EVALUATING THE IMPACT OF LAWS REGULATING ILLICIT DRUGS ON HEALTH AND SOCIETY

Editors:
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FOREWORD

The goal of drug control laws and policies must be the health and well-being of humanity and a scientific, especially quantitative, approach must be used to evaluate current laws and policies.

This collection of papers highlights some important topics and tools for the scientific evaluation of various aspects and consequences of drug laws and policies.

In what follows, the term "drug" is used to denote what for a long time has been and still is largely defined as "illicit drugs", although new attitudes are emerging. Drug use and availability, public sentiment about drugs and drug use and some national legislations have changed radically over the past decades. There has been a distinct shift in the types of drugs used, with new and classical ones now co-circulating, which population groups use them, which drugs are deemed socially acceptable and in what circumstances, and how legal systems try to regulate drug use and drug supply.

Research and debate about drugs have distinct facets, many considered in this book, among which:

- The distinction between light and heavy drugs or, between light and heavy use of drugs and respective health aspects

- The legalization of light drugs vs their potentially increased use and measures to reduce over-use,

- Attitudes towards heavy, addictive drugs such as opioids and the balance between repression/treatment of users,

- The estimation of the supply side and the size of the illicit drug market and ways to control it,

- Assessing the impact of laws and policies regulating illicit drugs on health and society and their benefits and costs to society

- The difficulties associated with defining, understanding and measuring poly-drug use and its consequences,

- The problems in following the introduction and use of New Psychotropic Substances (NPS).

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This book contains a selection of essays about recent trends in analyses of the drug phenomenon and evaluation of laws and efficacy of policies, written by experts coming from different fields and different countries, representing a variety of views and cultures.

It will help readers to keep abreast with developments in this important sector of social life.

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Rome, February 2022
Gianpaolo Scalia Tomba
University of Rome Tor Vergata, Rome, Italy

PREFACE

"This is a time for science and solidarity, as United Nations Secretary-General António Guterres has said, highlighting the importance of trust in science and of working together to respond to the global COVID-19 pandemic. The same holds true for our responses to the world drug problem. To be effective, balanced solutions to drug demand and supply must be rooted in evidence and shared responsibility….

….highlights the importance of scientific evidence to strengthen responses to the world drug problem and support the people who need us. It also speaks to the ultimate goal of drug control, namely the health and welfare of humankind."

The purpose of the book is well summarised in the Preface to the World Drug Report 2020 by the Executive Director of United Nations Office on Drugs and Crime (UNODC) Ghada Waly.

Much research over the past 30 years has been devoted to evaluating illicit drug laws and policies on a scientific basis.

Even the Global Commission on Drug Policy has specifically emphasized in its reports the need to base the evaluation of drug laws and policies on scientific evidence.

This need is spreading all over the world, and many scientific projects have made the quantitative evaluation of policies using standard and novel indicators central to their objectives.

From various projects and interactions of research groups comes this book that brings together many themes and many evaluations of drug laws and policies using both standard approaches and innovative methods.

The themes of the chapters emerged from workshops in which the various authors participated over the years and from collaborations within international projects. The sequence of chapters also emerged from such collaborations.

The first chapter discusses an innovative approach in the a priori quantitative evaluation of laws by specifically scoring repressive aspects. This is a new aspect of evaluating laws using quantitative approaches through specific "policy indices" and, for the first time, "a priori" quantitative evaluation of drug laws has been used through an approach never before used in the field of illicit drugs, the leximetric approach.

The second chapter shows how another type of a priori evaluation can be carried out by modeling the expected consequences of a change in the law, such as the legalization of cannabis, using a mathematical approach that allows for the prediction and analysis of possible scenarios.

The application examples, from which the quantitative methods are derived, are intended to make the quantitative methods more familiar and usable in the policy arena.

Chapters three through six cover various aspects related to the use of the most harmful classic substance, heroin or opioids, dealing with health consequences with the example of using a large hospital dataset in Chapter 5 and the treatment of severe users. Special attention is given to the very important and effective HAT therapy, which is not applied in many countries for

ideological reasons, whereas it should be applied for ethical reasons. Chapter 3 outlines the history of the therapy, reporting clinical trials and their efficacy results. Chapter 4 shows efficacy from an application perspective, reporting examples of recent application in Canada. In Chapter 6, efficacy is also mathematically evaluated through an appropriate model. These chapters are particularly useful for policy assessments of the new epidemic of heroin and opiate use observed in the last decade in Western countries.

Subsequent chapters, from the seventh to the eleventh, explain the different aspects, related to demand and supply reduction policies, and the indicators used to assess the consequences of substance use. In particular, Chapter 7 presents poly-drug use and analyzes the correlation between ineffective prevention interventions and school dropout. In Chapter 8, treatment effectiveness is analyzed, reporting the results of various applications. This is a very interesting topic, as treatments are applied but are not always scientifically evaluated. In Chapter 9, supply reduction policies are analyzed by considering possible indicators and showing their use to evaluate their effectiveness. Chapter 10 considers the estimation of market size, analyzing various approaches, and Chapter 11 analyzes the judicial costs associated with enforcement interventions, comparing four countries. The last chapter shows, in summary, the link between the gains of criminal organizations and investment in corruption with further gains as forms of power.

The key point of Chapter 12 is the quantitative approach to the study of the correlation between illicit drug trafficking profits and the level of corruption, thus assessing the socio-economic consequences of corruption, which, because of the correlation, are directly linked the illicit drug market profits, thus involving the entire world population in the consequences of the drug market.

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CHAPTER 1

The First Application of Leximetric Analysis on the Drug Law in Italy

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Abstract: The leximetric is a quantitative analysis method that can be applied to any law, with the aim of evaluating the policy objectives of the study and its effects. It is also used to compare policies adopted in the same state over the years or in different states and the different impacts they have on social factors.

In the present work, we apply this methodology for the first time to the laws on the sale and consumption of psychotropic substances to quantitatively assess the *a priori* level of repression that they express.

The subjects of this study are the three different 'anti-drug' laws in force in Italy in the period 1991-2018. We first choose the variable that can express in the abstract the degree of severity of these laws, then we elaborate a neutral scale in which we explain how we assign every score (on a decimal or binary system) and lastly, we evaluate the laws using the variable chosen.

Keywords: Drug policy, Law enforcement indicators, Leximetric evaluation, Social-health indicators.

INTRODUCTION

In this work, our aim is to develop an effective analysis of the legislative policies to evaluate their capacity to carry out their scope and the effects generated on society, as well as social costs. From the criminal law point of view, Italian legislation against drugs generates moments of friction with various constitutional principles, especially the principle of offensiveness. Indeed, the protected legal value (*bene giuridico tutelato*) at the core of this regulation has been found in different categories public order; the security of society, the normal growth of new generations[1] that cannot be considered respectful of the personalized and constitutional conception of the protected legal value, drifting to forms of protection typical of a paternalistic policy.

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This is especially the case in terms of the consumption or cultivation of 'soft drugs' (*e.g.* marijuana), banned by State laws on the basis of the idea that this conduct is not healthy, which therefore clearly interferes in the sphere of each citizen's self-determination [1]. In addition, this interference realizes an irrational discrimination between the use of 'soft drugs' and the consumption of alcohol which is instead fully liberalized, even though the latter is much more dangerous for human health.

In the present work, however, the aim is not to dwell solely on the multiple reasons that deny, in the abstract, any legitimation of the 'war on drugs' that the Italian Government has waged over the last century. Rather, we try to analyse the social costs of the above-mentioned policy. In this way, we want to understand whether there are practical arguments that support this legislative policy.

For those reasons, in this paper, we choose to use a relatively new methodology of quantitative analysis leximetrics that has never been used before in the field of drug law. We aim, in this way, to evaluate the degree of severity of the regulation that, during the last 20 years, has criminalized the production, sale, purchase and consumption of drugs to make a comparison between this regulation and the changes that the enforcement of those laws brought about on some crucial social variables.

'Leximetrics' was first coined by La Porta, Lopez-de-Silanes and Shleifer in their work from 1998 [2], in which they examined legal rules covering the protection of corporate shareholders and creditors. During the last year, this methodology has been mainly applied in the field of either corporate law [3] or labour law [4 - 6].

HOW THE METHODOLOGY WORKS

To carry out a quantitative analysis of the regulation, the first step is to identify some core variables through which we can observe the severity of every single law. Next, we have to assign a value to every variable using a binary or decimal system, or even combining them. In the end, considering all the variables, we can extrapolate the final value of each law and then compare them and their impact on the evolution of 'social costs'. In this way, we mean to verify different hypotheses of the connection between law enforcement and other social factors.

Interpreting the legal rules by numbers allows us to examine the evolution of drug regulation in Italy over time our work examines the changes since 1990 and, by applying the same methodology to other States as well, it would even be possible to create cross-country analysis.

Obviously, this method also presents some critical issues. Firstly, it is an extremely complex task to translate a legal text into numbers, and it is thus impossible to annul all the risks of excessively simplifying the concepts analysed.

Secondly, the analysis is mainly based on the 'law in books', while we lose the point of the 'law in action'. Finally, the election of the variables, like the construction of the scale of values to assign them, is subjective.

