy might differ significantly if focused on 'treatment', which may include behavioural therapies in addition to pharmacotherapies for some payers or programmes but only pharmacotherapies for others. All of these factors make it very difficult to construct an overall estimate of the cost of opioid abuse disorder treatment for the US healthcare system.

Original analysis of cost of a standardised dose of buprenorphine by payer in 2012

In the light of the findings from the published literature, and because of our desire to understand the extent to which costs per standardised dose of a pharmacotherapy can differ across payers being treated in the same phase of treatment (e.g. maintenance), we decided to conduct some original analysis of the cost of pharmacotherapy received on an outpatient basis. Given the complexities of settings and the like, and the fact that there are no publicly available data sources containing information on the cost of drugs distributed through OTPs, we focus only on the drug buprenorphine and its distribution through retail pharmacies. This focus provides a clearer cost of just the drug itself rather than the additional cost of wrap-around services that may be administered during detox (done on an inpatient basis) or with behavioural therapies (if delivered in an OTP). By looking at buprenorphine alone, and standardised doses given during a maintenance phase, we can reduce the noise and complexity caused by considering other therapies, and focus only on the variation created by different payers negotiating prices for the drug.

Information on buprenorphine obtained through a retail pharmacy comes from the Symphony Health Solutions' Integrated Dataverse and relates to a standardised dose (16 mg). The Symphony Health Solutions' Integrated Dataverse includes transactions from approximately 55 000 pharmacies, accounting for over 90 % of US prescription volume. This commercial database obtains and consolidates paid pharmacy transactions, physicians' claims and hospital claims from all payers to create a multi-payer claims database. As we rely in our analysis on information reported solely in retail pharmacies' claims, the cost we are examining represents only the cost of the medication, not the cost of dispensing it, which is absorbed by the retail pharmacy in the United States. We examine prices for the year 2012. We chose 2012 because this was the most recent calendar year before significant expansions in public health insurance took place under the Affordable Care Act (US Department of Health and Human Services, undated).

Our original dataset included 185 835 410 prescriptions administered throughout the year (2012). Of these, approximately 0.13 % (245 678 prescriptions) were for buprenorphine HCl (8 mg buprenorphine sublingual tablets) and Suboxone (oral strips, 8 mg buprenorphine/2 mg naloxone and 4 mg buprenorphine/1 mg naloxone dosages). We collapsed the data by uniquely identified client so that we could identify what the average cost of treatment was per client. For about 9.7 % of these clients, information on the cost of the prescriptions received was missing and could not be explained by rejected claims. Therefore, we dropped these observations. The final dataset contained 41 093 clients for whom we could construct an average cost of buprenorphine per day and month by plan type and buprenorphine formulation during the year.

Table 12.1 presents frequency and percentage of clients by type of payer and for the different forms of buprenorphine products available in the United States. Half (49.87 %) of our sample were individuals who paid for buprenorphine with commercial health insurance, while about one quarter of payers (25.67 %) obtained their medications by paying for them entirely with cash (out-of-pocket expenses). Public programmes, such as Medicare and Medicaid, represent almost 14 % of our sample. The remaining 11 % of clients purchased buprenorphine through savings clubs or assistance programmes (referred to here as 'mixed', as the payer can be mixed in these).

There are two plausible explanations for the relatively large proportion of commercially insured patients in our sample (vis-à-vis public insurance). First, as stated previously, the Symphony Health data contain only information on prescriptions picked up from retail pharmacies. To the extent that Medicaid- and other publicly insured clients pick up their buprenorphine from community health centres and/or prisons, these prescriptions would not be captured in the data (and hence would not be reflected in the primary payer). Second, by 2012 key elements of the Federal Mental Health Parity Addiction Equity Act and the Affordable Care Act had already come into effect, presumably extending substance abuse treatment coverage to more individuals (Nosyk et al., 2013).

TABLE 12.1

Clients by type of payer in the United States in the year 2012

Type of payer	Buprenorphine HCl (sublingual) 8 mg	Suboxone (oral strip) 4 mg/1 mg	Suboxone (oral strip) 8 mg/2 mg	Total (%)
Cash — no insurance	9 913	0	637	10 550 (25.67)
Private insurer	17 361	4	3 130	20 495 (49.87)
Public entity	4 863	1	777	5 641 (13.73)
Mixed	3 414	0	993	4 407 (10.72)
Total	35 551	5	5 537	41 093 (100)

Source: Symphony Health Solutions' Integrated Dataverse

Table 12.1 also provides a frequency count of the types of buprenorphine products and formulations that were obtained from retail pharmacies by type of plan. Buprenorphine HCl (the generic formulation) is by far the most common form of buprenorphine distributed by pharmacies (over 86.5 % of all prescriptions), with Suboxone (8 mg/2 mg) formulations coming in second (13.5 %). The rest of our analysis will, therefore, focus on these two products.

As different insurance companies have different rules regarding length of treatment covered and clients used varying quantities of buprenorphine by type of product, we created a 'standard daily dose' for maintenance in order to calculate cost to individual patients and types of insurance. We set this daily dose at 16 mg to be consistent with FDA guidelines (US Food and Drug Administration, 2014) and because it was within the usual range of dosage for patients on maintenance treatment (SAMHSA, 2004).

Next, we constructed an average total cost per standard dose of buprenorphine. This was the sum of average cost to clients (shared payments they made or full amounts, depending on whether or not they had any insurance) and plans per client identifier ([4]). Table 12.2 shows the overall costs to clients and plans and total cost of a standard dose of buprenorphine in the United States in 2012. When average costs are considered for all forms together, it would appear that the patient and plan equally share the average cost per daily dose. However, the story changes when the sample is broken down into its generic formulations versus one of its branded formulations (Suboxone oral strip 8 mg/2 mg). In the case of generic buprenorphine, clients pay a larger share of the total cost per daily dose than health plans and the total cost per daily dose is less than USD 10. In the case of branded buprenorphine (Suboxone oral strip 8 mg/2 mg), it is the plans that pay about two thirds of the cost per daily dose, and the total average daily cost overall is close to twice that of the generic formulation.

While the difference in total average cost per daily dose between generic formulation and Suboxone is not unexpected, the extent to which there is variation in the average plan cost per daily dose is surprising, particularly in the case of generic buprenorphine, where competition should drive the price down to the cost of production, and hence payers should face relatively stable and similar costs. However, Table 12.2 shows that both the standard deviation and interquartile range for a standard dose of generic buprenorphine paid for by the insurer ('plan') vary substantially, exceeding the mean. Interesting, the standard deviation of the plan cost per daily dose of Suboxone is similar in magnitude, although the interquartile range (75th percentile value to 25th percentile value) is much larger. Because pharmaceutical drugs are not bought and purchased in normal markets — prices are negotiated on the clients' behalf by insurance companies in private — variation remains.

TABLE 12.2

Average costs of a standard daily dose of buprenorphine, United States, 2012

	Standard dose of buprenorphine (16 mg)	Mean (USD)	Standard deviation (USD)	Minimum (USD)	Maximum (USD)	Interquartile range
All formulations	Patient cost per daily dose	5.4	5.0	0.0	44.6	9.3
(*n* = 41 093)	Plan cost per daily dose	5.6	5.5	0.0	46.4	9.7
	Total cost per daily dose	11.0	6.5	0.0	60.2	9.5
Generic buprenorphine HCl	Patient cost per daily dose	5.3	4.6	0.0	44.6	9.2
(*n* = 35 551)	Plan cost per daily dose	4.5	4.8	0.0	46.4	7.3
	Total cost per daily dose	9.8	5.6	0.0	48.0	9.1
Suboxone oral strip 8 mg/2 mg	Patient cost per daily dose	6.2	7.2	0.0	27.0	13.3
(*n* = 5 537)	Plan cost per daily dose	12.5	4.8	0.0	28.7	1.2
	Total cost per daily dose	18.7	6.6	0.0	54.0	6.9

([4]) Our sample included observations in which there were negative payments for payers. These could have been reimbursed by pharmacies or paid by the patient. Because we wanted not to show negative costs but still reflect the dynamics of payments in the data, we decided to offset these negatives costs through the client payments, thus lowering the client payment and total cost for these observations. Therefore, no information was lost and the visual representation makes more sense.

In Table 12.3 we take a closer look at the average cost per dose for generic buprenorphine by type of payer (private insurance, public insurance and so on) to make this point even clearer. Because small differences in daily dose prices can translate into large differences in monthly drug costs, we show the average cost per monthly dose of buprenorphine, rather than the cost per daily dose, which was shown in Table 12.2. To generate these monthly costs, we multiplied the daily cost by 30.

Several important insights can be gained from the simple descriptive statistics in Table 12.3. First, private insurers have a higher average total cost per monthly dose of generic buprenorphine than either public insurers (Medicaid/Medicare) or individuals who pay their drug costs without insurance. However, most of those costs are passed on to the patient, because the average plan cost per monthly dose is significantly lower on average for the private insurers than for the public insurers. Second, substantial variation remains, as indicated by the standard deviation, even within plan type for the same generic medication. Interestingly, however, the standard deviation is similar between public and private insurers from the plan perspective (what the insurer pays). That is not the case in terms of the variation in the client's share of these costs for people with these types of insurance. The variability in average cost to the client among the privately insured is even greater than that for the plan. Finally, mixed programmes appear to have the highest average total costs, with clients paying the biggest share of these higher costs. However, the variability in client costs is substantially lower for clients in these mixed programmes than if they were paying out of pocket, which suggests that there is indeed some negotiating power associated with receiving the medication through this source instead of paying cash.

Figure 12.1 illustrates the findings from Table 12.3 in graphic form in terms of client components and plan components by primary type of payer (public or private insurance, no insurance and other mixed options), but adds to the graph similar information on the average monthly cost of Suboxone. Here it is easy to see that, regardless of the type of plan or insurance, generic buprenorphine is less expensive than Suboxone in terms of plan costs across the board. The cost to the plan is higher but less variable for Suboxone than for the generic formulations, as is indicated by the smaller interquartile range shown in the box and whisker plots. That stands in contrast to the costs paid by the client in each plan, which have greater variability in the case of Suboxone even when median average costs (indicated by the line inside the rectangular boxes) are lower. The higher variability in the client's share of the costs may reflect different total prices of the drugs (so a function of just passing through the higher costs), or the variability may be generated by different private insurance companies placing the branded pharmaceutical in different tiers (requiring different levels of client cost sharing). From this graph alone we cannot tell.

Figure 12.2 combines the total health plan and patient costs by insurance type for each drug and plots the total monthly costs for a standard dose of buprenorphine. Coloured asterisks indicate statistically significant differences in mean values in the monthly cost paid between formulations of buprenorphine for the same plan type. Thus, we can see statistically significant differences between the costs for

TABLE 12.3

Average monthly costs of a standard dose of generic buprenorphine by type of payer in the United States in 2012

Type of payer	Variable	Mean (USD)	Standard deviation (USD)	Minimum (USD)	Maximum (USD)	Interquartile range
Private insurer (*n* = 17 361)	Average client cost per monthly dose	129.6	121.6	0.0	1 339.5	202.8
	Average plan cost per monthly dose	175.0	140.3	0.0	1 130.7	226.6
	Average total cost per monthly dose	**304.6**	**179.5**	**0.0**	**1 438.8**	**305.4**
Public entity (*n* = 4 863)	Average patient cost per monthly dose	30.0	75.1	0.0	1 110.7	9.3
	Average plan cost per monthly dose	231.6	143.8	0.0	1 393.2	155.8
	Average total cost per monthly dose	**261.7**	**141.9**	**0.0**	**1 429.2**	**184.1**
Cash — out of pocket (OOP) (*n* = 9 913)	Average patient cost per monthly dose	233.4	135.3	0.0	959.4	138.2
	Average plan cost per monthly dose	0.0	0.0	0.0	0.0	0.0
	Average total cost per monthly dose	**233.4**	**135.3**	**0.0**	**959.4**	**138.2**
Mixed (*n* = 3 414)	Average patient cost per monthly dose	263.1	80.0	0.0	1 021.3	64.6
	Average plan cost per monthly dose	184.8	98.4	0.0	1 058.6	68.4
	Average total cost per monthly dose	**447.9**	**89.3**	**33.2**	**1 266.5**	**0.0**

Note: Average plan and total costs were capped at zero. Some observations had negative values.

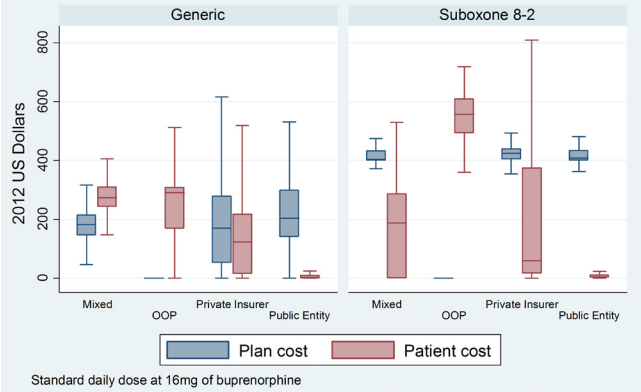
Suboxone and generic buprenorphine for all of the payer types. That is, total monthly costs for a dose of generic buprenorphine are consistently lower than the total costs for Suboxone for public entity payers, as well as for private insurers, out-of-pocket payers and mixed programmes.

What is particularly interesting about Figure 12.2 is that it is possible to see the extent to which total costs per monthly dose (which combines plan and client costs) varies by type of payer in comparison with the variation in pass through to plan or client. While we saw in Figure 12.1 that mixed payers had variability in the plan and client costs for generic buprenorphine separately, we see in Figure 12.2 that there is no variability in the total cost for generic buprenorphine within the mixed insurer category. There is only one value for the total cost per monthly dose (a set price), and what varies is just how that one cost is distributed between the client and the payer that is subsidising those costs (possibly associated with different cost sharing associated with different coupon or group deals). That is fairly different from total monthly prices faced by clients who pay entirely out of pocket (i.e. without insurance or with other coupons or subsidies). Clients who pay out of pocket entirely for the average monthly dose still see variability in the price paid whether paying for generic buprenorphine or Suboxone. The variation in price is less than that observed when the drug is being paid for primarily through private insurance. Negotiated prices by private insurers clearly vary quite a bit both in the total cost (shown in Figure 12.2) and in the distribution of who pays those costs (as shown in Figure 12.1). And, similarly, we see quite a bit of variation in the average monthly cost of generic buprenorphine paid for by clients with publicly provided insurance. While the average total monthly cost of Suboxone is still higher than that of generic buprenorphine for those purchasing it with public insurance, the variation in monthly cost per dose for the branded version is quite a bit less than that for the generic among the publicly insured.

The main point illustrated by these figures is that, despite there being a single cost for a pharmaceutical firm to produce these pharmaceuticals, the prices paid for them vary quite a bit depending on who is negotiating the price, and then the share of that cost that is borne by the insurer versus the client is also highly variable in most instances (with the exception of public insurance). Some of the variability between plan and client within the private insurer category may be due to differential placement of these drugs in their drug formularies (with different tiers requiring different levels of co-payment), or the generic version being excluded entirely from the drug formulary (causing the client to pay the full price). We cannot say from these data alone which factors are driving the bulk variation; we can only speculate on potential factors that may be causing some of the variation.

FIGURE 12.1

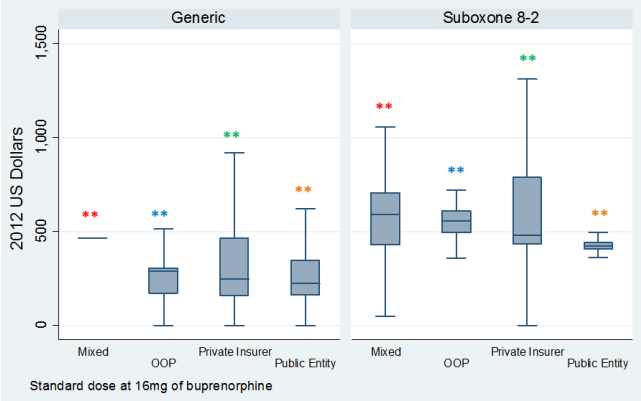
Monthly costs using a standard daily dose of generic buprenorphine and Suboxone by type of payer in the United States in 2012



Note: OOP, out-of-pocket expense

FIGURE 12.2

Total monthly costs for a standard daily dose of generic buprenorphine and Suboxone by type of payer in the United States in 2012



*P-value < 0.05
**P-value < 0.01

Discussion and conclusions

Despite modest declines in prescription opioid overdose deaths since 2010, more than 33 000 lives are lost annually to opioids (Rudd et al., 2016b). Thus the prescription drug problem remains significant in the United States. Increasing access to effective treatment is a major strategy proposed for dealing with the opioid epidemic in the United States, but the US treatment system is not well situated to deal with this problem because the primary payers — not private insurers — are not well informed about the real cost of treatment. Efforts to calculate the average cost of treatment for substance abuse (of any type) within this system are influenced by a variety of cost drivers that include (1) where substance use is delivered (inpatient, outpatient or partial outpatient settings), (2) the type of

facility in which it is delivered (inpatient hospital settings are different from inpatient OTPs) and (3) the additional services that frequently get delivered with the therapy. This chapter highlights yet another important source of variation in the cost of treatment, particularly relevant for pharmacotherapies, and that is the variation in negotiated input prices. While some attention has been given to the first three sources of variation listed, far less attention has been paid to differences in negotiated input prices for the exact same therapy, which by definition influences average cost.

Even when we focus on just the pharmaceutical cost of providing OST, we find that a variety of factors can influence the negotiated price paid, including the particular type of drug offered, the dose required (which varies depending on the stage of treatment) and the payer. We demonstrate in the last section of this chapter that, even when comparing standardised dosages and comparing the same stage of treatment, the expected payer matters when considering the average cost of the treatment. Looking at the data collected, we can see clearly that individuals with different types of insurance are paying different amounts for their daily and monthly doses of buprenorphine. While there are some general trends (branded pharmaceuticals are more expensive than generic ones), considerable variability remains in the prices paid within these categories, some of which are completely absorbed by the plans (in the case of public insurance) and some of which are more likely to be absorbed by the patient (in the case of private insurance).

The study has several limitations that need to be considered when drawing conclusions from it. First, we have focused here only on the cost of the pharmacotherapy portion of treatment, not any additional services that may make pharmacotherapy more or less effective. Second, we have been able to examine variation in the cost of only one pharmacotherapy (buprenorphine) that is prescribed and administered through retail pharmacies. This study cannot say anything about the variation in the cost of buprenorphine or other pharmacotherapies offered in other healthcare settings (community health clinics, hospitals, OTPs). Third, we have looked only at the cost of a standardised dose of a drug offered in the maintenance stage, which may not be the most important or expensive aspect of a full treatment episode (particularly if detoxification or induction into treatment is largely done in inpatient settings). Fourth, we could only provide information on the cost of this pharmaceutical only for clients who continued taking the drug. If clients were less likely to stay on a particular formulation because the costs were prohibitive, then our sample may be biased by people who had lower average costs in the first place (and hence were willing to stay on it for longer periods of time).

Even with these limitations, this study provides some useful insights and cautions for policymakers interested in drawing comparisons regarding the relative cost or cost-effectiveness of pharmacotherapies received in the United States to those countries that operate healthcare at a national level. The unique healthcare environment in which these services are currently being delivered may heavily influence the relative cost of the care received, but so too might the payer of the services (for instance, when purchasing power by large entities, such as government or large private networks, can affect the final price of these medications and their cost-effectiveness). Thus, it will be important for researchers to think of ways to standardise information across countries in a meaningful way so that relevant direct comparisons of costs across countries can be made. To the extent that international comparisons of the cost of treatment are made including countries with a single public payer, it would be wise to use information on the cost of treatment paid by our public insurers (Medicaid/Medicare) rather than private insurers, as the cost paid for the exact same therapies in the United States clearly differs depending on the bargaining power of the payer.

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Annex B
US regulations and clinical guidelines regarding the delivery of opioid agonist therapy in the United States

Prior to 2002, methadone and levo-alpha-acetyl methadol (or LAAM) were the only federally approved and supported OSTs available in the United States and both had to be distributed in certified OTPs. Methadone was first introduced on a national scale in the early 1970s, whereas LAAM, manufactured by Roxane Laboratories, received FDA approval in July 1993 (Center for Substance Abuse Treatment, 1995) but was taken off the market in 2004, when Roxane Laboratories stopped producing LAAM because of an increased risk of cardiac complications (Center for Substance Abuse Treatment, 2005).

Methadone treatment dosage, like that of the other pharmacotherapies, is expected to vary based on the stage of treatment. Regulation 42 CFR § 8.12 (h)(3)(ii)) states that, in the case of methadone, initial doses should not exceed 30 mg and the total dose for the first day should not exceed 40 mg unless the client's opioid withdrawal symptoms do not dissipate (SAMHSA, 2015b). For clients in the maintenance stage stage, there is no agreement on optimal dosages for patients. However, a common conclusion from several studies is that patients receiving higher methadone doses report better outcomes than those on lower maintenance doses (Leavitt, 2003). Only oral forms of methadone are allowed to be dispensed for opioid addiction treatment; non-oral forms are strictly prohibited. Currently, only oral forms of methadone can be dispensed for opioid use disorders, where non-oral forms are strictly prohibited. In the past, only liquid formulations could be dispensed, but current SAMHSA regulations permit solid forms of the medication (SAMHSA, 2015b).

A major limitation of methadone (and LAAM) is that it can be administered only within an OTP. Thus patients who would not or could not routinely attend OTPs for geographical, ideological or practical considerations are not well served by it (Fiellin and O'Connor, 2002; Oliva et al., 2011). It was not until the Drug Addiction Treatment Act of 2000 that the FDA allowed Schedule III-V medications, such as buprenorphine, to be prescribed for opioid use disorder treatment in non-OTP settings. Buprenorphine was approved by the FDA as a drug for the treatment of opioid addiction in 2002 (Kleber, 2007), and was expected to have an immediate impact on the utilisation of MAT (Ducharme and Abraham, 2008; O'Brien, 2008). Under the Drug Addiction Treatment Act (Civic Impulse, 2017) waivered physicians were permitted to prescribe or dispense buprenorphine to no more than 30 patients for the treatment of opioid use disorder at any one time. The Office of National Drug Control Policy Reauthorization Act of 2006 modified restrictions to grant approval for treating up to 100 patients at a time to physicians who had been waivered for at least a year, who were currently treating patients with buprenorphine and who opted to apply for the higher patient limit (Office of National Drug Control Policy Reauthorization Act, 2006).

In the case of buprenorphine as treatment for opioid use disorder, the optimal dosage for individuals also varies based on the stage of treatment (induction — also known as detoxification — stabilisation or maintenance). When approved, the recommended initial (i.e. first day) dose for someone in the induction phase is between 2 and 8 mg, and the usual stabilisation dosage is 12-24 mg per day (US Food and Drug Administration, 2014). As clinical experience with buprenorphine has increased, there has been greater appreciation of the nuances of prescribing buprenorphine reflected in more recent guidelines (Farmer et al., 2015; Kampman and Jarvis, 2015), but there remains a consensus that the recommended daily dose for most individuals receiving maintenance treatment lies between 12 and 16 mg per day (US Food and Drug Administration, 2014), with little clinical support for doses above 32 mg.

Naltrexone, approved by the FDA in tablet form in 1984 for treatment of opioid dependence, was not frequently administered to patients in pill form because of patient compliance problems as well as noteworthy side effects, now prominently featured on medication labels (Tai et al., 2001; SAMHSA, 2009; Rinaldo and Rinaldo, 2013). That changed in October 2010 when the FDA approved Vivitrol, a long-lasting injectable slow-release formulation that lasts for approximately 30 days. Naltrexone implants, which also provide sustained doses to a patient over several months, are available in other countries, but have not yet been approved by the FDA for use in the United States.

Patients using naltrexone pills may receive an initial dose of 25 mg during the detoxification (or induction) stage and then transition to 50 mg pills (one each day) during maintenance phase. However, those patients at risk of adverse events (young people, women, those with a shorter period of abstinence) may need lower daily doses, from 12 to 25 mg, building up to 50 mg per day (SAMHSA, 2009). The recommended dose of Vivitrol, the extended-release injectable formulation of naltrexone, is 380 mg, to be delivered intramuscularly once a month.

Our systematic review of studies examining the average cost of various substitution therapy pharmaceuticals identified only five studies in which information on the average dose of the pharmacotherapy was available (in real-world settings where these drugs were being paid for entirely through the usual market system). These studies, and the key characteristics of each, which are described in detail in the main chapter, are shown in Table A12.1.