Despite the problems underlined, thanks to this methodology we can put together a perspective that has never been explored before in assessing the evolution of the degree of severity of drug regulation. In this way, we can immediately appreciate the impact of that regulation on the health of consumers, on the jurisdictional costs and on social outcomes. Also, this typology of comparison between the scores attributed to the 'law in books' and the 'social costs' variables enables us to partially appreciate the real impact of the law, giving an idea of how the 'law in action' works.

Moreover, we tried to minimize the subjectivity of the analysis by first building a neutral scale to score the variables. Thus, we combine two different ways of scoring the variables: when we analyse the sanctions both criminal and administrative related to forbidden conduct, we use a scale out of ten, which allows us to better describe the complexity of the legislative solution adopted in each case. On the other hand, for the variables related to access to treatment for people with drug addictions (as seen *infra*), we prefer to score them using a binary system that naturally leaves much less space for the authors' subjectivity.

At any rate, it is easy to switch to different scales, as long as all the proposals are appropriate for representing the approaches of the different laws. Mathematically the leximetric scale, applied to various policies, is just a positive component vector. As a length, it can be modified to an infinity level, and it is only necessary to keep the ratios of the levels related to the different policies unchanged with respect to those identified above through scores with natural numbers, which are more easily understood by politicians.

Having evaluated laws *a priori* by assigning leximetric scores, it is then important to verify, through appropriate indicators, the *a posteriori* results of the corresponding policies that should be consistent with the scores. It is also important to verify whether the conduct evaluated (*e.g.* the sale or the use of illegal substances) is altered by laws or by other causes, such as the policy of criminal organizations in drug trafficking.

CHAPTER 2

A Review of the NERA Model Applied to the Recreational Use of Marijuana in the State of Washington

Yusra Bibi Ruhomally[1] and **Muhammad Zaid Dauhoo**[1,*]

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Abstract: Given that the legalization of marijuana is escalating in many parts of the world, the impact of Initiative-502 (I-502) in the state of Washington is appraised using the NERA model (N: Nonuser, E: Experimental user, R: Recreational user, A: Addict). Data available [12-15], on the prevalence of marijuana use, are used for analysis. To calibrate the model, genetic algorithm is performed for the periods prior to and post I-502. A rise in the peer pressure that recreational and experimental users exert on nonusers to try drugs in the post legalization period, is noted. The simulations show good agreement with the observed data, depicting the efficiency of NERA. Additional numerical investigations are conducted and the experiments show a growing tendency towards the population of marijuana users post I-502. The concept of targeted campaigns of prevention is explained and the effect of implementing such campaigns of prevention 1 year before I-502 on both the experimental and recreational users is examined. The numerical illustrations demonstrate a decline in the proportion of marijuana users when such campaigns of prevention are enacted 1 year prior to I-502. The present study provides a more feasible insight into the impact of I-502 and furnishes valuable perspectives to assist the health authorities in addressing the complex issue related to the rise of marijuana consumption. These findings can be useful to other states and countries considering changing the legality of marijuana use.

Keywords: Dynamical system, Genetic algorithm, Marijuana, Nera, Peer pressure, Targeted campaigns of prevention.

INTRODUCTION

The pervasiveness of illicit drug consumption has exacerbating impacts on human lives. The war against the distressing growth of illicit drug use seems irrepressible. Around 269 million people used drugs worldwide in 2018, which is approximately 30% more than in 2009, while over 35 million people suffer from

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drug use disorders, according to the World Drug Report 2020 [1]. It appears that the Covid-19 pandemic has already caused shortages of drugs on the street, leading to increased prices and reduced purity [1]. The Centers for Disease Control and Prevention's (CDC) National Vital Statistics System (NVSS) supports the claim that shortly after the pandemic emerged in the United States (US), monthly overdose spiked deaths from 50% to more than 9000 deaths between February and May 2020 [2]. The findings of the survey conducted [3] further vindicate that the recent rise in drug overdoses may have been boosted by numerous factors related to the Covid-19 pandemic.

With the changing landscape of marijuana laws in the US, there is a continuous debate over whether these laws have had an impact on the consumption of marijuana. The data from National Institutes of Health's (NIH) Monitoring the Future Survey show an increased prevalence of marijuana use among US teens in the past year, with 20.8% of 12^{th} graders, 19.4% of 10^{th} graders and 8^{th} graders at 7.0%. Past month marijuana vaping among 12^{th} graders nearly doubled in a single year to 14% from 7.5% [4]. Consequently, the epidemic of marijuana use in the US underscores the pressing need to examine and forecast the possible trends of marijuana usage in the population, which can furnish momentous insights to the government and policy decision-makers to adopt evidence-based policies on the problem of illicit drug use.

In a study [5], it is stressed that an increase in marijuana use is noted with the implemented laws. Some studies reported a positive effect against the enacted marijuana laws while a few investigations pointed out mixed effects on marijuana usage [6]. The aforementioned varied conclusions may arise when the impact of marijuana laws on the use of marijuana is scrutinised under different time scales. As stipulated in a study [6], a bunch of researchers have appraised the effect of marijuana legalization in a short time period, neglecting the fact that the legalization process often lasts for a few years. In addition, the behaviour of individuals towards substance use changes with time [7] and thus, it seems unrealistic to draw strong conclusions on the trend of illicit drug consumption when investigating within a small time frame. Alternatively, it appears more practical to explore and compare the trend of marijuana consumption before and after the legalization within a larger period in order to get valid information on the effect of the enacted marijuana laws. This major limitation forms the basis of the present study.

In November 2012, the state of Washington passed Initiative 502 (I-502) to legalise recreational marijuana use for individuals aged 21+. Several campaigns were created with the funding obtained and campaigns begun two years after the implementation of I-502 [8]. Due to the recent changes in marijuana policies in

many states in the US, the legalization wave is raising concerns on the impact of marijuana use among young people of age 15-30, before and after the

enactment of I-502. Differing views remain over the impacts of the decriminalisation. It is therefore crucial to quantify the progression of the different categories of drug users as pointed out in a study [9]. Whilst epidemiological data describes the phenomenon retrospectively, dynamic models can identify the evolution of a phenomenon through scenario analysis, thus providing a tool to simulate scenarios that are not possible in real life for practical or ethical reasons [10, 11].

Accordingly, in this work, the impact of I-502 on recreational marijuana consumption in Washington is gauged using a dynamic system termed as the NERA model [12]. Given that there is a continuous debate about the legalization of marijuana for recreational purposes and more states are considering legislation to legalise recreational marijuana use and/or sales, the present study proposes a retroactive investigation on what could have happened had preventive measures such as the enactment of targeted campaigns of prevention been taken in November 2011, that is one year before I-502, in Washington. It is imperative to point out that the present study deals with the abusive use of marijuana consumption for recreational purposes only.

The chapter is next channeled as follows: a description of the NERA system [10, 11, 13] is provided. The works of [10, 11, 14] are reviewed and an explanation of how the NERA model is applied to the state of Washington is illustrated. The NERA model is verified and validated using data [15], for the periods pre and post I-502, in Washington. The impact of I-502 on the use of marijuana amongst the population of 21+ in Washington is analysed. The concept of targeted campaigns of prevention applied to marijuana use is explained and corresponding numerical experiments are examined scrupulously. The concluding remarks are eventually provided.

THE NERA MODEL

People who become addicted to drugs typically go through predictable stages of abuse. Different models adopt different stages of illicit drug abuse. For example in a study [16], the categories are experimentation, regular use, problem or risky use, dependence and addiction. Schaeffer's model [17] consists of Experimental, Recreational, Circumstantial, Intensive and Compulsive users respectively. As pointed out in a study [18], the professionals involved in the field of illicit drug consumption define four main levels of drug addiction: Experimentation, Regular use, high-risk use, and addiction. It is highlighted that the transition between stages 2 and 3 occurs quite fast.

CHAPTER 3

HAT Wars: The Political History of Heroin-Assisted Treatment

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Abstract: This chapter examines the historical development of heroin-assisted treatment from the early twentieth century to the present day. It sk*etc*hes the philosophical underpinnings of those controversies surrounding the treatment, and the ways in which they have shaped the political and related drug-control environments in which debates over heroin-assisted treatment, and maintenance prescribing more broadly, have taken place. Within this rhetorical context, it argues that most of the notoriety of heroin and the harms with which it is associated stem, in fact, from the policies and controls about the drug, and contend that HAT mixes progressive intentions and methods with elements taken over from the repressive modalities of prohibitive drug control, rendering it a conflicted treatment that remains problematic for people who use heroin.

Keywords: British system of prescribing heroin, Diamorphine, Drug policy, Heroin-Assisted-Treatment, History of drugs, International drug control, Maintenance therapies, Pharmacological determinism, Social understanding, Swiss development of HAT, US influence on drug policy.

INTRODUCTION: THE CONTROVERSY OVER HEROIN-ASSISTED TREATMENT

Prior to embarking on this historical sk*etc*h of the historical and political trajectory of heroin-assisted treatment, I would like to say something about the conceptual framework within which the analysis functions. In a 2017 review of heroin-assisted treatment (HAT), the Swiss clinician widely considered to be the father of HAT, Ambros Uchtenhagen, lists a number of factors that structure public and medical concerns about the treatment, including fear of limitless demand, the attenuation of the will to recover, diversion to the illicit market, and so on [1].

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While doubtless these anxieties are indeed present, they are underpinned by deeper, often unconsciously held philosophical beliefs regarding drug use and

heroin specifically. One might summarise such beliefs by saying that they involve a purely pharmacologically determinist understanding of heroin, representing it as a dangerous drug that practically *possesses* its users, driving them to crime, social de*via*nce, and lack of any sense of responsibility to the remainder of humanity.

It is my contention here that, in bodily terms, heroin is in fact a relatively benign drug, and that the cluster of problems linked to it stems largely from the social policies and practices that contemporary societies deploy in their attempts to control the drug and its consumers. These deployments criminalisation, disease theories of usage, and the rest articulate heroin with a profound and complex set of social and psychological stressors, which in fact generate the harms that have become associated with the drug itself. HAT may offer a means to remove this set of stresses that impact the bodies and the experiences of people who use heroin. This objective is implicit in the treatment.

However, the strict supervision applied to the consumption of prescribed heroin under the HAT clinical apparatus arguably plunges the drug back into the social controls that generated the harm in the first place. Within HAT, which in many ways represents a progressive treatment and partially removes the social stressors from the lives of its patients, the pharmacologically determinist understanding remains operative, and the social understanding embedded in the treatment is not sufficient to counterbalance it. The treatment, therefore, retains elements of the reductive and dehumanising approach which has grown up with the prohibitive juridical system of drug control that has endured over the past century, and is, as a consequence, unable to access many of those who could otherwise benefit from it.

HISTORICAL CONTEXT

In order to trace the historical trajectory of Heroin-Assisted Treatment and the discourses and politics surrounding it, it is first necessary to discuss briefly the development of broader drug policies in the United States (US), Britain (UK), and continental Europe. The United States is, in many ways, the cradle of contemporary global drug policy. The international drug control regime not just in terms of the abstract overarching legal system as it is often popularly understood, but in the domestic policy arrangements obtaining within almost all present nation states is a creature of American drug policies.

The regime was inaugurated by the International Opium Convention of 1912 (the Hague Convention), and all those countries who were signatories to it were

required to enact laws that restricted drug consumption to 'medical and scientific' purposes [2]. Individual citizens of these nation states could only obtain drugs *via* the prescription, and in the early days of the system, dispensing of a qualified medical doctor. Some room was permitted for so-called deeply held constitutional principles, but in general, the national structure was elaborated and underwritten by a commitment to international drug control treaties.

Some may be surprised to learn that the United States was itself one of the first countries, indeed perhaps the first, to introduce heroin and morphine maintenance to its growing population of people dependent on these drugs, early in the twentieth century [3]. As will be outlined below, this situation did not last, and the US soon became the driving force behind the global prohibition of nonmedical drug use [4]. It was the first country to outlaw maintenance therapies [5]. In December 2018, the widely respected RAND Drug Policy Research Institute called on the US Federal authorities to conduct a Randomised Controlled Trial (RCT) on HAT in the US, in view of the fact that in 2018 America had witnessed some 47,000 opioid-related overdose deaths and more effective policies were consequently required [6]. The federal government so far failed to act in response to this call.

THE EMERGENCE OF ADDICTION

For millennia, opium (the latex produced by the poppy *papaver somniferum*) has been consumed for both relaxation and medicinal purposes [7]. There was no sharp delineation between these categories until the onset of social and technological modernity over the last few centuries. In the nineteenth century, the use of opium grew increasingly widespread in Europe, North America, and Asia, though as the century drew toward a close its social acceptability dwindled [8]. This was partly a consequence of the campaign against the British-controlled opium trade between India and China, the rise of metropolitan drug subcultures and the effects of the more potent alkaloids being extracted from opium by the modern pharmaceutical industry. Sertürner, a pharmacist in Paderborn, Germany, was the first to isolate the morphine alkaloid from the opium poppy in 1804, and by the middle of the century, the substance was central to the relief of pain in medical practice [9]. Morphine combined with the mid-century development of the hypodermic syringe to generate the conditions for first medical conception of addiction as a disease and concomitant attempts at treatment and cure.

The first known synthesis of diacetylmorphine took place at St Mary's hospital in London in 1874, but it was left to Bayer, a company of the highly successful German pharmaceutical industry to register the tradename 'heroin' for this substance in 1894 and to market it to North America and Europe. Heroin quickly

CHAPTER 4

The Effectiveness and Efficacy of Prescribed Diacetylmorphine (Heroin) in Reducing Drug-related Harms

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Abstract: Opioid overdoses have dramatically increased throughout the past 20 years. Overdoses and other harms associated with the use of the unregulated opioid supply have resulted in a consortium of approaches to reduce drug-related harms, which for decades has included heroin-assisted treatment, although there remains widespread reticence to implement this approach in spite of ample evidence to support its effectiveness. Heroin-assisted treatment is often reserved for persons who have attempted standard opioid agonist treatments - such as methadone - unsuccessfully in order to be eligible for heroin-assisted treatment in countries and regions where available. To date, heroin-assisted treatment is only available in nine countries, mostly in Europe. Heroin-assisted treatment has higher retention rates than other forms of opioid agonist treatments, is cost-effective, reduces overdose morbidity and mortality, and improves public order. Nonetheless, regulatory structures impede its implementation. The present chapter herein presents further details of the evidence on heroin-assisted treatment and newer treatment modality iterations, such as injectable opioid agonist treatment and safe opioid supply programs.

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Keywords: Diacetylmorphine, Diamorphine, Fentanyl, Harm reduction, Heroin, Heroin-assisted treatment, Hydromorphone, Injectable opioid agonist treatment, Medication for opioid use disorder, Opioid agonist treatment, Safe opioid supply programs, Supervised injectable heroin.

INTRODUCTION

North America has witnessed a staggering and sustained increase in fatal opioid overdoses during the past 20 years, with a particularly dramatic increase since 2015 [1, 2]. The recent surge in deaths is largely driven by the adulterated unregulated drug supply that contains highly-potent opioids like fentanyl [3] and others drugs including benzodiazepines, benzodiazepine-related drugs, and other tranquilizers [4 - 7] resulting in unknown drug composition and potency. Multiple public health and medical interventions have been proposed and implemented to address these preventable deaths. Examples include abstinence-based treatment options [8], harm reduction programs [9], and opioid agonist therapies (OAT) like methadone and buprenorphine/naloxone, which are considered the first-line, gold-standard opioid treatment options for opioid use disorder [10]. While OAT results in impressive reductions in overdose-related mortality and gains in health-related functioning for some people receiving treatment [11], these approaches have been associated with high rates of treatment discontinuation which frequently results in people returning to the unregulated drug supply [12, 13]. Some countries require the discontinuation of unregulated drugs assessed *via* drug screening in order to continue receiving OAT medications resulting in treatment termination [14], while other countries allow for the continued use of unregulated drugs while on OAT with drug screening among some recipients demonstrating an increased use of unregulated drugs [15]. As such, these OAT options aren't fully sufficient replacements and moving beyond first-line, standard treatment approaches for some individuals is imperative in order to reduce needless mortality rates. In response, options beyond traditional OAT have been innovated, trialed, and implemented. Heroin-assisted treatment is one such example, but regulatory structures in most countries have long impeded widespread implementation [16, 17]. These political barriers are fueled by controversy as heroin's therapeutic use for opioid use disorder often seems counterintuitive [18], and stigma around heroin use can overshadow scientific evidence and create hindrances to public and political acceptance [18 - 20]. In this chapter, we present evidence on heroin-assisted treatment, as well as newer modalities including injectable opioid agonist treatment and safe opioid supply programs.

WHAT IS HEROIN-ASSISTED TREATMENT*?*

Pharmaceutically manufactured prescription heroin (frequently referred to as diacetylmorphine or diamorphine) is used for heroin-assisted treatment (HAT) programs, and is also known as supervised injectable heroin [21 - 23]. HAT is often reserved for people with severe opioid use disorder who have attempted and were unable to stabilize on first-or second-line treatment options and continue to use opioids from the unregulated drug supply despite experiencing multiple health and social harms, including a high risk of fatal overdose and adverse outcomes such as HIV, Hepatitis C, and other infections [24 - 26]. Prescribed heroin has been used as a "last resort" form of treatment in the United Kingdom (UK) since the 1920s [27]. Pharmaceutical-grade heroin is manufactured in the UK, the Netherlands, and Switzerland [28].

As an opioid, heroin leads to tolerance (i.e., needing more of the drug over time to achieve the desired effect) and dependence (i.e., the development of withdrawal symptoms in the absence of the drug). Moreover, heroin is administered by many *via* injection, a mode of administration that expedites and enhances euphoric sensation [29] but is also associated with infections such as HIV, Hepatitis C, and soft tissue infections that if left untreated can result in significant morbidity and mortality [30 - 36]. Additionally, many of these outcomes are theorized to be shaped by the context in which drug use occurs, known as risk environments [31], and can include factors such as if people who use drugs have access to harm reduction programs that distribute sterile syringes, other equipment for drug use, and naloxone an opioid antagonist that reverses opioid overdose. While HAT programs were not originally designed to directly address overdose deaths, much of the current interest in them stems from the potential to replace or offset use of opioids from the unregulated drug market in order to reduce fentanyl-related overdose deaths [3]. To facilitate HAT, a healthcare provider with narcotic prescribing ability and in countries, provinces, or states in which regulatory structures have allowed for its dispensation can prescribe heroin to patients in a variety of settings.