TABLE A12.1

Previous cost estimates of substitution therapy using buprenorphine, combined buprenorphine/naloxone and methadone in the United States

Study	Year	RCT, observational or simulation?	Purpose: maintenance or induction (detox)	Insurance (payers)	Average dose	Average cost per dose (in constant 2015 USD)
Jackson et al.	2015	Simulation using cost data from 11 state Medicaid programmes and single-state agencies	Maintenance (six months total)	State addiction treatment payers	Flexible doses for methadone, buprenorphine and extended-release naltrexone (simulation)	N/A. Only costs per day of treatment are available: 13.31 for methadone, 21.16 for buprenorphine and 48.36 for extended-release naltrexone
Schackman et al.	2012	Simulation using cost data from an observational study	Maintenance (excluding first six months of treatment)	N/A	8 mg buprenorphine/2 mg naloxone	8.33 for four tablets of 2 mg buprenorphine/0.5 mg naloxone and 0.93/mg for an 8 mg buprenorphine/2 mg naloxone tablet. Authors adjusted for discounts frequently available to large public and private insurers using the published local discount for all Medicaid drugs (14 % discount plus 3.15 dispensing fee per 30-day prescription). Original data in 2010 dollars (7.62 for four tablets of buprenorphine/naloxone and 0.85 per 8 mg tablet)
Polsky et al.	2010	RCT	Induction and maintenance (12 weeks total)	Six community out patient treatment programmes in New Mexico, North Carolina, Maryland, Maine and Pennsylvania	No average dose was provided	Adjusted average acquisition cost of buprenorphine/naloxone. No costs per dose were provided although substance abuse costs were 87.48 and 26.01 for buprenorphine administration during the induction and maintenance phases (74 and 22 in 2006 dollars from original data)
Jones et al.	2009	RCT	Maintenance after one year of stabilisation period (six months total)	Clinical trial (analysis assumed patients did not incur costs for medications)	17 mg per day of buprenorphine (range: 6-24 mg); 69 mg per day (range: 20-100 mg) for clinic-based (MC) methadone; and 70 mg per day (range:25-100 mg) for office-based (MO) methadone.	Buprenorphine: 10.02 per daily dose (original data in 2006 dollars: 8.48 using 0.53 per mg as base) Clinic methadone: 3.56 per daily dose (original data in 2006 dollars: 3.01 using 0.05 per mg as base) Office methadone: 3.39 per daily dose (original data in 2006 dollars: 2.87 using USD 0.05 per mg as base)
Kaur et al.	2008	Observational (using administrative data)	Initiation (fixed observations for six calendar months) and maintenance (fixed observations for 12 calendar months)	Commercial health maintenance organisation, point-of-service, preferred provider organisation, direct access, medical savings account, and traditional indemnity plans in a New Jersey managed care organisation	Between 4 and 24 mg of buprenorphine with a range from < 4 to 48 mg (authors calculated per individual prescription per day using the following formula: number of tablets divided by days' supply multiplied by the strength of buprenorphine naloxone filled	19.4 per patient per day during six-month initiation period and 3.44 per patient per day during 12-month follow-up (15.9 for six-month initiation and 2.82 for 12-month follow-up in original price data. Note: authors did not specify dollar years, assumed 2005 dollars

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CHAPTER 13

A cross-national comparison of public expenditures on drug treatment: context is key

Freya Vander Laenen and Delfine Lievens

Introduction

From the papers in this report it has become clear that public expenditure research is a complex matter. Four methodological elements contribute to this complexity: (1) the lack of good-quality data; (2) the complexity of the estimation methods as such; (3) the difficulty in disentangling data for different addictive substances and behaviours (illicit drugs (and different types of illicit drugs), alcohol, tobacco and gambling); and (4) the difficulties in developing a uniform methodology across different countries that allows country comparisons.

With regard to the last point, it is quite clear that when comparisons are made across countries it is important that the same measures are used (Ásgeirsdóttir and Ragnarsdóttir, 2013). A common conceptual and methodological framework is indispensable for a valid cross-national comparison (as advocated in 2000 by Collins and colleagues). A cross-national comparison of public expenditure is important, in particular for the countries in the EU. It allows countries to compare their specific, national results with expenditure in other countries.

Even if national and international data registration is improved and a uniform methodology is systematically applied to measure expenditure, the results of such an analysis must be used with caution in a cross-country comparison. In particular, caution is required when using the results of a free-standing public expenditure study for policy (decision-making) purposes. In fact, other factors should be taken into account to contextualise the results from public expenditure studies. Countries differ in terms of drug policy, in healthcare and treatment organisation and financing, in the provision of types of drug treatment and in the socioeconomic context (Mathers et al., 2010; Metz et al., 2014; OECD, 2014; Eurostat, 2016). The challenge is how to make meaningful comparisons across countries with different characteristics.

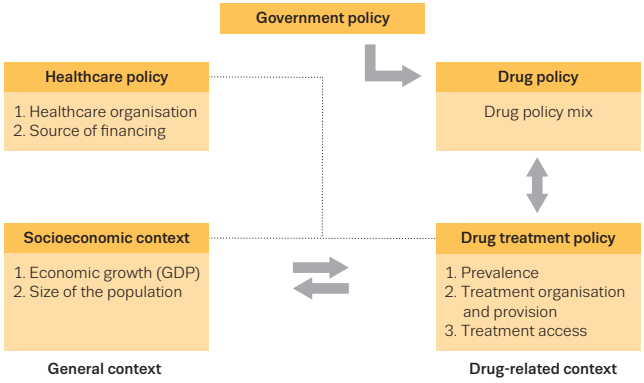
In order to take into account that cross-national comparisons are affected by the characteristics of national treatment policies and systems, we present a multidimensional model to improve the analysis of public expenditure studies.

A multidimensional model for improving the analysis of public expenditure studies

Figure 13.1 presents a multidimensional model for the interpretation of expenditure on treatment of illicit drug users. Government policy is the starting point of the model, given its overall influence on different policy domains and competence levels. Furthermore, this contextualisation model takes into account that drug treatment expenditure is determined by the drug policy, drug treatment policy, healthcare policy and the socioeconomic context. We elaborate on each of these domains, and investigate whether or not EU data are available on these topics.

FIGURE 13.1

Model for the contextualisation of drug treatment public expenditure



Drug policy

The drug policy is likely to influence drug treatment expenditure. Overall, in European countries, drug policy has a balanced and integrated approach with a focus on alternatives to punishment for drug users and on (drug) treatment (Reuter, 2009; Council of the European Union, 2012), although these measures are available to varying degrees in the different countries (EMCDDA, 2015a). As a consequence, for instance, should the policy change to an approach that is more focused on punishment, this is likely to influence the drug budget of governments. Public expenditure studies on drug policy provide insight into how drug expenditures are composed or what the public authorities' 'policy mix' is. Consequently, the prevailing balance between the various sectors of drug policy (prevention, treatment, harm reduction and law enforcement) becomes visible (Moore, 2008; Vander Laenen et al., 2008; EMCDDA, 2014a).

Drug treatment policy

In addition to this relationship between drug policy and drug treatment policy, there is interaction between drug treatment policy and drug treatment expenditure. However, the government might have less impact on expenditure related to the consequences of illicit drugs, such as hospital and other inpatient treatment, since this expenditure is influenced more by clients' clinical and behavioural characteristics (Metz et al., 2014) and by the drug treatment organisation than by deliberate drug policy options (Moore, 2008).

This relationship between drug treatment policy and public expenditure is determined by a couple of factors. A country's drug treatment policy is, among other things, influenced by the prevalence of different types of illicit drug misuse and different profiles of illicit drug users, the organisation and provision of drug treatment, and the number of treated persons (of the target group).

Public expenditure in a given country will be influenced by the prevalence of different types of problem drug use and the profiles of drug users. Substantial variation can be found between the EU countries in the levels, types and sequences of substance use (EMCDDA, 2015b; Degenhardt et al., 2016). However, differences in public expenditure cannot be solely explained by the country's prevalence rates of problem drug use. For instance, an EU cross-country comparison on hospital drug treatment found no positive correlation between the number of substance abusers and a higher rate of hospital occupation for these problems (Lievens et al., 2014). The EMCDDA summarises the (last year) prevalence of high-risk drug use of the EU Member States; however, data are missing for most countries ([1]). The registration of prevalence estimations should be increased so that policymakers can monitor the key targets and the allocation of resource to drug policy (Hickman et al., 2002).

Next to the prevalence rates of problem drug use and drug users, the organisation of drug treatment influences the policy and subsequently the public expenditure, as the choice of inpatient or outpatient drug treatment affects the drug treatment budget. In fact, the unit cost for inpatient care is much higher than that for outpatient care. For example, Gossop and Strang (2000) estimated a cost of EUR 168 (per patient per day) for opioid detoxification in the inpatient setting compared with EUR 7 in the outpatient settings (year 1999/2000). From this point of view, it is interesting to separate inpatient treatment expenditure from those for outpatient treatment. However, we should add that, taking the concept of economies of scale into account (Glied and Smith, 2011), the size of a treatment service will have an impact on the costs of the treatment as well: bigger treatment services will result in lower average costs ([2]).

In Europe, a wide range of treatment interventions is available, from detoxification, pharmacological maintenance, psychosocial care and long-term rehabilitation to community-based interventions or harm reduction. However, there are important disparities regarding the provision of types of drug treatment across the EU Member States (Metz et al., 2014). In general, the (dominant type of) treatment provision depends on the sociocultural context of the country (Reissner et al., 2012; Metz et al., 2014). Mathers et al. (2010), for example, reported that opioid maintenance treatment is more provided in the western European countries than the eastern European countries. The treatment offer can also differ with regard to the provision of treatment for different domains linked to problem drug use, such as interpersonal relations, personal development and social inclusion, and to what extent treatment is illness focused or wellness oriented (Neale et al., 2011). This applies for instance to the provision of additional psychosocial support and the provision of OST (Vanderplasschen et al., 2015). For EU countries, the TDI provides useful data on the number of new clients entering outpatient and inpatient treatment centres in EU Member States, making it possible to monitor

([1]) Since 2012, problem drug use has been known by the broader term 'high-risk drug use'. High-risk drug use is defined as the use of psychoactive substances (excluding alcohol, tobacco and caffeine) in a high-risk pattern (e.g. intensively) and/or by high-risk routes of administration in the last 12 months.

([2]) Although Kristensen et al. (2008) do warn that services may become so large that the cost of treatment will be higher because of diseconomies of scale.

(differences in the use of) the types of drug treatment (Mounteney et al., 2016).

Next to the prevalence and the profile of problem drug use and the types of treatment interventions, access to treatment will have an impact on drug treatment expenditure. In mental healthcare, a treatment gap — i.e. the gap between the number of people who need and the number of people who actually receive treatment — has been frequently reported (Woodward et al., 1996; Alonso et al., 2004; Kohn et al., 2004; McLellan and Meyers, 2004; Wittchen et al., 2011; Rehm et al., 2013) ([3]). There is no international database providing data on the treatment gap; nevertheless, the prevalence rates of problem drug users (given that recent data are available on the EMCDDA website) and the number of clients in treatment can be provided by the EMCDDA *Statistical Bulletin*, as part of the data published in the 'treatment demand' database ([4]). The EMCDDA provides only estimates of the treatment gap for clients covered by estimates of problem drug use (predominantly opiate-using clients).

Healthcare policy

Drug treatment expenditure is influenced by the general healthcare policy. The healthcare system and the organisation of healthcare might affect this expenditure. In fact, as is the case for drug treatment, the organisation of (mental) healthcare in the EU differs by country. Whether drug treatment is (partly) integrated within the (mental) healthcare system in a given country or operates largely independently from that system, many studies (e.g. Priebe et al., 2008; Samele et al., 2013; Haro et al., 2014) have reported considerable variation in mental healthcare provision across Europe. Yet we are unable to make good systematic comparisons of these differences across countries.

Furthermore, the structure of healthcare systems also determines public spending on drug treatment. Drug treatment expenditure is influenced by the source of finance, i.e. general taxation or insurance-based systems. Countries with predominantly insurance-based systems (e.g. Belgium, Germany, France, Luxembourg and the Netherlands) have higher healthcare expenditure, because the insurance-based system is characterised by a lower degree of control over expenditure (Pestieau, 2006). Moreover, the mix of public and private health financing differs in EU countries, leading to differences in reimbursement and coverage of costs (Metz et al., 2014). The eastern European countries are characterised by a lower proportion of public financing of healthcare (e.g. 54 % in Bulgaria and 62 % in Hungary) than the western European countries (e.g. 83 % in Luxembourg and 77 % in Germany) (Eurostat, 2016). Health expenditure by type of financing (general government, social security, private out-of-pocket and private insurance) and by type of function (inpatient care, outpatient care, long-term care, medical goods and prevention) is an essential component of the SHA ([5]). The SHA provides a systematic description of the annual financial flows related to the consumption of healthcare goods and services in European countries. Its intention is to describe a health system from an expenditure perspective. Furthermore, it aims to provide an integrated system of comprehensive, internally consistent and internationally comparable accounts, which should as far as possible be compatible with other aggregated economic and social statistical systems and can be retrieved from the Eurostat or OECD database.

Socioeconomic context

Public expenditure should also be framed within the socioeconomic context of a country. Socioeconomic variables that are known to be associated with the likelihood of substance misuse, such as employment status, education and income, should be reported (Henkel, 2011). For EU Member States, the EU Statistics on Income and Living Conditions (SILC) instrument is used to collect data on income, poverty, social exclusion and living conditions (available on the Eurostat website) ([6]). Next, changes in the economic situation may affect expenditure on healthcare and drug (treatment) policy. For example, an EMCDDA study (2014b) on the 2008 economic recession showed the impact of austerity on public expenditure regarding drug policy, and even on the mix of public and private health financing. The same study noted that public austerity has led governments to move from inpatient to outpatient treatment because of the cost savings (EMCDDA, 2014b). In this context, the economic situation and the wealth of a country, as well as its population, are part of our model.

First, public expenditure analysis can be contextualised in terms of the proportion of the GDP. Drug-related expenditure as a proportion of GDP is relevant, because it takes into account that a richer country might invest more in drug (treatment) policy for a given size of problem

([3]) Kohn et al. (2004) reported a 92.4 % median treatment gap for alcohol misuse and dependence in Europe. This study did not report the treatment gap for illicit drug disorders.
([4]) See http://www.emcdda.europa.eu/data/stats2016

([5]) Eurostat (2016, 2017).
([6]) Data on income and living conditions can be extracted from the EU SILC instrument, see http://ec.europa.eu/eurostat/web/income-and-living-conditions/data/database

(Reuter, 2006). Healthcare expenditure in eastern Europe is much lower than in the other EU countries, linked to the lower GDP per capita. Moreover, the proportion of GDP spent on illicit drug treatment should be compared with the proportion spent on other health problems (e.g. mental illness, obesity, cancer) (Knapp, 2003; Moore and Caulkins, 2005). This economic impact analysis allows decision-makers to monitor resource allocation in accordance with the economic burden imposed by the different health problems (McDonald, 2011).