Goals of heroin-assisted Treatment

- Improve the health of people who use drugs.
- Reduce the use of drugs from the unregulated supply.
- Reduce participation in illegal activities to procure drugs.
- Increase accessibility and retention in treatment.
- Social improvement and stabilization, including improved ability to work, housing stabilization, and financial security.
- Connection to harm reduction and other health care services.

CHAPTER 5

The Hospitalization Risk Profile of Opioids Users

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Abstract: Drug use-associated health problems are a complex phenomenon changing over time. Published studies regarding drug-related diseases are mainly based on emergency rooms data; moreover, most of these studies focus only on diseases related to injecting drug use (*i.e*. HIV, B and C Hepatitis).

This chapter presents a study based on an exhaustive nationwide source on hospitalizations in Italy: the National Hospital Discharge Database (NHDB). The hospitalization risk profile of opioids user was studied, in terms of hospitalization rates and observed comorbidities; age and gender differences were taken into account.

The NHDB collects data regarding all patients discharged from any Italian hospital, recording their demographic and clinical data. Cases analysed in the study: all the patients diagnosed with conditions related to opioid use during the study period 2005-2019.

To perform a more detailed analysis, opioids users also using other substances "poly-users" were studied too.

Main findings: i) Pathologies with the highest risk of hospitalization among opioid users: infectious diseases (i.e. infectious intestinal diseases, HIV, viral diseases with rash, chlamydia and other viral pathologies). ii) Risks are greater in women than in men. iii) In women, excesses of risk were also observed for Ischaemic heart diseases, cerebrovascular and respiratory diseases (this excess is also present in men), and diseases of the digestive and urinary system.

This nationwide study provides relevant information in terms of public health, giving indications to public services about the burden of diseases to keep under observation the opioid users.

Keywords: Age, Comorbidities, Gender, Hospitalization, Infectious diseases, Opioid users, Poly-users, Risk profile, Standardized hospitalization rates, Time trends.

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Carla Rossi and Susanna Conti (Eds.)

INTRODUCTION

Drug use-associated health problems are a complex phenomenon changing over time. Most findings available in the literature on drug-related diseases, apart from aspects related to mental illness, are referred to as blood-borne infectious diseases [1 - 3].

The European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) shows recent results on drug-related hospital “emergencies” from a network of sentinel hospitals across Europe. The data showed that among the substances, most commonly involved in “acute” drug toxicity events there are obviously heroin, but also other substances such as cocaine and cannabis and some prescription drugs [4]. Three-quarters of the patients were discharged directly from the emergency room, of these almost half were discharged quickly and only a minority of patients were hospitalized. The remaining quarter required admission to intensive care due to serious clinical characteristics.

Some morbidities have also been regularly analysed by EMCDDA and concerned those related to problematic substance use and, in particular, injecting drug use, i.e. infectious diseases transmitted through blood. Specifically, HIV and hepatitis B and C were monitored in the data analyses of the epidemiological indicator "Drug Related Infectious Diseases (DRID)" [5].

A 2015 EMCDDA insights volume has been dedicated to mental health disorders, and typical consequences of psychotropic substance use. This type of psychiatric comorbidity has also been considered in the international literature among comorbidities [6].

In any case, EMCDDA has not yet collected analysed data on hospitalized subjects, as those investigated in the study described in the present chapter, aimed to analyse the type of diseases most closely related to the use of the substances.

An exhaustive national source, the National Hospital Discharge Database (NHDB), was used to provide a comprehensive picture of the phenomenon of substance consumption-related morbidity.

Interesting findings and conclusions are presented below, along with suggestions for future development.

METHODS

Data Source

To study the pathologies affecting drug users, records from the NHDB were analysed.

The NHDB collects data regarding all patients discharged from any Italian public and private hospital after an urgent or planned (diagnostic or interventional) admission. For each patient, demographic data (*e.g.,* gender, date, place of birth) as well as the primary diagnosis and up to five secondary discharge diagnoses are recorded; diagnoses are codified according to the World Health Organization (WHO) International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM).

Case Definition

For the purpose of this chapter, the focus was kept on opioid users: the ICD-9-CM codes of diagnoses mentioning the use of opioids are presented in Table **1**. The "cases" analysed in this study are the patients diagnosed with the above-mentioned selected codes, reported as primary or secondary diagnoses on discharge forms. The study period is 2005-2019. "Incident cases" were defined as patients diagnosed with at least one of the selected ICD codes in their first hospital admission, occurred during the study period; a "washout" period (2001-2004) was used to avoid the inclusion of "prevalent" cases.

Table 1. ICD9-CM codes of the drug related diagnoses.

Substance involved in Diagnosis	ICD9-CM	Description of Diagnosis
Opioids	3040	Opioid type dependence
	3055	Opioid abuse
	9650	Opiates and related narcotics

To perform a more detailed analysis, we took into considerations opioids users using also other substances ("poly-users").

Statistical Analysis

For each group of patients hospitalized for at least one diagnosis mentioning the use of the opioid cted substances ("cases"), incidence rates, and age-standardized with the direct standardization method (Europe 2013 Standard Population as reference), were calculated by gender. Age and gender distributions of incident cases and rates were described; the gender ratio (M:F) was calculated, and its

CHAPTER 6

Epidemiological Models to Assess Heroin Epidemic Waves and Treatment Outcomes

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Abstract: Researchers have recognized, for more than half a century, the similarities between the modes of spread of drug use and those of infectious diseases. Such an assumption allows one to model the consequences of drug use and epidemiological indicators and, using available data, to make impact assessments of drug policies and short- and medium-term predictions of interventions, which modify visible and hidden aspects, such as prevalence and/or incidence to be estimated.

A crucial issue concerns models with "closed populations" or with "open populations." The former consider fixed populations, with no inputs (births, immigration, *etc.*), only deaths can occur, and allow only short-term predictions; the open population models, more complex, allow medium- and long-term predictions of policy interventions, providing information to decision-makers. Recent data on the visible consequences of heroin/opioid use (overdoses, emergency interventions, *etc.*) and Eurostat's recent European estimates of the rapidly growing heroin market (in Italy, over 64% growth between 2011 and 2019) show that a second epidemic wave of heroin use is currently underway. In contrast, in Denmark, as well as in Switzerland, there is definitely an 'endemic' behavior of heroin use, confirmed by the data on overdose deaths, which is very low in Denmark and decreasing for young people in Switzerland. The main cause of this is the so-called Heroin Assisted Treatment (HAT), used in Switzerland for more than 25 years, and in Denmark for more than 12 years, which can be called the anti-prohibitionist approach to treatment. The dynamic model, shown here, mathematically demonstrates the effectiveness of HAT.

Keywords: Drug supply, Drug use consequences, Drug use spread, Health consequences, Heroin Assisted Treatment, HAT efficacy evaluation, Heroin epidemics, Infectious disease modelling, Mover-Stayer models, Overdose deaths, Parameters, Problem drug use, Variables.

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INTRODUCTION

For more than half a century, researchers have recognised similarities between the mechanisms governing the spread of drug use and the spread of infectious diseases (the equivalent of 'contagion' is, for drug use, the transmission of knowledge of this 'innovative' social practice from one individual to another) [1, 2]. The epidemiological approach, derived from this assumption, allows modelling of available observational data on the 'visible' consequences of drug use, as well as short- and medium-term drug policy impact assessments and forecasts [3]. Drug models, of course, are more complex than infectious disease models, as they cannot benefit from direct measures of some critical quantities under investigation and rely only on measures of visible drug-related phenomena. Moreover, they cannot include hidden behavioural variables that influence the spread of drug use and the influence of the market, governed by criminal associations, on drug use beginning and increase.

As in economic and social studies models, the main indicators that can be used are “prevalence” (state variable = the number of existing cases at a given time), and “incidence” (= the flow of new cases occurring in each ‘period’). The approach is very useful for assessing the impact of drug policies and interventions and for providing short- and long-term forecasts about the visible and hidden aspects of drug use and supply. Using specific models, it is also possible to estimate the prevalence of users and dealers and the incidence of specific consequences such as deaths or treatment requirements.

Infectious disease and drug use epidemics also share an important qualitative feature: the presence of additional 'waves' after an initial large wave, followed by an endemic trend. New epidemic waves result first and foremost from the absence of effective control interventions. Even a disease that spreads by epidemic, if vaccination does not intervene, reappears in subsequent waves when the proportion of susceptible individuals increases sufficiently, through births and immigration.

Epidemic waves of covid-19 are now seen throughout the world and are therefore not an unfamiliar concept to anyone except a few ideologically influenced individuals.

A specific operational model with an open population [4, 5] can be used to explain the development of the second epidemic wave of heroin supply and use observed specifically in Western countries. The model can also be used to assess how policy intervention, regarding therapeutic assistance through Heroin Assisted Treatment (HAT), changed specific parameters and variables with the effect of significantly reducing and delaying the development of the second epidemic wave

of heroin supply where it is regularly used at the state level.

In the following section, the second epidemic wave of heroin use in Western countries is briefly reported using indicators, based on administrative data, on the consequences of heroin/opioid use and supply, such as overdose deaths.