Second, public expenditure on illicit drug treatment should be reported per capita. The population size has an impact on the demand for public goods and related public expenditure.

These economic and demographic data of the EU Member States, such as the GDP and the population, are reported by the Eurostat and OECD databases. These databases also provide extensive data on healthcare expenditure (by provider, by function and by financing agent). Unfortunately, expenditure by type of health problem is not available, which prevents comparisons of the proportion of GDP spent on illicit drug treatment with the proportion spent on other health problems.

To sum up, with this model we want to provide a framework to contextualise drug treatment expenditure. By developing this model, we are trying to incorporate the critique that public expenditure studies are overall limited to cross-national descriptive comparisons rather than comparative policy analysis (Ritter et al., 2015). Our model helps to explain differences between countries in their drug treatment expenditure with the help of three indicators (healthcare policy, drug treatment policy and the socioeconomic context). We are aware that some external factors have not been included in the model. For example, this is the case for community values (e.g. the marginalisation and stigma attached to substance use; see Wittchen et al., 2011), and the cultural context in a country will influence the differences in treatment approaches as well as the clients' characteristics (Valentine, 2009; Matheson et al., 2014; Metz et al., 2014). Another example is the quality of evidence in a given country that is available to guide policy decisions and the value that is attached to scientific evidence in the policy debate. However, in our model, we focused on factors for which EU data are available in international databases. By focusing on these factors, we want to move the discussion forward on public expenditure studies in drug policy.

Concluding thoughts

This multidimensional model can provide a valuable basis for an assessment of public spending on drug treatment policy, and this kind of model could be applied to other health problems. Adapting this framework for different diseases would allow us to make comparisons between different health problems across EU countries. Providing information on social security systems, institutional structures, cultural traditions, etc. becomes even more important if studies from high-income countries are compared with studies from low-income countries (Lievens and Vander Laenen, 2016). To give but one example, with respect to the healthcare system, Dickson-Gómez (2012) stated that the treatment of substance misuse disorders in some developing countries is not adequate to meet demand, is not evidence based and is of poor quality. Conversely, the eventual shortage of treatment provision is caused by the fact that in low-income countries the proportion of public expenditure allocated to drug treatment is lower than in high-income countries.

However, it should be clearly stated that our model does not pursue an (economic) evaluation of drug treatment policy. An evaluation model would require an investigation of outcome measures such as the quality of care or the cost-effectiveness of the treatment. A public expenditure study cannot detect a lack of performance without other types of research such as a cost-effectiveness analysis (Lievens et al., 2012; Ritter et al., 2015). Therefore, public expenditure studies should be conducted and, in particular, the results reported with caution. They run the risk of being misused for policy means because money is the common metric for putting expenditure on a common footing (Dominguez Rivera and Raphael, 2015; Lievens et al., 2016). In fact, money cannot be the only metric for evaluating policy, let alone be the only basis for policy decisions. Health, human rights and development are essential factors to be considered in policymaking and in developing a balanced drug policy, as was clearly stated by the Lancet Commission on Drug Policy and Health on the eve of the 2016 United Nations General Assembly Special Session on Drugs (Csete et al., 2016).

To conclude, governments and health systems are confronted with a number of problems such as increasing costs while available financial resources are under pressure (Bhattacharya, 2016). As a consequence, they are faced with difficult decisions in allocating available resources (Hoang et al., 2016). In view of the increasing importance of accountability and the requirement for an (economic) evaluation of drug policy, it is clear that economic methods of policy evaluation are here to stay.

Despite the lack, so far, of a uniform methodology to measure public spending in different countries, it is still possible, even when comparability is low, to contextualise the results of public expenditure studies. Overall, to increase comparability, we recommend at least presenting public expenditure per capita and as a proportion of GDP (Lievens and Vander Laenen, 2016).

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14

CHAPTER 14

Social cost of illicit drugs in France: what's new in estimating the value for lives lost and illness?

Pierre Kopp and Marysia Ogrodnik

Introduction

Social cost studies are a useful tool for public authorities. They allow the ranking and prioritising of public policies. In the present case, the social cost of drugs measures the monetary resources expended by the various social agents as a consequence of the consumption, production and trafficking of illicit drugs.

The objective of this chapter is to describe the general methodology used to compute the social cost of drugs. It falls into three parts. Part one defines what a social cost study is, its usefulness and its composition, depending on the available methodologies. Part two explains how to compute the social cost of drugs according to the methodology chosen. The third part shows how the methodology was applied to French data for 2010 and the data sources used.

What is a social cost study?

Definition and objectives

In economics, consumption of goods generates a private cost, intentionally borne by the consumers, which they agree to pay in order to enjoy the benefits of the goods. However, sometimes, it can also produce a social cost, which includes all the costs unintentionally borne by society that the consumers did not take into account in their initial consumption decision.

From the perspective of policymakers, social cost is a synthetic indicator of the extent and importance of a social problem that is useful to compare and rank different social issues. Expressed in a monetary unit that will be meaningful to everyone, it represents the value of the losses to society resulting from the phenomenon. Consequently, it helps policymakers to adopt an appropriate policy, especially when it involves significant public expenditure that is a burden on the national public budget. Furthermore, when a policy evaluation is sufficiently precise, it also permits better evaluation of the benefits of a given public policy such as prevention or repression. It also acts as a guide to changing taxation rates or reviewing related legislation.

The social cost of drugs evaluates the overall consequences of drugs in terms of their monetised costs to society. The trade in and consumption of these drugs have negative consequences, as they lead to illnesses, loss of quality of life for individuals, premature deaths, loss of production for businesses and public expenditure. The state has to prevent and treat those consequences. On the other hand, drug users dying prematurely may 'save' some public funds (in terms of foreseeable but prevented spending on health, social care or pensions), and these consequences must also be taken into account. A complete social cost study estimates the net social costs, i.e. estimates total costs and deducts social benefits of illicit drugs.

Composition of social cost

Social cost is composed of an external cost and of the effect of net public expenditure on social welfare, as detailed in Table 14.1.

Some harms including pain, fatigue and suffering in relation to disease, referred to as 'intangible costs', are difficult to measure and to put a value on. Those intangible costs concern the victims and their relatives (who may stop working to care for the victim). They are usually entered in cost-benefit analyses as a theoretical, if unmeasurable, construct that should be forgotten in decision-making.

Given the difficulty of estimating intangible costs, these are excluded from social cost calculations.

External cost

External cost is made up of the costs that do not directly affect the consumer but directly negatively affect a group of other citizens who do not receive any monetary compensation for that cost. In the case of drugs, those classic externalities comprise accidents provoked by drug use and affecting third parties, as well as production losses for firms and administrations when drug users have to stop working. The components of this external cost have to be converted into a monetary unit.

In addition, external cost includes all the secondary effects that are unintentionally borne by consumers, i.e. intrapersonal externalities. In the case of drug use, the inclusion of costs borne by consumers in this category or private costs (the latter are not included in the external cost) depends on the methodology chosen. One the one hand, some authors consider those intrapersonal externalities to be a private cost, as they assume that consumers are fully responsible for the consequences of their choices, because they should be aware of the risks associated with drug consumption. This position is advocated by the defenders of Becker and Murphy's (1988) theory of rational addiction, such as Walker and Kelly (2011). On the other hand, it can be considered that drug users' addiction impairs their capacity to take in information and make rational decisions. That is to say that the part that looks for pleasure is resistant to the part that understands the negative consequences of drugs (Collins and Lapsley, 1995). Thus, in this second case, the harms that individuals cause themselves by consuming drugs (loss of quality of life, premature death) are included in the external cost.

As described above, private costs refer to drug-related expenses that are considered to be intentionally borne only by the drug consumer and are therefore excluded from the scope of external cost. There are three sources of private costs. First, private costs concern drug purchases that are fully assumed by the consumer. This can be explained by the assumption that the utility derived from drug consumption is at least equal to their price. As for the consequences, it is supposed that the private benefits arising from drug use and the monetary amounts spent on drugs compensate each other. This explains why the benefits directly retrieved from drug consumption are absent from the analysis and why the components of the social cost seem to be quite one-sided. Second, the fines imposed on drug consumption and on driving under the influence of drugs are included in the category of private costs. Finally, health expenditure that is not reimbursed by public health insurance, but is either paid by drug users themselves or reimbursed by private insurance, is also considered to be private costs. It can also be noted that private costs can also include intrapersonal externalities depending on the theoretical framework chosen.

Effect of public net expenditure on general welfare

There are two main sources of drug-related public expenditure: (1) the part of treatment paid by public health insurance for every disease caused by drugs and (2) public expenditure on prevention, treatment and reduction of supply funded by the government. They all have a negative impact on public finance. However, when drug users die, they no longer receive pensions and other benefits, so it has a positive impact on the public finance budget. Moreover, some countries that chose to legalise the supply of certain drugs, e.g. cannabis in some of the US states or Uruguay, receive tax revenues, which also has a positive impact. The difference between the two first elements and the last two provides the net public expenditure related to drugs.

As public expenditure has to be financed by additional taxes, it has an impact on general welfare. The marginal cost of public funds refers to this impact — when government raises one additional unit of revenue to finance expenditure. Therefore, the effect of public expenditure on general welfare is obtained by multiplying the net public drug-related expenditure by the marginal cost of public funds. There are many published estimations of this parameter. For instance, the European Commission provides the calculation for European countries (Barrios et al., 2013), but there are also national estimations, such as the Quinet report (Quinet, 2013) in France.

Calculation methods

Preliminary calculations

Calculating the components of the social cost requires first an assessment of mortality and morbidity caused by drugs, as well as the age of death for the former.

Morbidity and mortality

Data on morbidity and mortality are used to compute the value of deterioration in life quality and the values of lives

lost, production loss, treatment cost and pensions not paid due to premature deaths.

Collection of these data necessitates first listing the drug-related diseases. In the case of illicit drugs, most studies identify overdose, HIV and AIDS, HCV, HBV and accidents (EMCDDA, 2011; Institut de Veille Sanitaire, 2011). Then, it is necessary to compute the associated morbidity and mortality for each disease.

Sometimes national data are detailed and provide the morbidity and mortality induced by drugs for each disease, but in many cases there are only global data per whatever the cause of it. In the latter case, it is necessary to use tools to estimate drug-induced morbidity and mortality. For that purpose, the population attributable fraction (*PAF*) used by the WHO (2016) are applied. Population attributable fraction refers to the chance of developing or dying from a disease, D, due to the presence of one risk factor (here it is the use of a given type of drug). It is computed by the formula:

$$PAF = \frac{P(D)-P(D/\bar{E})}{P(D)} \quad (14.1)$$

where $P(D)$ is the probability of developing or dying from the disease, E an exposed subject, $\bar{E}$ is a non-exposed subject and $P(D/\bar{E})$ is the probability of developing or dying from the disease if the risk factor did not exist. Here, for one drug type, one population attributable fraction is computed for each drug-related disease. Note that $PAF \in [0,1]$, and that a different population attributable fraction linked to the same risk factor cannot be added. Indeed, there could be multiple causes of a death, and this comorbidity is not taken into account in the population attributable fraction calculation. For each disease, morbidity and mortality are multiplied by the associated population attributable fraction, in order to obtain the number of ill people and deaths attributable to drugs.

Age at death

The age at death from a drug-related disease is also necessary to estimate the number of years lost in order to compute the values for lives lost, lost production and civil servants' unpaid pensions. There are two methods of estimating the number of years lost. If the average age at death for a given disease is known, it is possible to compute the difference between the life expectancy of the whole population and the average age at death. This difference is then multiplied by the mortality. It is an imprecise methodology, as the average age at death is not an accurate parameter. The second method consists of multiplying, for each age group, the number of deaths by the number of years lost, and then adding the results found for each age group. This method is more reliable but more complicated to interpret, and it requires more detailed data. This study adopts the first method. In both cases, such estimations are potentially biased by the fact that most drug users come from deprived areas where life expectancy is lower than in the overall population ([1]). However, in the absence of data on the socio-economic status of drug users, life expectancy of a whole country is used. It potentially leads to an overestimation of the costs. Nevertheless, this overestimation concerns only the last years of life, which are the most discounted in the calculations.

External cost

Unlike public expenditure, which is directly valued in monetary units, external cost is more complex to estimate. The value attributed to those costs directly depends on the methodology chosen. When interpersonal externalities are included, it corresponds to the sum of the values of losses of quality of life, lives lost and lost production.

Value of loss of quality of life

For a given drug-related disease, d, the value of loss in life quality (LLQ) is calculated by the formula:

$$LLQ_d = Mb_d \times VLY \times \omega_d \quad (14.2)$$

where Mb represents the morbidity for the drug-related disease d, VLY the value for one year lived, and ω_d the coefficient of deterioration in life quality.