Specific methodological tools, particularly mathematical-epidemic models, are then introduced in subsequent sections to link observed data with the hidden phenomena that generate them. This makes it possible to evaluate specific interventions implemented to control the prevalence and consequences of drug use by reducing supply and demand. The evaluation of policy interventions and the resulting trends in Italy and Switzerland are also discussed and compared, using the considered model.

Several general conclusions are reported in additional sections, including policy conclusions recently considered by international organizations calling for changes at UNODC for countries around the world. They are supported by the results of the evaluation of Swiss health policy compared with the general ones applied by other countries. The main finding specifically addresses the evaluation of HAT in Switzerland since much of the historical information about HAT and its health and social efficacy is explained extensively in Chapters 3 and 4.

SECOND HEROIN/OPIOIDS EPIDEMIC WAVE

The United States and Canada generally show trends in drug use that come directly to Europe, so it is useful to look at what has happened in North America [6] and, as far as Europe is concerned, in some European countries, such as France, the United Kingdom, Portugal and the Netherlands, which are part of the Eranid-IDPSO project[1] and, with a focus on providing a comparison, in Italy and Switzerland.

A specific section on the consequences of drug use in the Eranid-IDPSO project report is devoted to the use of the indicator of drug-related deaths due to the second wave of the heroin and opioid epidemic. Using official data, available on the OECD website [7] or on the official websites, the same OECD indicator is used for all the 7 Eranid-IDPSO, not just European, countries *i.e.*, the percentage change in the number of opioid-related deaths in the period 2011-2016 is evaluated.

The average value for the countries, which provided their data to OECD, is +20.72% and for the 7 Eranid-IDPSO countries the result, which is obtained, using both OECD and official websites as data sources, is:

CHAPTER 7

Development of New Indicators for Assessing the Level and Consequences of Drug Use: Applications and Comparisons

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Abstract: The chapter regards new drug use indicators that have been proposed and applied since 2014 to measure individual levels of harm from drug use also considering poly-drug use. Such behaviour has been increasing since 2000. Indicators are based on the frequency of drug use within a specific time period and expert groups' harm scores for the various substances used. The indicators allow the estimation of risk profiles for selected groups of individuals and comparisons over time and between populations. Recent advances in the classification of drug harms allow refinement of these indicators, separating harm consequences on self and effects on others.

The new indicators have been applied to many datasets of problematic or adolescent populations (ESPAD survey for example) allowing comparisons among countries and populations in the framework of international projects.

Using ESPAD-Italy survey information also related to personal behaviour, it was shown that high values of poly-drug use indicators are linked to specific behaviours related to interest in school, relationship with parents and use of leisure time. These results are consistent with previous analyses based on surveys among high school students in Italy.

The most recent applications illustrate how the new approach can be used to assess the link between drug use and personal behaviour among adolescents with school drop-out in order to design proper prevention policies.

Keywords: Drug use consequences, Drug use indicators, ESPAD dataset, ESPAD-Italy dataset, Frequency of use, Harm scores, Harm to others, Harm to self, Health indicators of drug use, High school students, PDU data, Poly-drug use, Poly-drug use indicators, Prevention, Risk profiles, Weighted average.

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Carla Rossi and Susanna Conti (Eds.)

INTRODUCTION

'New trends in drug consumption present new challenges for monitoring and assessing the demand for drugs, the size of the drug market and the lifestyles of users. Drug consumption shows higher and higher proportions of poly-use. Poly drug use has widely been recognised as a serious health risk (Kelly and Parsonos, 2008; Lamonica and Boeri, 2012). For these reasons, a large amount of research has focused on identifying which drugs are usually combined together and on the consequences of combining them (Kedia and Relyea, 2007; Makkai, 2001; Earleywine and Newcomb, 1997).'

This we wrote in 2013 at the beginning of the first work on new poly-drug use indicators published in 2014 [1]. In the paper, new indicators were proposed to better evaluate drug user behaviours based on the available data.

The proposed approach was based on the frequency of use of each substance for a single subject in the time period considered: lifetime, last 12 months, last 30 days. Poly-drug use was measured by adding up the frequency of use of any substance multiplied by the corresponding harm score of the various substances. Scoring was based on the van Amsterdam *et al.* classification [2], where the health and social impairment scores for each substance were derived using a Delphi procedure within an interdisciplinary group of scientists. Only the health consequence scores, which were provided with a vector of 3 values, were considered and the principal component method was applied to derive a single health harm score, denoted by W, for each substance, to be used to assess each subject's poly-drug use indicator.

Any drug user was then characterized by the two new scores: frequency of use score, denoted by FUS, and poly-drug use score, denoted by PDS.

The first application covered subjects from the surveys conducted in 2012 in the Low Threshold Services and in the Communities in the four countries then participating in the EU project JUST/2010/DPIP/ AG/1410: New methodological tools for policy and programme evaluation https://www.ce3s.eu/2012/01/27/eu-project-just2010dpipag-1410-new-methodological-tools-for-policy-and-programme-evaluation/).

The new scores were appreciated by researchers on drug use and drug policy and a project was designed to apply them to the ESPAD data from school population surveys, which is very useful in evaluating the start of drug use, as systematic analysis of substance use and related harm among adolescents is of paramount interest. The poly-drug use score represents the overall severity of harm associated with multiple substance use and may help to better monitor and

understand patterns and harms from poly-drug use, but also to assess the effects of policy interventions on both, drug users and the drug market, in reducing poly-drug use and the associated harm The indicators were then applied to the ESPAD survey data from various countries [3].

It should be remembered that at the same time as van Amsterdam, Nutt in the UK was also working on scores relating to the social and health consequences of each substance used [4] and in 2015 they published a very interesting new paper together [5].

All the scores proposed in the various works are consistent, but in the recent work, they are proposed as a single summary value related to health and a single value related to social consequences and therefore it is possible to evaluate the poly-drug use indicators directly without intervening first with principal component analysis on vector scores.

We will go into the details of the indicators in the next paragraph explaining specifically the score values from [5], reported in Table **1**.

The methodology from which the scores were derived is reported extensively in [6], where comparison is also reported between the health score, assessed by principal component analysis, used in studies [1] and [3], and the self-harm new score reported in reference [5] and used in subsequent works as a basis for poly-drug use indicators (Fig. **1**), the correlation coefficient is 0.844.

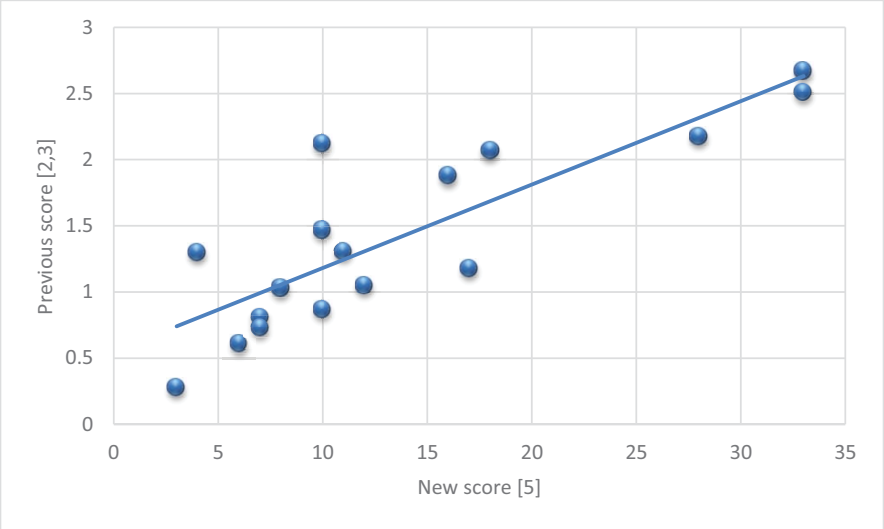

Fig. (1). Scatter diagram between the new score and the previously used score.

CHAPTER 8

Evaluating Treatment Outcomes from Drug Policies and Practices

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Abstract: Although the human right of individuals around the world has been recognised and enshrined in the United Nations 1966 Convention, global drug policies continue to debate the prevailing philosophies of treatment and practice and often fail to monitor, evaluate, and inform these policies with the best international evidence on what works, for whom, and when.

This chapter will introduce the need to evaluate treatment policy with an overview of treatment philosophies; discuss methodological considerations; measure outcomes and implementation; and finally, outline the future of treatment policy evaluation.

There is a widespread availability of a diverse range of drugs worldwide that are increasing in potency and purity with adverse consequences for individuals, families, communities, and societies. Due to the prevalence and complexity of drug use and marketing globally, along with the rights of individuals to receive appropriate treatment, there is a need for evidence-based information and research to develop the best international practice to ensure good treatment evaluation and outcomes.

Methodological considerations were discussed and examples of case studies, across a range of countries that measured outcomes were outlined, highlighting the importance of monitoring and evaluating the implementation of treatment modalities and philosophies.

Drug treatment policies and philosophies vary across countries due to practice, finances, resources, vested interests, resistance to change, and other constraints. Current practices need ongoing evaluation in terms of needs, process, outcome, client satisfaction, and economics in order to ensure that treatments are ethical and person-centred, meeting the goals of individuals rather than imposing perceived successful outcomes.