The calculation of the value of loss in life quality requires choosing a value for one year lived. Various methodologies exist. Some studies differentiate according to the age and the individual's position. Other researchers refuse to make such a differentiation because studies have shown few conclusive results of making such a differentiation and, above all, they do so for ethical reasons. Consequently, they propose a fixed value for one year lived for every individual. For instance, Quinet (2013) set it at EUR 115 000 per year saved for the French population. His calculations are based

([1]) In France for instance, there is a gap of six years in life expectancy between executives and workers among men, and three years among women. See http://www.insee.fr/fr/themes/document.asp?ref_id=ip1372#encadre1 (accessed 25 April 2016).

on the recommendation of the OECD report (OECD, 2010), which computes a 'value of a statistical life' derived from surveys in which people were asked their willingness to pay for a small reduction in their mortality risk. This value lies between EUR 1.5 million and 4.5 million in OECD countries. Desaigues et al. (2011) use another method (the contingent valuation) and recommend a valuation of EUR 40 000 for the European population and do not take into account the specificities of the different countries. The choice of a value will impact markedly on estimates of the social costs. Addicted individuals suffering from a disease experience a loss in life quality during the period of treatment or remission. The WHO (2004) provides coefficients of deterioration in life quality for each disease that can be used. For each disease, this coefficient is multiplied by the value of one year lived. The result gives the annual cost of loss in life quality per person for one disease.

Value of lives lost

Unlike morbidity, which is a stock variable, mortality is a flow variable, for which values are based on present and future periods, i.e., when one individual dies during a given period, the consequences are spread over time. For each drug-related disease,the value of lives lost (*VLL*) is computed according to the following formula:

$$VLL_d = Mt_d \times \sum_{t=1}^{T_d} VLY \times (1+\alpha)^{-t} \qquad (14.3)$$

where VLY represents the value of one year lived, Mt the number of deaths caused by the drug-related disease d, T_d the number of years lost and α the discount rate.

Such calculation requires choosing the value for one year lived used in the calculation of the value of the deterioration in life quality and a discount rate from the literature. For instance, the Australian Government recommends a discount rate of 7 % (Office of Best Practice Regulation, 2007), whereas the United States recommends a discount rate of 3 % (Interagency Working Group on Social Cost of Carbon, 2010) and Quinet a discount rate of 4 % for France (Quinet, 2013).

Production loss

The loss to society caused by a death is also valued in terms of production lost when the subject stops working partially or completely. The values for production losses are calculated by disease type in two ways (INCa, 2007).

The first is the 'flow of discounted revenues' approach. It considers that one individual is like a machine from society's point of view: a departure from the market represents a loss in potential production, and this loss is calculated via a discounted flow. This method is consistent with the hypothesis of full employment of resources ([2]). It is important to note that, under that hypothesis, the effects of drug production, supply and use on creating employment are not taken into account. The second method of computation is the 'frictional cost' approach. It consists of an examination of the production losses caused by a disease from the organisation's point of view. These losses depend on the duration of the organisation's internal reorganisation to recover the previous production level. For extended absences, it is assumed that the work of the absent employee is accounted for by an increase in internal productivity or by the recruitment of a new employee. Thus, after a given period, the production level always returns to its previous level. This second calculation method is very complex and is not compatible with the hypothesis of full employment of resources.

When data provide an annual value for production lost per disease that is already discounted, this value is multiplied by the number of years lost to give the production loss caused by a disease. Then, for each disease (d), this production loss per individual (APL) has to be multiplied by mortality (Mt) to obtain production loss (PL):

$$PL_d = Mt_d \times yl_d \times APL \qquad (14.4)$$

Public net expenditure

Every country has its own social system and its own rules for recording public expenditure. Despite the work that has been done by Eurostat, the OECD and the WHO on public expenditure on health programmes to estimate national public expenditure on mental health and substance abuse, there are no specific estimates of public expenditure on drug-related interventions.

Public net expenditures are obtained by adding treatment costs to spending on research, prevention and repression, and by deducting from this civil servants' unpaid pensions and — when applicable — tax revenues.

([2]) All available resources are used in the most efficient way. There is no unemployment (or only frictional unemployment).

Treatment costs

Treatment costs borne by public health insurance are calculated by multiplying each drug-related disease by the annual cost of the treatment of one patient by the number of individuals concerned. Operating costs for the structures caring for drug users are added to those treatment costs. When annual treatment cost per disease is available (TC_d), total treatment cost (TTC) for a drug-related disease (d) is obtained by multiplying it by morbidity (MB_d):

$$TTC_d = TC_d \times Mb_d \quad (14.5)$$

Spending on research, prevention and repression

It is difficult to estimate the resources allocated to policing illicit drugs, as this is only a part of the police's activity and the funding of drug-related initiatives is embedded in the wider budgets of public entities. In France, Kopp and Fenoglio (2006) estimated drug-related public expenditure by estimating drug offences as a proportion of the total number of offences and by assigning that proportion of the police budget to supply reduction initiatives. However, such estimates only provide an order of magnitude for costs.

Concerning the cost of health prevention initiatives, it is necessary to define the area of prevention (for instance, if the funds are allocated to drug prevention or to other health risk prevention). Moreover, in addition to accounting for the budget for prevention initiatives, it is necessary to include all support provided to the organisations involved.

Unpaid civil servants' pensions

The death of a civil servant puts an end to the payment of his or her pension, thereby generating savings for the government. The amount of pensions (*UP*) that are not paid by the state is estimated through a discounted sum of annual unpaid pensions (*AP*). Here it is required to take into account only retirement years. Assuming that the average years of retirement is average life expectancy minus average age of retirement, the formula is:

$$\begin{cases} T_d < \vartheta : UP_d = \gamma \times AP \times \sum_{t=1}^{T_d} (1+\alpha)^{-t} \\ T_d \geq \vartheta : UP_d = \gamma \times AP \times \sum_{t=T_d-\vartheta}^{T_d} (1+\alpha)^{-t} \end{cases} \quad (14.6)$$

Here we use the number of years lost instead of the number of retirement years lost, because, if an individual dies before the age of retirement, there will be ϑ years of pension unpaid in both cases, but the discounted value of those unpaid pensions will depend on the years remaining before retirement.

There are also biases in this calculation because the proportion of public servants among drug users is unknown. Considering the proportion of public servants in the general population will lead to a possible over-estimation of the benefits.

Tax revenue

Data for tax revenue are generally provided by the national statistical service. When applicable, the measure is accurate for sales, but data concerning the taxation of firms producing drugs are not always available. In addition, when individuals die, they no longer pay taxes. The last factor is very complex to measure and is often omitted from social cost studies.

The social cost calculation

Social cost is the sum of the external cost, and the effect of public expenditure on general well-being. In order to obtain the effect of net public expenditure on general welfare, drug-related net public expenditure is multiplied by the marginal cost of public funds. Many studies provide a value for this marginal cost (Dahlby, 2008), and the value chosen affects the results. Finally, social cost is calculated by the formula:

$$SC = EC + \delta \Delta G \quad (14.7)$$

Estimating the social cost of illicit drugs in France in 2010

Methodology and parameters chosen

Most of parameters used are based on Quinet's (2013) recommendations: the value for one year lived is fixed at EUR 115 000, the discount rate at 4 % and the marginal cost of public funding at EUR 1.2. Quinet's report, which relies on the OECD's recommendations (2010), is the most relevant recent study for France. Moreover, the estimation we have chosen to use is annual production loss based on flow discounted revenues, and thereby we assume that there is a full employment of resources. Average life expectancy is fixed at 80, and average age of retirement at 60. Data sources used for the calculation are detailed below.

Data collection

Mortality and morbidity

The data for illicit drugs come from multiple sources. Morbidity and mortality data for AIDS and for overdoses were obtained from the French observatory for drugs and substance abuse (OFDT, 2013). For overdoses, the average number of deaths in the period 2000-10 was used. We also used Laumon et al.'s (2011) data for the number of fatal traffic accidents due to cannabis. For HIV morbidity, Morlat (2013) indicates that 150 000 individuals were living with HIV in France in 2013, 74 % of whom were covered by the health insurance system. Moreover, 89 % of illicit drug users who are infected with HIV are following a course of treatment and 10.9 % of the individuals infected with HIV are drug users (Jauffret-Roustide et al., 2013). Thus, the morbidity associated with HIV is 150 000 × 0.74 × 0.109 ÷ 0.89 = 13 600. The French national statistical service, INSEE ([3]), indicates that non-fatal serious traffic accidents that generate hospitalisations are 10 times as frequent as fatal serious traffic accidents. Thus, accident morbidity is 230 × 10 = 2 300. As the data of interest are provided directly, there is no reason to use the population attributable fraction here. HCV morbidity is derived from Dhumeaux's (2014) estimation, which concluded that 40 % of HCV cases reported were associated with drug use and, by his estimate, 8 % of people with HCV have a chronic disease.

Average age at death

In order to make the results easier to interpret, the choice was made to use the average age at death for the whole population instead of making calculations for each age group. Average age at death due to an illicit drug overdose was based on an estimation by Janssen and Palle (2010). For AIDS, we used data for 2009 from the Institut de Veille Sanitaire (2009). For accidents, Laumon et al. (2011) estimated that the majority of deaths in traffic accidents caused by cannabis are in individuals under the age of 25, so we took that as our estimation. To compute the number of years lost, average age of death per disease was deduced from the average life expectancy of 80.

Annual production loss

Here we use the estimates of the French national cancer institute (INCa, 2007), based on the human capital method, which follows the hypothesis of full employment of resources. Even if unemployment is important in our society, and even if individuals are replaced after their departure, we considered here that one death corresponds to one work position lost. The logic for this is that there is a loss of welfare when a resource is wasted ([4]). Therefore, it is more pertinent to suppose that each working hour lost by a drug user is not replaced. The estimation of EUR 12 349 per year is already discounted and takes into account the lost production before retirement and the unpaid production after retirement.

Treatment costs

For illicit drugs, HIV data come from a French health insurance provider's statistics (Medic'AM, 2014). The last available study on the cost of care for HCV (Ducret et al., 1998) is for the year 1998, but the unitary cost of care has been multiplied by two since the introduction of interferon-alpha and ribavirine (Medic'AM, 2014). Therefore, we also multiplied Ducret's estimation of the annual cost of care by two. Finally, data from Vallier et al. (2006) are used for chronic complications. For substitution treatments, thei cost is also estimated on the basis of Medic'AM (2014) data and by making additional assumptions. Medic'AM data indicate that substitution treatment spending stands at EUR 93.5 million. We supposed that 50 % of the endowment for illicit drugs made by the French centres for the treatment and prevention of addiction (CSAPA) (EUR 60 million) was devoted to substitution treatments. Spending on substitution prescriptions by addiction liaison and care teams (ELSA) was presumed to be the same. Finally, the cost of ambulatory medical prescriptions was estimated by considering that patients who receive buprenoprphine (103 000 in 2010) need a monthly prescription, whereas those who receive methadone (41 000) need two prescriptions per month. A visit to a doctor cost EUR 22 in 2010, and consultations for substitution treatment prescriptions cost EUR 93 million. Consequently, the cost of substitution treatments stands at EUR 262 million.

Research, prevention and repression costs

To estimate public spending related to drugs, we use the French observatory on drugs and drug addiction's report (OFDT, 2013), which relies on a French drug-related report

([3]) http://www.insee.fr/fr/themes/document.asp?reg_id=24&ref_id=18715

([4]) A doctor who cures a patient who has lung cancer caused by cigarettes cannot simultaneously cure another patient who has developed cancer that is not related to consumption of any type of drug. Therefore, one patient is not cured because of diseases caused by drugs. This is why treating drug users generates a cost. If the hypothesis of fully employed resources were dropped, the doctor would be always available to cure a new patient.

(Document de politique transversale, 2011) describing different public policies. According to this document, it appears that the proportion of public spending on law enforcement and prevention is 66 % for illicit drugs (EUR 913 million).

Unpaid civil servants pensions

The death of a civil servant puts an end to the pension payments, thereby generating savings for the government. In France, the average year of retirement is assumed to be 60. According to the National Bureau of Statistics (INSEE ([5])), the average annual pension was EUR 15 072 in 2011. The sum of the unpaid pensions was then actualised, as previously, using a discounting rate equal to 4 % (Quinet, 2013) over the future years of unpaid pension. The total unpaid pension was multiplied by 21 %, which corresponds to the proportion of public employees in the workforce.

Results

We found that the annual social cost of illicit drugs is EUR 8.7 billion. Expressed as a ratio per inhabitant, it represents a cost of EUR 133 in 2010. This cost represented 0.44 % of French GDP in 2010. In comparison, the social costs of tobacco and alcohol are EUR 122 billion and EUR 118 billion, respectively.

External costs represent a large proportion of the social costs (67.9 %) of illicit drugs. This can be explained by the number of lives lost (1 605) and by the value chosen for a year saved (EUR 115 000), which result in a value of lives lost of EUR 2.7 billion. The loss of quality of life also represents a sizeable cost (EUR 2.6 billion).

Drugs lead to an increase in the net public expenditure. Although civil servants' unpaid pensions lead to cost saving (EUR 45 million), this does not compensate for the expenditure on reducing supply and prevention (EUR 913 million) and treatment (EUR 1.4 billion). Consequently, the net difference in public expenditure equalled EUR 2.3 billion for illicit drugs in 2010. In comparison, it was EUR 13.8 billion for tobacco and EUR 3.0 billion for alcohol.

Conclusion

The aim of this study was to explain how to estimate the social costs of illicit drugs. Although there is a more commonly accepted methodology, several specific adjustments can be made when making estimates, which have an impact on the results ([6]). Therefore, the results obtained from a social cost study will depend on the choice of methodology, which is influenced by national specifics. Here, the parameters chosen to compute the social cost of drugs in France in 2010 were based on a report (Quinet, 2013) that makes official recommendations for France that are based on OECD (2010, p. 33) recommendations, using a value for one year lived of EUR 115 000, a discounting rate of 4 % and a marginal cost for public funding of EUR 1.2.