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Keywords: Abstinence, Addiction, Best practice, Drugs, Ethical, Evaluation, Evidence-based, Harm-reduction, Implementation, Legislation, Methodology, Modalities, Monitoring, Outcomes, Person-centred, Policy, Practice, Research, Substance use, Treatments.

INTRODUCTION AND THE NEED TO EVALUATE TREATMENT POLICIES

In spite of the recognition of the human right of individuals around the world enshrined in the United Nations 1966 Convention, global drug policies continue to debate the prevailing philosophies of treatment and practice and often fail to monitor, evaluate, and inform these policies with the best international evidence on what works, for whom, and when [1].

Globally, according to the World Drug Report 2021 [2], approximately 200 million people used cannabis in 2019 representing 4% of the world's population with North America experiencing the highest rates of prevalence at 14.5%. With regard to cocaine use, approximately 20 million people used cocaine in 2019 corresponding to 0.4% of the global population and its use was the highest in Oceania at 2.5%. Almost 62 million people used opioids for non-medical purposes in 2019 corresponding to 1.2% of the global population. The number of people using drugs worldwide has nearly doubled over the past decade, with increases in the last few years mainly driven by new estimates of prevalence in Asia and Africa.

Within Europe, the European Drug Report of the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) [3] highlighted the widespread availability of a diverse range of drugs of increasingly high purity and potency. These changes were observed in the large seizures of cocaine and other drugs during 2020. The report also found that patterns of use were becoming more complex, with people who use drugs being presented with a greater selection of substances to use. Drug production and trafficking also adapted rapidly to global travel restrictions and, in spite of the global pandemic, there was little evidence of any major disruptions in drug supply. Online platforms, on the surface and on the dark web, were increasingly exploited by drug traffickers with drug markets increasing in complexity.

Clearly no one continent, country or its people has been left unscathed by these challenges, yet there remains significant diversity in global drug policies, philosophies and the care for people who use drugs, their families, and their communities. Drug treatment philosophies may be simplified into a dichotomy of approaches, harm-reduction-based approaches and abstinence-based approaches. Harm-reduction philosophies according to Dale-Perera [4] are defined as:

"policies or programmes that focus directly on reducing the harm resulting from the use of alcohol or drugs without necessarily affecting the underlying drug use". Abstinence-based approaches have been, to date, synonymous with the American Society of Addiction Medicine (ASAM) (2013) definition, who define abstinence as, "Intentional and consistent restraint from the pathological pursuit of reward and/or relief that involves the use of substances and other behaviours" [5].

Treatment provided nationally or locally for people who use substances can only be provided in line with the national policy approach whether this is a harm-reduction, an abstinence based or a combination approach. However, regardless of the national policy, the provision of appropriate, continuous person-centred care and the protection of the human rights of an individual to receive this care is key and has been tested in the European Court of Human Rights (ECHR) in Strasbourg. In the case of Wenner v Germany 2016 [6]. Mr. Wenner had been using heroin for 17 years and for more than 16 years, from 1991 to 2008, he was enrolled and treated in a harm-reduction service and was receiving methadone and in 2008 he was sentenced to six years in prison. Mr.Wenner asked if he could continue his methadone treatment while in prison, but the prison authorities and courts refused, ordering instead a treatment based solely on abstinence. Wenner's legal team challenged this decision arguing that Article 3 of the European Convention on Human Rights prohibits torture as well as inhuman or degrading treatment. In the final judgment of the court, it was found that "The respondent State failed to comply with its positive obligation under Article 3. There has accordingly been a violation of Article 3 of the Convention" [6].

Given the scale of the drug prevalence, drug marketing and treatment challenges, and given the human rights enshrined and tested within the European Court of Human Rights, there is a need to ensure that treatment provided to people who use substances is evidence based, ethical, person-centred and meets the needs of the individual. The aim of this chapter is to provide a discussion of the methodological considerations for treatment outcome monitoring and evaluation illustrated by an international range of both traditional and novel treatment outcome case studies. Our objective is to provide the best international practice for treatment outcome studies and to learn from past work. We will also conclude with a note on best practice in implementation of such studies and the future for treatment outcome evaluation as we see it.

CHAPTER 9

Using Supply Indicators in the Evaluation of Drug Supply Reduction – Challenges and Opportunities

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Abstract: Interventions to tackle the supply of drugs, are seen as standard components of illicit drug policies and drug market-related administrative data, such as seizures, price, purity and drug-related offending, are widely used for policy monitoring and evaluation. However, these data are not primarily collected for this purpose, which makes interpretation and analysis difficult. Examples of limitations of these data sources include: the extent to which they reflect operational priorities rather than impact on drug supply; question marks over the robustness of and consistency in data collection methods; and issues around the timeliness of data availability.

Making sense of such data is therefore challenging and extreme care needs to be taken when using it. Nevertheless, given the considerable resources invested in drug supply reduction, understanding the impact of these interventions is essential, so improving the quality of the data collected and expanding its scope should be a priority for those seeking to understand or monitor drug markets and supply reduction. In addition to highlighting some of the potential pitfalls in using supply indicators for policy evaluation, this chapter presents some options for improvements based on the current European Monitoring Centre for Drugs and Drug Addiction programme of work to develop their supply-related monitoring and analysis. The conceptual framework developed to underpin this work may have wider applications and has the potential to provide a richer picture of drug markets, at both national and international levels, to aid efforts to evaluate drug supply reduction policies.

Keywords: Drug policy, Drug supply indicators, Drug supply reduction, Evaluation, Monitoring.

INTRODUCTION

The use of illicit drugs is a global phenomenon and the International Drug Control Conventions [1] on Narcotic Drugs, Psychotropic Substances, and the Illicit

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Traffic in Narcotic Drugs and Psychotropic Substances aim to restrict the production, supply and use of these substances while maintaining supplies for scientific and medical purposes. The conventions provide an international framework within which most national laws, policies and interventions that seek to control these activities are developed and, through its influence on the policies of the signatory nations, it also has an impact on drug use patterns, supply and markets. Although requiring criminal penalties for trafficking they also include provision for alternatives to punishment for dependent drug users.

Within this framework, most countries' drug policies seek to tackle both demand and supply so interventions to tackle the problems associated with drug markets and the supply of drugs are standard components of illicit drug policies, alongside activities aiming to reduce demand, such as treatment and prevention initiatives. Evaluating supply reduction activities requires not only an understanding of the markets, how they operate and the crime associated with them, but also measures of the activities being undertaken to tackle them. A range of drug market-related indicators, particularly administrative data, such as seizures, price, purity and drug-related offending, are now used in most countries for policy monitoring and assessment of the drug situation. In addition, international agencies, such as the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) monitor and report on the drug situation cross-nationally and therefore, seek to collect and make available key data in a uniform manner from the countries they cover. The data reported by different countries is collated, analysed and reported on and also made available to national governments and researchers for additional analyses to improve our understanding of the drug market, identify trends and new threats, for benchmarking, or to consider the impact of policies and programmes.

However, the illicit nature of the drug market limits the data available and interpreting them is challenging [2, 3]. For example, administrative data that are not primarily collected for policy monitoring or evaluation, such as seizures, are open to different interpretations: is an increase in seizures a positive sign (more efficient law enforcement) or a negative symptom (of increased trafficking and availability)? It is therefore important that those involved in drug policy monitoring and evaluation are aware of these challenges and seek to limit or take account of them in their analyses.

This chapter draws on the experience of the EMCDDA in improving the collection, analysis and reporting of supply-related data within the EU and other partner countries for a wide range of purposes including improving our understanding of drug markets, identifying trends and new threats, and considering the impact of policies and programmes. It aims to highlight some of the challenges in analysis and interpretation of drug supply-related data, while

also suggesting some opportunities for improvements, through increasing the range and quality of available data. It is based on a previous paper considering the use of supply-related data for cross-national analysis [4]. However, the focus of the chapter is on the use of supply indicators in policy monitoring and evaluation.

A CONCEPTUAL FRAMEWORK FOR DRUG SUPPLY INDICATORS

The EMCDDA has been working on developing the existing supply indicators for some time, in collaboration with a range of experts in the field [5, 6]. These are conceptualised as covering three broad thematic areas:

- Drug markets, drivers and facilitators – encompassing the whole supply chain, from illicit production/cultivation to trafficking and sale and considering both drivers of participation in these activities and enablers of drug supply, including different processes, actors, and environmental factors, such as weak governance;
- Drug-related crime, harms and other consequences – extending beyond drug law offences to consider other types of drug-related offenses [7] and harms to communities, such as the environmental impact of the dumping of waste from drug production;
- Drug supply reduction and responses – the law enforcement and other activities that are undertaken to tackle and disrupt drug markets and supply.