Owing to the variety of methods available, cross-country comparisons of estimates of social costs are also difficult. The fact is that the value of a human life and the discounting rate, the importance of which we have shown for the cost estimates, are not the same from one country to another. Furthermore, existing studies do not use the same definition of social costs. While, for instance, some take into account intangible costs, others do not (Reuter, 1999). Finally, the provision of public services also differs greatly from one country to another. In particular, the portions of spending on care that come from public and private expenditure depend on how the system of healthcare funding is organised (individual insurance versus social charges). The rules of public accounting can vary widely in different countries, even within the EU. However, social cost studies remain a powerful tool for governments to assess the scale of a social problem and rank the different issues by priority. Moreover, even if the value of one year lived can be the subject of debate, mortality and morbidity, as well as the net expenditure arising from drugs, are a reality and the French government needs to look at new strategies to reduce them.

([5]) http://www.insee.fr/fr/themes/tableau.asp?reg_id=0&ref_id=NAT-TEF04571.

([6]) For instance, in the case of France, intrapersonal externalities were taken into account, intangible costs were omitted, the value for one year lived was fixed for the whole population whatever the age and the social status, and WHO data were used to evaluate loss of quality of life.

TABLE 14.1
The social cost of illicit drugs in France in 2010

Disease	Number of cases	Deterioration in quality of life (%)	Annual cost of care (EUR)	Number of deaths	Average age of death	Years lost	Value of lives lost (million EUR)	Production loss (million EUR)	Loss in quality of life (million EUR)	Total cost of care (million EUR	Pensions not paid (million EUR)	Public expenditure (million EUR)	Tax revenue (net of VAT)	External cost (million EUR)	Net public expenditure	Social cost (million EUR)
Overdose	–	0	–	300	34	46	721	170	–	–	5	–	–	891	–5	885
HIV	13 600	13	15 377	–	–	–			203	209	–	–	–	203	209	454
Aids	6 300	50	10 000	75	55	25	135	23	362	63	3	–	–	520	60	592
Accidents	2 300	30	9 185	230	25	55	585	156	79	21	3	–	–	820	19	842
HCV	92 000	13	9 000		–	15 (a)		–	1 375	828	–	–	–	1 375	828	2 369
Complicated hepatitis	7 360	75	9 224	1 000	65	15	1 279	185	635	68	35	–	–	2 099	33	2 138
Substitution treatment	150 000	–	1 747	–	–	–	–	–	–	–	–	–	–	–	–	–
Addiction centres	–	–		–	–	–	–	–	–	262	–	–	–	–	262	314
Hospital units	–	–	–	–	–	–	–	–	–	7	–	–	–	–	7	8
Total illicit drugs	**271 560**	**–**	**54 533**	**1 605**	**–**	**–**	**2 720**	**534**	**2 654**	**1 458**	**46**	**913**	**–**	**5 908**	**2 326**	**8 698**

(a) Patients die not from HCV, but from cirrhosis.
For net public expenditure and the social cost (the last two columns) the totals do not correspond to the sum of the figures in the rows above. This is because the totals take into account the public expenditure (column 13) and tax revenue (column 14).

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VI

SECTION VI

Insights and implications

CHAPTER 15

Estimating drug treatment expenditure: discussion and concluding remarks

15

CHAPTER 15

Estimating drug treatment expenditure: discussion and concluding remarks

Cláudia Costa Storti and Charlotte Davies

This EMCDDA Insights report has gathered together studies from a wide range of experts, providing a unique overview of the methodologies used for estimating expenditure on drug treatment. The very existence of these studies is testament to the growing importance of this field of enquiry within the current economic climate, where cost-effectiveness of interventions, evaluation of policies and ensuring value for money in public investment are high up on the political agenda. Nevertheless, the topic remains in its infancy and, despite an increase in the number of studies over the past decade, there is still much to be done in terms of methodological development. Issues such as the absence of commonly agreed definitions and approaches, the lack of harmonised or complete datasets on drug-related public spending or costs and/or on the activity of drug-related health providers, and uncertainty about the most appropriate economic models to use all act as barriers to rapid development of this field of analysis.

In the absence of systematic discussion of these issues, there has been little opportunity for policymakers, practitioners and researchers to take advantage of existing knowledge and experience. As a first step in addressing this gap, this report has brought together a set of diverse studies, encompassing much of the recent work on drug treatment expenditure in different parts of the world. It therefore represents the current state of the art in this field and, by focusing on methods, it has allowed the main methodological commonalities and considerations that arise from these types of estimates to be identified. A discussion of these commonalities and considerations forms the basis of this chapter.

Scope and objective of estimates

Some of the studies presented are diverse in terms of their aims and objectives. It is clear that the different aims and potential uses of a study have a significant impact on the methodology, definitions used, choices of data sources and results of estimates.

For example, studies such as those by Davies (Chapter 6) and Molinaro and colleagues (Chapter 7) seek to explore the impact of drug use on drug-related health expenditure and may be a first step for cost-benefit analysis. Other studies aim to estimate spending on certain types of treatment or in certain specific settings, such as Gennetti and colleagues (Chapter 8), who estimate spending on OST, and Lievens and Vander Laenen (Chapter 9), who estimate spending on inpatient drug treatment in hospitals. If expanded, these types of study allow a comparison of the costs of treatment with the benefits these treatments provide. Furthermore, if the costs and benefits are compared with the costs and benefits of alternative types of treatment, it is possible to conduct a cost-effectiveness analysis. When the costs of certain types of treatment are added to the costs of all other drug treatments provided, the full amount of drug treatment expenditure can be calculated.

In this vein, the studies described by Hajnal and Kender-Jeziorska (Chapter 4), Ritter and colleagues (Chapter 1), Mikulić (Chapter 2), Origer (Chapter 5) and Vopravil (Chapter 3) all aim to estimate total public expenditure on drug treatment and may provide a good basis for the economic evaluation of drug treatment and public policies at a macro level. Kopp and Ogrodnik (Chapter 14) go a step further and exemplify a method to evaluate drug policy and estimate social costs, i.e. the costs borne not only by the public sector but by the whole of society, showing how public expenditure is only one part of the picture when assessing costs from a societal perspective.

Other types of study such as the one by Gonçalves and colleagues (Chapter 11), which aimed to see how changes in the provision of different health services impact on the costs of the drug treatment network, may be relevant for

cost-sensitivity analysis. This type of analysis explores, for instance, how changes in treatment activity, changes in the costs of inputs or uncertainty in the cost allocation can impact on treatment costs.

The geographical focus will also have an impact on the study design. While most of the papers focus on national estimates, Lievens and Vander Laenen (Chapter 9) aimed to find a method for cross-national comparison of expenditure, and their primary focus was, therefore, the identification of harmonised international datasets that could be used for this purpose. In contrast, Molinaro and colleagues (Chapter 7) carried out their analysis at a regional level and were able to link regional health datasets to achieve their study aims.

It is important that policymakers and those commissioning studies are clear about the aims, objectives and specific policy question they are seeking to answer in order to guide the design of an appropriate methodology. The papers contained in this publication may provide a useful starting point and trigger discussion on the types of models that are suitable to answer different policy questions and stimulate the future development of guidelines on the most appropriate methods.

Defining drug treatment

The definition of drug treatment adopted will impact on the design and on the results of any study on expenditure. Since definitions provided by international organisations such as the WHO (1988, p. 3) or the EMCDDA (2012) are rather broad, they allow a wide range of differences in the operational use of the term 'drug treatment'. These differences are apparent in the studies presented in this publication. Within the broad parameters set by the international definitions, the authors of the studies have chosen to operationalise the term in a way that allows estimates of costs to be made in practice. The scope and objective of the study will influence this, but data considerations are also important.

A major consideration is how expansive the chosen definition of treatment should be. The operational definition developed for the monitoring of drug treatment activity data (EMCDDA, 2012) is the most straightforward. This restricts the focus to structured interventions that aim to address a person's drug use. This is the option taken by Ritter et al. in Chapter 1 and may be a sensible approach for studies looking at drug budgets in order to describe governments' policies and their allocation of resources (Reuter, 2006). Studies looking at labelled expenditure as part of a wider study of public expenditure are most likely to use this definition, although Hajnal and Kender-Jeziorska (Chapter 4) highlight the fact that choice can be limited by practical issues and the lack of data on causality.

Some authors add, to the costs of interventions addressing drug use, the costs of treating associated comorbidities. Their rationale may be to consider the more complete costs of treating drug users and/or to support an assessment of how public investment in one area of health (drug treatment, for instance) may provide savings in other areas of health (HIV or HCV treatment). This kind of cost-benefit analysis may be appropriate in situations where governments are trying to rein in public spending (Bhattacharya, 2016). The costs of associated comorbidities are taken into account by Molinaro and colleagues (Chapter 7), and Davies (Chapter 6) uses an expansive definition of drug treatment that includes most treated health conditions that are associated with drug use. The difficulty in determining causality between drug use and health conditions is highlighted, however, by the author choosing to restrict the definition to the conditions associated and considered in the WHO Global Burden of Disease study (Mathers et al., 2002).

Between these two operational definitions, other definitions have been used by authors. Origer's definition (Chapter 5) 'refers exclusively to interventions targeting persons who show problems related to the use of illicit drugs' and includes drug-related infectious disease. The inclusion of drug-related infectious disease is perhaps the least controversial of the related health conditions, given the well-documented and often quantified link between drug injecting and the prevalence of infectious disease and the role of OST and needle and syringe programmes in controlling the spread of drug-related infectious disease. Beyond this, there remains a lack of evidence and research on the proportion of illness and disease that is drug related from which to identify the relevant attributable fraction. This is likely to limit the use of a more expansive definition.

The decision to adopt a more expansive definition of treatment leads to the inclusion of different types of drug treatment services and, therefore, has a considerable impact on cost estimates and the methods and data required to carry them out. As Ritter and colleagues suggest (Chapter 1), a clear identification of the services accounted for is necessary when estimates of costs of treatment are made.

Drug treatment, harm reduction and prevention

The unclear boundaries between the conventional categorisation of drug-related interventions — treatment, harm reduction and prevention — can make it difficult to adhere to a narrow definition of drug treatment. These essentially artificial constructs (Caulkins, 2006) may be easier to define on paper than in practice, particularly when attempting to separate the costs of various activities where interventions are delivered together as an integrated service (OECD et al., 2011, p. 73) and may be funded by the same source. Many local drug treatment providers deliver a suite of interventions across the prevention/harm reduction/treatment spectrum. Ritter and colleagues (Chapter 1) state that, despite a clear definition of treatment in their Australian study, data provided by state governments included some elements of expenditure on prevention and harm reduction. In some cases this was identifiable (such as needle and syringe programmes), while in other cases the prevention and harm reduction activities could not be identified or, therefore, excluded. Vopravil (Chapter 3) included both treatment and harm reduction together, as it was not possible to distinguish spending between the two.

Some authors describe expenditure or cost studies that separate these services. For example, the tool described by Musto (Chapter 10) to estimate expenditure on 'drug treatment' by local authorities disaggregates expenditure on low-threshold services from expenditure on structured drug treatment services. Gonçalves and colleagues (Chapter 11) looked at all the costs incurred by drug dependence treatment teams and attempted to disentangle expenditure in order to estimate the marginal costs of different types of dependence-related activities. Methods to do this, however, are reliant on detailed activity and expenditure data.

In an ideal world, the definition of drug treatment would emanate from the scope and objective of the study and be supported by robust data that allow this definition to be operationalised in a linear-type fashion. Experience has shown, however, that compilation can be limited by the nature of national health systems and statistical systems. Studies are likely to require an element of pragmatism in decision-making, and it is important to clearly describe the options adopted and understand how these affect estimates.

Mapping service provision, funding sources and assessing coverage of estimates

As Ritter and colleagues (Chapter 1) suggest, it may be helpful for studies to begin with the mapping of treatment types and funding flows. Such an exercise can shed light on the complexity of the latter, the many actors and the funding sources involved in the financing and delivery of drug treatment services (Chalmers et al., 2016). It can also provide a valuable resource for checking the coverage of estimates, controlling double counting and identifying areas for data improvement.

The System of Health Accounts (SHA) suggests a comprehensive conceptual accounting framework for the financing of health (OECD et al., 2011), and the structure can be used to support drug-related estimates. Respecting this structure assists the mapping process and helps to ensure completeness of estimates and comparability of results.

Even in countries where it is not possible to provide expenditure estimates, the mapping of treatment services, funding sources and flows will provide a foundation for future work, aid transparency and accountability, and it will help to assess how changes in funding may affect different parts of the treatment system (Chalmers et al., 2016).

When estimates of expenditure are provided, treatment maps can act as a useful tool for assessing the coverage of estimates. Few studies are able, at present, to provide full estimates of drug treatment across the entire healthcare system. Studies, for example, often do not include expenditure on treatment delivered by general practitioners. The missing areas of expenditure should be identified and, if possible, some assessment of the impact of this on the overall estimate should be made. Many of the studies estimate expenditure for inpatient hospital stays. However, hospitals represent only one setting for drug treatment and may account for a confined proportion of drug treatment activity, which also takes place in outpatient settings ([1]). Despite inpatient treatment costing significantly more per day than outpatient treatment (EMCDDA, 2014), using inpatient hospital data alone is likely to result in an

([1]) According to data available for inpatient hospital-based residential centres, in the 16 reporting countries with data available (out of 28 EU countries plus Norway and Turkey), these clients represented 6 % of the total number of clients receiving inpatient and outpatient treatment, in 2014. Taking into consideration that data for the number of clients in hospitals in outpatient-based treatment are not available (which may lead to an underestimation of the total number of clients treated in hospitals), we can conclude that hospital-based treatment represents a confined proportion of the total clients treated in Europe, on average. However, the data also show that the relative importance of outpatient and inpatient provision varies greatly within national treatment systems (EMCDDA, 2016).

underestimation of drug treatment expenditure. However, the relative importance of the number of clients in inpatient hospital-based treatment varies greatly between countries, so country-specific information is vital and, as Vander Laenen and Lievens (Chapter 13) state, considering the differences in treatment structures and coverage of estimates is important when interpreting cross-national studies.

Isolating drug-related expenditure from addictions expenditure

A common challenge when estimating drug treatment expenditure or costs is how to isolate drug-specific data from broader datasets, particularly those integrating alcohol-related information. Some countries have an integrated strategy that includes other substances such as alcohol (EMCDDA, 2016) and it may be desirable to conduct evaluations of both policies together. Ritter and colleagues (Chapter 1) found that it was impossible to disaggregate drug and alcohol expenditure, and their estimate includes both. Some international data sources such as the SHA do not disaggregate the costs of drug treatment from the costs of alcohol treatment. Therefore, at this stage, it may require additional modelling if the data from international sources such as the SHA are going to be used to estimate drug-specific expenditure.

National accountancy and reporting systems may record and report public expenditure data on drug treatment alongside expenditure data on mental health problems or dependencies such as alcohol dependency. Some of the studies aim to disaggregate this expenditure, often using treatment activity data. For instance, Genetti and colleagues (Chapter 8) extracted data on the costs of illicit drugs from an aggregate budget containing expenditure data on drugs, alcohol and gambling. Gonçalves and colleagues (Chapter 14) also isolated costs of drug treatment from a wider addiction budget that included alcohol and tobacco. Their analysis allowed the identification of marginal costs for different types of addiction. Musto (Chapter 10) states that adult substance misuse services in England are mostly integrated, with providers typically treating both drug and alcohol clients, and drug users often presenting with both drug and alcohol problems, which means that isolating specific spending on drug treatment can be challenging. Local authorities deal with this issue pragmatically within their financial returns, with some reporting combined alcohol and drug treatment budgets, rather than disaggregated spending, and others merely splitting their substance misuse budget by allocating half to drug and half to alcohol treatment. Within the cost calculator that the author describes, separate costs for alcohol and drug treatment are estimated using treatment activity data on the number of days in treatment.

These examples show that it is possible to disaggregate expenditure in some instances, particularly where detailed activity data exist. Nevertheless, it may not always be desirable to do so and again this will be partly dictated by the scope and objective of a study. Regardless, in every estimate it is useful to list the different types of substances and dependencies covered for each type of intervention that is included.

Identifying labelled drug treatment expenditure

The government budget is one of the most important policy documents produced by governments, as it contains details of the financial resources committed towards the implementation of policy objectives. A review of budget and/or fiscal year-end accountancy reports and other budget and policy documents for implemented or executed budgets can help identify expenditure on drug treatment. In public accountancy, data can be published both for planned budgets and for executed expenditure. Data may differ between the two because of, for instance, unexpected changes in the drug situation (the reactive nature of some drug-related expenditure means that these costs depend upon the number of clients presenting for treatment, which cannot be known at the beginning of the financial year) or changes in the prices of inputs used in treatment (for instance, a change in the price of medicines). Differences may also be due to the regular overall revision and increased accuracy of public accountancy data after some years of a spending exercise. The latest data available should be considered the most accurate.

The studies in Sections II and III of this publication show that, in practice, expenditure on drug treatment may not always be easily identifiable in public accountancy documents, as they may not contain the level of disaggregation required to identify drug treatment expenditure.

Drug treatment funding is often embedded in programmes found at many different government levels (central, regional and local government). The examples provided by Mikulić (Chapter 2) and Vopravil (Chapter 3) for Croatia and the Czech Republic respectively show the importance and

challenges posed by the consolidation of drug-related public expenditure, when spending is realised by different levels of the general government. Ritter and colleagues (Chapter 1) give the example of Australia, where different schemes financing drug treatment and their grant amounts are frequently labelled and can be found in a number of different sources, notably published public records, and extractable directly from the federal government budgets. Where possible, it is helpful to use two or more different sources as a check on the reliability of the figures. These authors found that sometimes data from different sources did not match perfectly. When this happened, they took the middle point for estimates. Furthermore, both Musto (Chapter 10) and Davies (Chapter 6) refer to the mainstreaming of the drug treatment budget into a wider public health budget in England. Along with a shift in responsibility for the allocation of drug treatment funding from central government to local government, this has had an impact on the availability of labelled drug treatment expenditure.

In order to overcome these difficulties, besides using the conventional approach of analysing public accountancy documents, some studies also rely on the contribution of key experts. The use of key experts is an established method often used to guide data collection and assist in the interpretation of data, as is the case of Hajnal and Kender-Jeziorska (Chapter 4). In some studies, for example those by Mikulić (Chapter 2), Vopravil (Chapter 3) and Musto (Chapter 10), key experts were asked to provide expenditure data themselves. Key experts used in the various studies included those responsible for consolidating health accounts, representatives from the relevant ministries, central and local government units and institutions responsible for the implementation of the national drug strategic documents, and treatment providers and commissioners. Experts should be selected based on their knowledge, position and a thorough assessment of bias and they can provide a valuable input into a project when appropriately selected. The choice of experts and the method of engaging them are important and will be influenced by the kind of information required and the resources available. Questionnaires may be appropriate for the collection of standardised expenditure data, while interviews may be more appropriate for gaining a better understanding of funding streams and data sources.

Unlabelled drug treatment expenditure

Public expenditure on drug treatment, however, is often not identifiable in accountancy documents and is embedded in broader budgets. This may include budgets of planned programmes that have elements of drug treatment alongside other elements such as criminal justice diversion schemes; wider budgets for the provision of healthcare services delivered on the basis of need, such as mental health and dependencies, or on the basis of the settings where treatment is provided, as is the case for hospital services. Budget lines that incorporate other addiction services such as alcohol or tobacco will also require disentangling to isolate drug-specific expenditure. These unlabelled expenditure items require identification before they can be measured and valued. Treatment system and funding maps can provide a useful tool for identifying relevant areas of unlabelled expenditure and for assessing the overlap with existing labelled expenditure data if relevant.

A key decision in the measurement and valuation of unlabelled expenditure is which modelling approach to apply. Two broad modelling approaches are commonly used: the top-down approach and the bottom-up approach. When data available on drug-related expenditure are embedded in broader programmes, the top-down modelling approach has been chosen. Models estimate the fraction that is attributable to drugs, based on objective criteria involving activity data. Bottom-up modelling requires knowing how much a unit of treatment costs, taking into account all possible productive factors involved in health provision and multiplying by the volume of the service utilisation.

There is no gold standard method and the decision on which costing method to use will depend on the scope and objective of the research and the availability of data and financial resources (Geue et al., 2012). As Hajnal and Kender-Jeziorska (Chapter 4) suggest, the top-down approach may be the only one feasible in countries with a lack of client-level data. It can also be cheaper and easier to implement than the bottom-up approach, although it may be less accurate (Mogyorosy and Smith, 2005). This is particularly so when services are not homogeneous, as it may assume that all services have an equal unit cost (Negrini et al., 2004).

The bottom-up approach, in contrast, is often more detailed than the top-down method, as it requires either data on the average unit cost of the different types of treatment provided or detailed information about the amount and price/wages/rents/tariffs of all types of resources used to provide a health service (such as staff, premises, equipment, energy, technology, prescribed medicines). As the Maksabedian and colleagues (Chapter 12) study shows, input costs as elementary as the price of medicines can vary significantly depending on the healthcare financing scheme paying for drug treatment, the setting

or the treatment provider. Therefore, a detailed inventory of costs related to a service is essential. This means that bottom-up estimates are often more complex and expensive to implement and may not fully take into account the costs that are not specific to that service (Negrini et al., 2004). Musto (Chapter 10) suggests, however, that this detailed method can be more robust and transparent and may allow exploration of the drivers of change.

All in all, there is a clear understanding that a mixed approach, using both top-down and bottom-up estimation methods, may be advantageous (Chapko et al., 2009).

The studies described in this Insights report used different approaches: bottom-up only, top-down only and a mixed approach. The bottom-up approach was used by Davies (Chapter 6), Origer (Chapter 5), Molinaro and colleagues (Chapter 7), Ritter and colleagues (Chapter 1) and Lievens and Vander Laenen (Chapter 9), and seems to be a common method for estimating hospital expenditure. This may be due to the availability of unitary costs and service utilisation data for hospitals and/or concerns about the high level of aggregation at the hospital level and the heterogeneity of services that the data cover. Indeed, the top-down approach was used in studies predominantly when the level of aggregation was low, for example when the starting point was addictions treatment expenditure, as in the papers by Gennetti and colleagues (Chapter 8) and Musto (Chapter 10).

One way to address uncertainties in the estimates and enable verification of the data is to conduct a comparison between a top-down and a bottom-up approach (Van Malderen et al., 2009). While Ritter and colleagues (Chapter 1) used a bottom-up methodology to estimate hospital expenditure, they carried out a top-down estimation as well and compared the results. They found a 15 % difference in estimated expenditure between the two approaches. This is of a similar magnitude to the differences between the two approaches found in other studies (Chapko et al., 2009). In Ritter and colleagues' analysis and in Chapko et al.'s (2009) study, estimated expenditure on hospital drug treatment tended to be higher using the bottom-up approach. If such sensitivity analyses could be carried out in other studies, it would assist researchers to assess both the most appropriate method to use and the potential impact of choice of method on their results.

Top-down approach and expenditure data

The top-down approach estimates the proportion that drug-related expenditure represents of the total broader budget, frequently with the help of activity data.

This requires the identification of both expenditure data sources and data sources on which to base the division. International databases include COFOG, published by Eurostat, and the SHA, published by Eurostat, the OECD and WHO. COFOG publishes data on expenditure by purpose and for the public sector in detail on health, by country. The SHA publishes data on total health and by sub-functions by purposes (18 sub-categories), by provider and financing schemes. These datasets benefit from the use of internationally accepted definitions, harmonisation of concepts and availability of annual data. Until 2012, differences were captured for expenditure data, with COFOG focused on government-funded healthcare and the SHA recording all expenditure on health. This led to large differences between the two databases in reported expenditure on similar items such as hospital services (Lievens et al., 2014). With the development of the SHA data system ([2]), this database has been improving, and it can be anticipated that the SHA will develop data for different financing schemes and, therefore, that data will be available for public sector expenditure on health, including for the 18 different functions. A European Commission Regulation adopted in 2015 requests that all EU countries report expenditure data annually using the SHA methodology for the reference year 2014 onwards ([3]). The high level of aggregation in the SHA dataset, in which drug-related expenditure is included within the category 'Mental health and substance abuse', may not allow drug treatment expenditure to be fully isolated. In their study, Lievens and Vander Laenen (Chapter 9) reviewed the international literature and databases to see if they could be used for estimating drug treatment expenditure.

The studies contained in this publication mainly used a top-down approach in cases where the expenditure data were more disaggregated. Musto (Chapter 10) and Gennetti and colleagues (Chapter 8) both sought to identify expenditure on an element of drug treatment and used expenditure on substance misuse services to do so. The tool described by Musto divides expenditure by days of treatment for the different types of treatment and can be described as a gross-costing method. Gennetti and colleagues used more of a micro-costing method to devise a 'repartition key'

([2]) See http://ec.europa.eu/eurostat/web/health/health-care/data/database
([3]) See http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX-:32015R0359&qid=1427698121193&from=EN

to apply to the expenditure data, which may reduce some of the inaccuracies in top-down methods, particularly in relation to resource use (Tan et al., 2009).

Ritter and colleagues used results from a survey of sampled GPs to find out what proportion of all prescriptions were for drug treatment and then applied that proportion to the overall expenditure on prescriptions. Other sources of data for separating out drug treatment expenditure may be administrative system data, activity data, annual reports and key expert opinion.

Bottom-up approach: measurement and valuation

In order to estimate expenditure on drug treatment using a bottom-up approach, it is necessary to have a measure of service utilisation and a value to attach to it. Data on service utilisation are more common for hospital inpatient services than for other levels of the healthcare system, so it is no surprise that the majority of authors estimating unlabelled expenditure used this data source to some extent. Activity data in hospitals and in many other healthcare settings are usually recorded using ICD-10 codes (from F11 to F19) referring to a diagnosis of mental and behavioural disorders due to psychoactive substance use ([4]). As Ritter and colleagues (Chapter 1) point out, however, the main ICD-10 classification does not correspond with a narrow treatment definition, given that it includes those seeking treatment for acute intoxication, psychotic disorders and other conditions related to their drug use rather than drug use itself. Using these data results in a wider estimate of expenditure. It is possible, however, to break down the diagnosis data further ([5]). For example, Davies (Chapter 6) used a more detailed breakdown of the ICD-10 code in England, which allowed identification of the clinical states (using an additional level of coding). This means that cases that do not fit with the treatment type being studied can be excluded. Data, however, are commonly reported only at the substance level and in few sources.