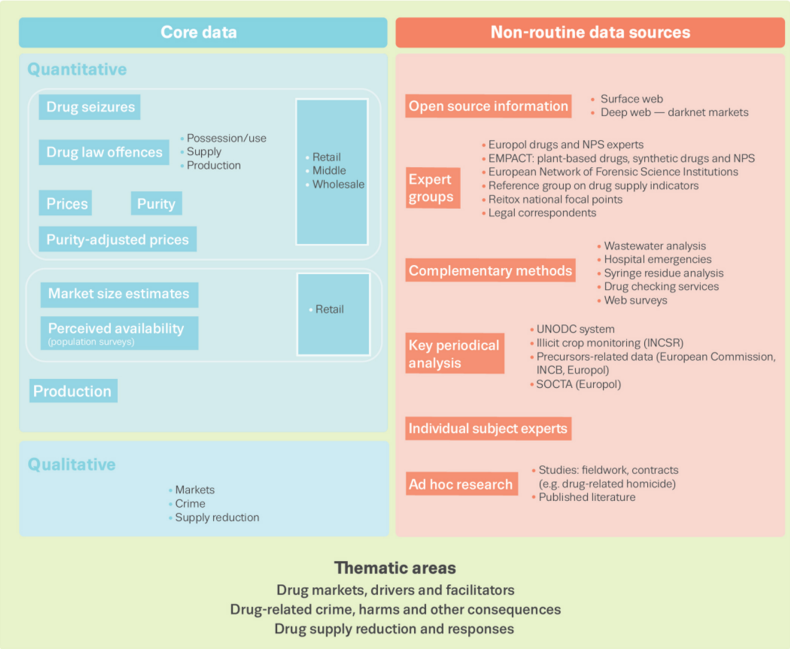

Fig. (1). The EMCDDA drug supply monitoring system.

CHAPTER 10

Estimating the Size of the Drug Market – A Critical Review of Approaches Used

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Abstract: Both policymakers and the public are interested in the size of the drug market. However, often both the origin and the veracity of estimates made in this area are unclear. To help understand this topic, this chapter summarizes the findings from a literature review of studies that have attempted to produce an estimate of the size of the drug market. Different methodological approaches and the challenges inherent in estimating the size of drug markets are discussed. The greatest attention is given to demand side approaches as they have been most commonly used; however, the supply side and some more recent innovative approaches are also considered. The chapter concludes by making some recommendations for future studies intended to improve the evidence base in this area.

Keywords: Drug demand, Drug epidemiology, Drug market estimation, Drug supply, Wastewater based epidemiology.

INTRODUCTION– ESTIMATING THE SIZE OF THE DRUG MARKET: A CHALLENGING PROPOSITION

Both policymakers and the public are interested in the size of the drug market and estimates appear in both government and media reports. However, both the origin and the veracity of these estimates are often unclear. A review of the research undertaken in this area reveals a number of studies that have attempted to estimate the quantities of drugs consumed in specific markets. Overall, however, there are surprisingly few studies available to inform a discussion on this topic, reflecting the considerable difficulties associated with producing credible market size estimates (MSE). In this chapter, we will attempt to shed light on this topic

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by exploring the methodological approaches that have been used and the challenges of estimation and interpretation.

The discussion here draws on a literature review to identify studies that have attempted a market size estimate (MSE). This was formative work conducted as part of a project to improve approaches to estimating the size of the European drug market. The full report of this project is available and provides details of the methods used [1]. Twenty-one case studies were identified, just under half of which focused on cannabis only. It is worth noting that limitations to the evidence base in this area are not just the small number of studies available but also the fact that not all drug types have been given equal attention.

The size of a "drug market" is usually operationalised to refer to the quantities of a particular illicit drug available to, or used by, a given population during a given timeframe. Less commonly monetary values rather than quantities have been estimated. A parameter necessary for any estimation is the geographical boundary that the estimate applies to. Of the studies that informed this discussion, one attempted to produce a global estimate whereas all others produced national estimates, with the USA and UK accounting for around half of all studies identified. Thus, another limitation of the evidence base in this area is the lack of geographical coverage. This is important because it cannot be assumed that estimates made in one drug market are applicable elsewhere or that the methodological approaches used are necessarily easily transferrable.

APPROACHES TO ESTIMATING THE DRUG MARKET

Conceptually, two main strategies have been used to estimate a drug market's size. These can be characterised as: demand-based or bottom-up approaches and supply-side or top-down approaches. Demand side approaches have been most used and will be given greatest attention here.

Demand-side Approaches

Conceptually, a relatively simple approach to estimate the size of an illicit drug market is to calculate a "drug consumption estimate". In theory, this can be accomplished by multiplying the number of users of a particular drug by the amounts of drugs they consume during a given time period. This approach requires us to consider two challenging issues for drug epidemiology – how to measure drug prevalence and how to measure the quantities of drugs consumed?

For the purposes of MSE, even if we restrict our attention to a single substance, we also need to recognise that data on some sub-groups of drug consumers is likely to be particularly important for the construction of an accurate estimate. We

know from studies of alcohol that a relatively small number of heavy consumers account for a disproportionately large share of overall consumption. In Switzerland for example, around 11% of consumers are estimated to consume around 50% of all alcohol used and similar patterns have been observed for cocaine and cannabis [2, 3]. A methodological consideration is therefore the extent to which samples are representative of different drug consumption patterns and that data on the behaviour of a relatively small number of high-quantity consumers are included in the estimate. To accomplish this, studies in this area have often stratified their sample in some way rather than simply calculating an average consumption estimate for all consumers of a particular drug. Many studies therefore start by trying to group the population of drug users of interest into behavioural categories based on their typical consumption patterns (daily users, occasional users, *etc*), and then calculate average consumption estimates for each of these groups separately. Data from other sources (behavioural studies *etc*.) may be necessary to inform the calculation of each estimate. A potential problem is that the more detailed data needed to accomplish this task may be simply unavailable, unreliable, or difficult to collect.

Faced with problems of data availability, some studies have taken an alternative approach that removes the need to collect detailed information on consumption patterns. Rather than trying to quantify consumption patterns, they measure typical expenditures on drugs in a given time. Provided sufficient information is available on drug prices, it is then possible from the estimation of the market's overall value to back calculate the quantities needed to support this level of expenditure. This approach still requires an estimation of the number of users but assumes it is a better strategy, for either practical or methodological reasons, to estimate average expenditures rather than to estimate consumption. The method can be elaborated by including additional information on discounting, gifts and market structure, for example considering if high-purity products or different formulations of a drug are available that are differentially priced.

Estimating Drug Prevalence

A challenge for demand side approaches is that they require an estimate of the number of those using the drug(s) of interest. Despite their well-know limitations [4] for collecting information on often low prevalence, stigmatised, and hidden behaviours like drug use, many studies that attempt a MSE have used data on drug prevalence generated by surveys of the general population (GPS). Prevalence rates are then applied to census data which allows an estimate of the overall number of drug users within the area of interest. In addition to the more general question of the adequacy of GPS for measuring drug use per se, another issue here

CHAPTER 11

Estimating the Costs of the Criminal Justice System

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Abstract: This chapter looks into the economic costs of drug control to the criminal justice systems in four European countries, Italy, Poland, Portugal and Spain as a contribution to the debate on the costs of illicit drugs to society suggesting paths for investigation.

At the global level, extensive evidence has been collected and research has been carried out on the importance of estimating the costs of crime to society [1]. However, there is still little evidence on some aspects of the criminal justice costs considered in relation to the laws and regulations for which they were incurred. The study of Farrell and Clark [2] is one example of an empirical estimate of the direct cost of public expenditure on the global criminal justice system. Using six different regression models, the study found that there was a direct relationship between the wealth of nations and the amount spent on criminal justice: richer countries spend more GDP per capita than less developed countries.

Italy, Poland, Portugal and Spain show both differences and commonalities in terms of their geographical position, economic development and criminal justice system organization in relation to drug control. All four countries are based on a civil law system and have old judicial traditions.

The analysis shows that drug-related costs for the three sectors considered (police, courts and prisons) as a share of GDP, from 2010 to 2018, have increased only for Poland, while for Italy, there has been a slight decrease and for Portugal and Spain drug-related justice expenditure has sharply decreased.

Keywords: Cost of justice, National economy, Politicisation of drug research, Prohibitionism, Social costs of drug use.

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INTRODUCTION: OBJECTIVE AND METHODOLOGY OF COST ANALYSIS

This chapter aims to analyse the costs to the criminal justice system of controlling illicit drugs in four EU countries, Italy, Poland, Portugal, and Spain in a comparative analysis between 2010 and 2018. The study estimates only direct costs for the following three criminal justice sectors: police, justice (prosecutors' office and courts), and prison.

Cost estimation was conducted to shed light on the internal distribution of illicit drug control resources across the four countries, *i.e.,* to understand how each country allocates the different budget shares dedicated to drug control in the criminal justice chain, *i.e.*, police, justice, and prison. Cost estimates are then compared across the four countries to highlight differences in the type of drug control legislation in place.

This chapter examines the economic costs of illicit drug control to criminal justice systems in four European countries, Italy, Poland, Portugal, and Spain, as a contribution to the debate on the costs of illicit drugs to society, suggesting avenues of investigation.

Globally, there is ample evidence and research on the importance of estimating the costs of crime to society [1]. However, there is still little evidence on some aspects of criminal justice costs considered in relation to the laws and regulations for which they are incurred. The study by Farrell and Clark [2] is an example of an empirical estimate of the direct cost of government spending on the overall criminal justice system. Using six different regression models, the study found that there is a direct relationship between the wealth of nations and the amount spent on criminal justice: wealthier countries spend more GDP per capita than less developed countries.

Italy, Poland, Portugal, and Spain show both differences and commonalities in terms of geographic location, economic development, and criminal justice system organization in relation to drug control. All four countries are based on a civil law system and have old judicial traditions.

The analysis shows that drug-related costs for the three sectors considered (police, courts, and prisons) as a share of GDP, from 2010 to 2018, increased only for Poland, while for Italy, there was a slight decrease and for Portugal and Spain, drug-related justice spending decreased sharply.

For the law enforcement and supply reduction sector, the estimate was obtained for 2010 and 2018 by dividing the total cost of police salaries by the total number

of all officially recorded crimes. In the definition of officially recorded crimes, all crimes recorded by police officers according to EUROSTAT were included. The resulting average cost per crime was then multiplied by the number of drug-related crimes (defined as including drug possession, drug dealing, and drug trafficking) to obtain the estimated cost of drug-related police salaries in 2010 and 2018.

For the judicial branch, the estimate was obtained for the years (2010 and 2018) by dividing the total approved annual budget allocated for staff salaries by the total number of all officially recorded crimes, as defined above. The resulting average cost per crime was multiplied by the number of drug-related crimes. For the justice sector, a second estimate was also obtained based on the total approved annual budget allocated to the entire justice system (as reported by the CEPEJ Report for 2012 and 2018) divided by the total number of all officially recorded crimes. The resulting average cost per crime was then multiplied by the number of drug-related offenses. Rather than using the number of prison sentences to construct the estimates, we decided to use the number of drug offenses because prison sentences alone would not account for all costs, as they are only one part of the judicial process and would not include, for example, the costs of prosecution, the length of court proceedings, or the costs of remand.

For the prison sector, the estimate of drug-related incarceration costs was obtained for the years 2011 and 2018 by multiplying the number of person-days of incarceration for drug-related offenses by the average cost per day. The prison population reported in specific days was multiplied by 365 to obtain an average daily prison population to arrive at an annual estimate of person-days incarcerated. Permanently sentenced inmates generally do not constitute the total number of inmates. Other types of inmates were added to the calculation, assuming that the proportion of such inmates held for drug offenses is the same as convicted individuals. The number of non-convicted individuals (inmates) was calculated as the difference between the total reported prison population and the convicted prison population.

Costs for the three sectors considered, public police, justice, and prisons, were then normalized for GDP, population, purchasing power parity, and average wage values for the four countries in order to compare the costs of countries with different levels of economic development and population sizes.

Data were collected from international and national institutional sources. The main data sources accessed and items researched are listed in the Data Sources section.

CHAPTER 12

Drug Crime and Corruption

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Abstract: Non-transparency, *i.e.,* widespread corruption in public administrations, favours organized crime in all its activities.

This chapter shows that this is not only an ethical-philosophical statement but is also statistically verifiable and it is possible to estimate the damage that the level of corruption causes to the legal economy and other sectors.

Corruption is measured here through the index elaborated by Transparency International, whose reliability is verified by comparison with two other indices, recently proposed at the international level.

The most important result is the significant link between the turnover of "drugs", in various countries and in various years, and the corruption index, in the same countries and in the same years, as verified based on official data and official estimates, showing quantitatively how the earnings of criminal organizations are largely invested in corruption.

It then highlights specific aspects that are related to the level of corruption such as the link, very significant, between transparency and competitiveness, the latter measured by the World Economic Forum indices, showing how corruption negatively affects the legal economy of the country and, using additional indicators, other important aspects as Life Satisfaction, Education *etc.*

Keywords: Competitiveness, Corruption, Criminal organizations, Drug market gains, Illegal drug markets, Indices of corruption level, National economy, Transparency.

INTRODUCTION

Illegal drug markets provide an immense source of power and revenue for organized criminal groups. That has remained the case despite the vast investment of political, financial, social, and military capital into the global "war on drugs,"

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which has also generated a vast and tragic human cost. Far from curtailing drug markets, which are in fact expanding in scale and complexity worldwide, repressive criminal justice and military responses to drug trafficking have exacerbated the already profound impacts of drug-related organized crime from prolific violence in certain states to increased corruption, and undermined political and economic stability.

So here begins the executive summary of the 2020 report of the Global Commission on Drug Policy [1], where there is also an extensive bibliography.

The Organization for Economic Co-operation and Development (OECD) also recognizes that organized crime provides a key element in the failure of states to achieve development goals, both in high- and low-income states. It also argues that the cyclical links between inequality and corruption are exacerbated in contexts where drug trafficking is prevalent [2]. The interesting fact showing the consequences of corruption in various sectors (extractives, infrastructure, health and education), provided in [2], is reported in Table **1**.

Further qualitative information on all these topics can be found on the internet, using the keywords: corruption, consequences, and drug trade.

These general considerations provide a very appropriate framework for this chapter in which, after giving a brief outline on the assessment of the level of corruption, measured by various indicators, we show that the adopted corruption index, based on Transparency International's assessment, changes on average as a function of the gains associated with the illegal drug market. Using official estimates of these gains, made in different countries, and, assessing their correlation with the corruption index, in the same countries and in the same years, we obtain a robust clue to the hypothesis that drug trade gains are largely invested in corruption, as argued in the literature. Statistically based quantitative assessments of some corruption-related consequences/causes are also provided.

Below are the main results obtained with the quantitative analysis, using the corruption index, obtained as a complement to CPI which measures transparency, as comparisons of CPI with other indices of transparency, reported in [3, 4], show its robustness. Specific indicators, related to the main corruption 'consequences/causes', as indicated in the reports of the Global Commission on Drug Policy and OECD just qualitatively, are analysed as statistical mean conditioned with respect to the corruption index values.

Table 1. Consequences of corruption across sectors.

	Extractives	Infrastructure	Health	Education
Misallocation of state revenues	Budget skewed away from services for the poor. Resource dependency common.	Over-investment and mis-investment in infrastructure facilities.	Budget cuts. Health and pharmaceutical subsidies. "Corruption-friendly investments" (construction, building, consultancy services).	Lower value for money (education is one of the bigger posts on national budgets).
Wasted resources	Illicit financial flows may reflect stolen state revenues. Inefficient sector governance hampers production and revenue potential.	Too-expensive subsidies. Over-inflated costs in construction cause losses for tax payers	Ghost workers and absenteeism facilitated by corruption.	Leakage of funds allocated for education. Ghost workers and absenteeism.
Inflated prices	Framework conditions for industrial development in other sectors of the economy largely neglected, resulting in uncompetitive prices for individuals and firms.	Bribes demanded for access to water and electricity. More expensive power supply.	Inflated prices of medicines and services.	Extra (informal) payments for textbooks, certificates/ grades and teachers' salaries.
Reduced quality	Few consequences if services are inferior. Lower quality of basic service delivery, including health and education.	Low-quality roads and other constructions. Poorer utility service provisions (like power cuts).	Substandard and fake medicine. Lower quality of health services offered.	Inferior teaching. Lower-quality school facilities. False diplomas (grades not reflecting qualifications).
Scarcity	"Scarcity" of competitors if tenders for oil licenses are manipulated.	Network services not necessarily provided to all districts, despite contractual commitments.	Lack of medicines (non-availability, sub-standard, or fake/not working).	Teaching not taking place. Insufficient supply of teaching services and school supplies.
Unfair allocation of benefits	Political corruption causes income inequalities.	Poor segments more exposed if there is government failure behind the provision of electricity, water and sanitation.	Health care allocated to those who pay bribes, and less upon needs.	Good grades to those who pay. Private schools not available for poor segments.
Other negative consequences	Conflict/civil war, terror attacks, bunkering (stolen oil), illegal mining, environmental damage, lack of safety in production (causes health damage and deaths).	Tax/accounting-related fraud. Theft of electricity supply. Embezzlement in construction. Low quality construction claims lives.	Fake medicines – sold by help of corruption and linked to organized crime. Lack of treatment claims lives.	Embezzlement of public funds – from the central level to each single school.

EARN MONEY IN ILLEGAL DRUG TRADE AND INVEST IT IN CORRUPTION: CONSEQUENCES

In [5] a study of the relationship between corruption and profits from the illicit drug trade is reported. The authors specifically argue that profits from drug trafficking and the illegal economy are partially reinvested in the legal economy, thus increasing the overall level of corruption. They use data from a UNODC report [6] in which the global turnover of organized crime is estimated at about $870 billion per year (1.9% of global GDP), 580 of which is available for money laundering. They also show, through maps, that the countries of origin and transit

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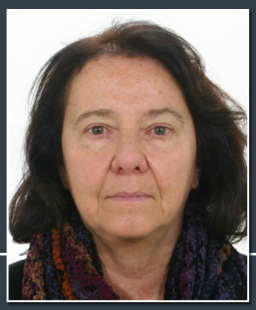

Carla Rossi

Carla Rossi, degree in Mathematics, full professor of Mathematical and Medical Statistics from 1981 to 2015, has published more than 200 scientific articles and monographs on: mathematical models for life sciences, biometrics and biostatistics, mathematical and statistical models for social and health problems, teaching mathematics and statistics.

She has participated, mainly as coordinator, in many national and international research projects. She has been a member of several ethics committees for clinical trials.

For 16 years (1999-2015), she has been a member of the Management Board of the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) representing the European Parliament.

Susanna Conti

Susanna Conti is an epidemiologist and biostatistician (degree in Mathematics) who has worked for 40 years in Public Health research at the Italian National Institute of Health holding the position of Director of the Statistics Unit since 1999.

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She has been principal investigator in many European and Italian projects; author of more than 200 publications and book chapters.