In addition to the consistency between the coding system and the definition of drug treatment used in the study, researchers need to take into account of the impact of the coding process and the context in which it is carried out on the accuracy of the activity data. The adoption of healthcare payment systems based on DRGs for hospitals across Europe means that patient diagnosis is directly linked to financial reimbursement ([6]). The DRG system is an inpatient classification system that differentiates the amount of hospital resources required to provide care. The basic set-up of DRG-based hospital payment systems is: (1) a patient classification system (PCS) is used to group patients with similar clinical characteristics and relatively homogeneous resource consumption into DRGs; (2) some kind of hospital cost information is used to determine DRG weight levels, usually at (about) the average treatment costs of patients falling within a specific DRG; (3) DRG weights are converted into monetary values and the payment rate may be adjusted for structural (teaching status, region) and further resource consumption variables (length of stay, utilisation of high-cost drugs or services); before (4) hospitals are paid on the basis of the number and type of DRGs that they produce.

This system may lead to 'upcoding', whereby patients are classified into codes that attract higher reimbursement, and is a problem that has also been identified within healthcare data drawn from health insurance databases. This practice was identified in the United States, but it has also been documented in European countries (Busse et al., 2013). It is suggested that, following frequent updating of DRGs and payment rates and the use of meaningful classifications, upcoding can be minimised (Steinbusch et al., 2007). Many countries also audit a sample of cases per year to check on coding practice. Where 'upcoding' is deemed to be a potential problem for measuring drug treatment activity, there are steps that can be taken to minimise the impact. For example, in Hungary, where this practice is deemed to be standard and where there are commercially available software packages that help coders allocate cases to higher reimbursement categories, Hajnal and Kender-Jeziorska (Chapter 4) used expert knowledge to identify what they call 'hidden' diagnoses and cross-checked the client against other indications of drug use such as attendance at treatment services. Using a methodology like the one used by Molinaro and colleagues (Chapter 7), which links the healthcare records of individuals attending treatment services to create an electronic health record from which treatment costs of conditions thought to be linked to drug misuse can be included or excluded, may reduce its impact. This method would allow researchers to determine the relevant conditions for an episode of treatment to be included in an expenditure estimate, depending on the study definition.

([4]) See: http://apps.who.int/classifications/icd10/browse/2010/en

([5]) While the F10-F19 coding system indicates the substance involved, the system used by Davies also specifies the clinical states. However, it should be noted that not all four-character codes are applicable to all substances; see http://www.who.int/substance_abuse/terminology/ICD-10ClinicalDiagnosis.pdf

([6]) DRGs are a way of grouping patients together into classifications based on both diagnosis and resource use. First implemented in the United States in 1983, the system was adopted by Portugal in 1988 and its use spread across Europe in the 1990s.

However, data linkage is not common and may not be possible in countries with strict data protection laws.

To cost the identified treatment activities, it is necessary to have a method of valuing the activities. The widespread use of activity based funding (ABF) means that there is often a source of cost data that is linked to activity data. Davies (Chapter 6), Molinaro and colleagues (Chapter 7) and Ritter and colleagues (Chapter 1) estimated unlabelled inpatient treatment costs from hospitals using unit cost data for the relevant patient group derived from the national tariff for reimbursement. These data are more accurately described as price rather than cost data, as they reflect the price paid within a certain country for the treatment delivered and may not reflect actual resource utilisation (Mogyorosy and Smith, 2005). The basis of the price calculation differs across countries and, although drawn from some kind of costing exercise, the final price may be adjusted for a number of factors, for example to encourage the adoption of best practice. Using insurance databases to attach monetary value to resources could be misleading in comparative studies because the reimbursement rate (cost-sharing rate) could differ significantly between countries (Boonen et al., 2003).

Often, however, the activity data are not recorded or reported using the same categories as the cost data. ICD-10 codes, which form the basis of healthcare diagnosis, need to be mapped to the relevant DRG. This is carried out using a computerised algorithm for the purpose of DRG allocation, but researchers may need to map the categories themselves. For countries with an identifiable drug misuse DRG category such as Australia, this is not an issue. Despite the widespread use of DRGs, they have been developed separately by countries and there are large differences in the number of groups and the grouping logic that underlies them (Busse et al., 2011, 2013). However, the SHA has been working on this topic and international organisations are aware of the need to harmonise definitions in order to facilitate international comparisons (OECD et al., 2011), for example in the estimation of drug treatment costs.

Furthermore, the proportion of hospitals covered by the DRG payment system differs across countries, and some types of hospitals, such as psychiatric hospitals, may be excluded from the DRG system (Busse et al., 2011). DRG costs may also be expressed in a different unit; for example, in England, inpatient hospital activity is reported using number of episodes or bed-days, but the cost data refer to a spell of treatment from admission to discharge, which can comprise multiple episodes. Where this is the case, the impact of the differences may be explored, as in England, where it was found that the majority of spells contained only one episode. Alternatively, another, more compatible, method of measuring unit cost data can be found. In Lievens and Vander Laenen's paper (Chapter 9), total expenditure on delivering inpatient hospital services in a country was divided by the total number of bed-days to calculate a unit price per bed-day. This is the same approach that was taken by Origer in Chapter 5.

Categorisation

The method of data categorisation is not fully harmonised across studies, although there are some common categorisation options used. Normally categorisation responds to the structure of service provision or to the structure by which expenditure data are organised. In wider public expenditure studies, categorisation has tended either to follow Reuter's classification of prevention, harm reduction, treatment and enforcement (Reuter, 2006) or to use the categories from COFOG, which has a category for health and sub-categories for medical products, appliances and equipment; outpatient services; hospital services; public health services; and R&D (OECD et al., 2011). However, these categories may not be sufficient for a detailed drug treatment expenditure study. Vopravil (Chapter 3), for example, although using Reuter's classification, created a number of sub-categories in order to allow meaningful analysis for Czech policymakers. The creation of nationally relevant and sufficiently detailed categories of expenditure should ideally be carried out within a framework of internationally recognised categories of expenditure. Mikulić (Chapter 2) provides an example of drug treatment spending classified according to both Reuter's and the COFOG classifications. Both classifications are possible but require additional work during the data collection exercise.

Within the healthcare field, the SHA is the main international system for categorising health expenditure. It was developed to allow an internationally harmonised way of recording health expenditure and to provide a tool for the monitoring and analysis of health systems (OECD et al., 2011). The SHA identifies three axes for categorisation: type of care function, care provider or funding scheme. As a guiding principle in their analysis, Ritter and colleagues (Chapter 1) sought to use the SHA categorisation. They found that they were

unable to accurately reflect drug treatment expenditure in Australia using just one of the axes and so took a pragmatic approach that blended mutually exclusive categories across the different axes.

Concluding remarks and next steps

Across the diverse studies in this Insights report there is one overarching similarity: the adoption of a pragmatic approach to the methodological choices. The scope and objectives of each study, as well as its potential users, provide the framework within which decisions on the way that the treatment definition is operationalised, on the perspective taken, and on the data sources and methods to be used are made. Yet these decisions will also be influenced by data availability and the resources available for carrying it out. A study will involve a series of compromises, and researchers need to choose what works best for them, while respecting the good practices applicable to the field.

The heterogeneity of studies presented in this report provides a rich source of information for assessing the impact of methodology on study results and building up a knowledge base on which methods and data are appropriate in different circumstances. It is therefore essential that studies provide detailed methodological information either within the study report or in a separate technical document. This also aids transparency and allows study replication. The methodological considerations identified here may provide a good starting point, but the reporting of methodological information should be as detailed as possible, including, for example, the documentation of all decisions, however trivial.

Mapping drug treatment systems, funding sources and the data available for a study provides a tool that helps guide estimates, assess the coverage of estimates and encourage the improvement of data systems. The SHA may provide a good framework for the mapping exercise. This should be seen as the first step in carrying out estimates and can be a valuable exercise in itself, even for countries where actual expenditure estimates are not possible at this time. A mapping exercise can also provide contextual information for the interpretation of study results. While the diversity of studies makes the comparison of results difficult, the reporting of methodological information and descriptions of the treatment systems and funding sources will aid interpretation of results.

Contextualisation of the values obtained by estimates of public expenditure on drug treatment is important, particularly if the results are to be used in the context of policy evaluation or to compare regions or countries. Factors such as the type of drug policy in place, the prevalence of drug use, the prevalence of problem drug use, the proportion of clients who have access to drug treatment, the type of treatment favoured (for instance, inpatient versus outpatient) or the socioeconomic context of the treatment provision (for instance, the GDP or the wealth of a region/country considered) should all be taken into consideration.

Additional challenges remain to be addressed. There are a number of issues that still merit in-depth assessment because of the lack of agreement on the best solutions and their potentially major impact on results. This includes, for instance, which associated comorbidities should be included in the cost estimates of drug treatment and how to deal with the fluid boundaries between the conventional categorisation of drug-related interventions for treatment and other interventions, harm reduction, prevention and social reintegration. Similarly, disentangling the costs of drug treatment from the costs of other types of treatment, such as alcohol, tobacco and wider mental health service costs, remains a challenge and good practice in this area still needs to be identified.

Developing methods to estimate public expenditure on treatment requires effective working partnerships between drug policymakers, specialists in health accountancy, drug treatment activity and those in charge of economic modelling. Continuous improvements require the extension and maintenance of such partnerships, with the goal of developing good practices, standards and guidelines in the field. While aiming to develop commonly accepted models for estimates, with procedures for regular updates, should be a target in the field, such projects clearly carry a cost that needs to be assessed and minimised.

While recognising the limitations imposed by currently available models and datasets, it is important to promote consensus-based improvements in estimation methods and work towards agreement on best practices. This publication has shed some light on current practice and, in doing so, it highlights a number of areas for future development, as outlined in the box below.

Towards improved methods for estimating expenditure on drug treatment

It is possible to identify certain good practices that can be used to improve and harmonise estimates of public expenditure on drug treatment. To fulfil this goal, it may be beneficial to:

- Ensure that clearly defined aims and objectives are developed for each exercise, and note that these may differ from case to case.
- Develop a clear definition of drug treatment for the study, including the operational definition applied in estimates. This should help to clarify the scope and objective of estimates.
- Adopt a clear operational definition of drug treatment that is consistent with the general definition of drug treatment and takes into account data availability and modelling approaches available.
- Develop a map of treatment provision and funding flows. This exercise will help identify missing data, minimise the risk of double counting and facilitate assessment of the coverage of estimates.
- Use, where possible, international recognised classification systems, such as the SHA, as a guide for identifying and classifying both healthcare service providers and financing sources. This ensures the use of a comprehensive conceptual accounting framework, supporting complete estimates and allowing cross-country and cross-sector comparability with other fields of health provision.
- Analyse all levels of government activity, budgets and/or fiscal-end accountancy reports to identify labelled expenditure on drug treatment, as responsibility for financing drug treatment can lie with multiple actors.
- Estimate unlabelled expenditure using both top-down and bottom-up modelling approaches where possible. Modelling decisions should be based on a pragmatic analysis of data and resources available, as well as the reliability and accuracy of estimates.
- Assess the overlap between labelled and unlabelled expenditure and take steps to prevent double counting of expenditure.
- Report detailed information about the estimation exercise, including the definitions, methods and data used.
- Contextualise the results of estimates. As the results of estimates will very much depend upon contextual factors, such as the extension of the use and the degree of risk taken by drug users and the social and economic framework or other social integration policies, setting results in context is key for insightful analysis.

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Abbreviations

ABF	activity-based funding
AIDS	acquired immune deficiency syndrome
ATC	anatomical therapeutic chemical
COFOG	Classification of the Functions of Government
COI	cost of illness (method)
DCLG	Department for Communities and Local Government (England)
DDD	defined daily dose
DRG	diagnostic-related group
EMCDDA	European Monitoring Centre for Drugs and Drug Addiction
EU	European Union
FDA	Food and Drug Administration (United States)
GDP	gross domestic product
GP	general practitioner
HBV	hepatitis B virus
HCV	hepatitis C virus
HIV	human immunodeficiency virus
ICD-10	International Statistical Classification of Diseases and Related Health Problems, 10th revision
IDT	Instituto da Droga e da Toxicodependência (Institute for Drugs and Drug Addictions, Portugal)
LAAM	levo-alpha-acetyl methadol
MAT	medication-assisted therapy
MBS	Medicare Benefits Schedule (Australia)
NDTMS	National Drug Treatment Monitoring System (England)
NGO	non-governmental organisation
NHS	National Health Service (United Kingdom)
NIDA	National Institute on Drug Abuse (United States)
OECD	Organisation for Economic Co-operation and Development
OST	opioid substitution therapy
OTP	opioid treatment programme
PHE	Public Health England
R&D	research and development
RCT	randomised controlled trial
SAMHSA	Substance Abuse and Mental Health Services Administration (United States)
SD	standard deviation
SHA	System of Health Accounts
SIND	Sistema Informativo Nazionale per le Dipendenze (Italy)
SSN	Sistema Sanitario Nazionale (National Health System, Italy)
TDI	Treatment Demand Indicator
VHA	Veterans Health Administration (United States)
WHO	World Health Organization

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TD-XD-17-001-EN-N

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