we can proceed to tackle the even more complex issues of a growing medical cannabis industry and learn from other countries that may be in a strong position to acquire data on medical cannabis use and products more systematically.

DECLARATION OF INTERESTS

S.R.B.W. has stock ownership in Merck and General Electric; N.D.V. has no conflicts of interest.

AUTHOR CONTRIBUTIONS

Nora Volkow: conceptualization, manuscript preparation. **Susan Weiss**: conceptualization, manuscript preparation

KEYWORDS

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We need convincing data to support a public health approach to cannabis regulation

Agreed measures of cannabis use and impacts are essential in evaluating regulatory change and supporting policy decisions driven by public health evidence. A shared understanding of measures also responds to the call for greater collaboration and coordination in cannabis research. The iCannToolkit provides a collaborative foundation that can be expanded to additional domains and to address emerging and context-specific data needs.

The article by Lorenzetti *et al.* highlights the challenges posed by the lack of agreed minimum standards for quantifying cannabis use or dosage [1]. It also demonstrates a collaborative approach to reach agreement on measures, with the potential for expansion to support a more comprehensive understanding of the impacts of cannabis regulation.

Canada's regulated retail cannabis market launched in October 2018, joining only Uruguay and a handful of US states that had previously legalized non-medical sales and use. Canada's Cannabis Act sets

out clear objectives for legalization, focused upon public health and public safety [2]. It also mandates that a review of the administration, operation and impact of the act be conducted 3 years following implementation.

Currently, in 2021, more than 20 states in the United States have passed or are in the process of passing legislation permitting adult non-medical cannabis use and steps towards legal retail are being taken internationally, including in Mexico, Malta, Switzerland, Luxembourg and the Netherlands. Those considering legalization are looking to learn from the experience of those who have gone before. Also, Canada's legislative review of the Cannabis Act is poised to begin, opening a window during which public health, public safety, academia, government and industry, among others, will attempt to influence regulatory adjustments.

To monitor the impact of legalization Canada has invested in two national population surveys, the National Cannabis Survey and the Canadian Cannabis Survey, and has provided funds that are supporting research initiatives across the country [3]. Although many of these studies include measures of consumption, associated risk behaviour and source, there is limited comparability between them. Even Canada's two national surveys use different time-frames and sampling methods to report current rates of use and cannot be compared [4, 5]. In the absence of agreed measures, answers to basic questions concerning changes in consumption, product sources and risk behaviour are subject to variation.

Data on prevalence vary according to how a question is asked [6]. That variation allows strategic selection of data that support particular interests, and therefore poses a challenge to objective public health and safety policy decisions. For example, a survey question that asks respondents how often they smoke cannabis may miss the increasing rates of consumption via alternative methods such as vaping and ingestion, resulting in an underestimate and even a perceived decline in overall use.

Consistent data regarding the impacts of cannabis use and policy are therefore essential to support policy decisions that reflect public health and safety interests; particularly in the context of increasing industry influence [7].

Policymakers in Canada determining whether the Cannabis Act is tracking towards its objectives, and whether regulatory change is required or appropriate, are faced with the challenge of determining which data to trust. On an international scale, policymakers faced with the question of legalization are looking to determine whether it has increased or mitigated harms, and how. At all levels, the public health sector needs valid and reliable data to make a convincing case to introduce and retain public health restrictions that frustrate the profit interests of the private sector; for example, those on advertising, marketing and taxation [7, 8].

As Lorenzetti *et al.* acknowledge, the iCannToolkit will not fill all of these knowledge gaps. Standardized, or at least comparable, measurements of cannabis consumption must be accompanied by retail, health and criminal justice data to create a comprehensive picture of the impacts of legalization. Priorities include measures of equity, product sales and illegal market share [6].

The iCannToolkit demonstrates the potential to apply a similar Delphi procedure to generate additional core measures, informed by a comprehensive list of options currently in use across different contexts. Such a list, or menu, is currently in development and is intended to provide a publicly available reference for those interested in measuring cannabis use towards the objective of increasing data sharing and comparability.

The variation in regulatory and retail approaches within Canada, across states in the United States and in the planned Swiss pilot studies frames an incredible natural experiment in which to test common measures across settings. A shared understanding of measures also responds to the call for greater collaboration and coordination in cannabis research [6, 9]. The greatest challenge for the field may be in identifying appropriate leadership, capacity and funding to support a coordinated approach.

DECLARATION OF INTERESTS
None.

KEYWORDS
Cannabis, data collection, legalization, measurement, policy impact, population surveys

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The iCannToolkit: a tool to embrace measurement of medicinal and non-medicinal cannabis use across licit, illicit and cross-cultural settings

The iCannToolkit is a first important step to systematically gather evidence regarding the health effects of contemporary medical and non-medical cannabis use—over time, among licit and illicit settings, cultures and age groups—in order to inform policy development and to raise awareness concerning cannabis use-related risks and benefits.

We welcome the commentaries [1–3] which endorse our proposal to standardize the assessment of cannabis use and make important considerations for the universal use of the iCannToolkit throughout research, treatment and public health settings.

Volkow & Weiss [1] highlight that the use of the toolkit has important implications for the standardized measurement of exposure to medicinal cannabis, the use of which is increasing internationally. The iCannToolkit is intended to be applicable to measuring non-medical and medical cannabis use in regulated and illicit markets. The items from the first layer will need to be validated (and, if necessary, adapted) to reliably cover medical and non-medical use throughout nations and jurisdictions. The second and third layers enable the characterization of different modes of use and biologically confirmed cannabinoid exposure. We believe that the iCannToolkit can be a useful tool for gathering data to profile and compare the risks and benefits of exposure to medical and non-medical cannabis. This can help us to understand how the legalization of medical and non-medical use affects retail products that are developed and consumed, their health impacts on users and impacts upon the criminal justice system.

Jesseman [2] suggests that the iCannToolkit is a first step to gathering systematic evidence to inform a public health approach to cannabis regulation, and creates a foundation for research collaboration, data-sharing and coordination. As illustrated by the two Canadian epidemiological surveys, measurements of cannabis are often incomparable due to inconsistent items on cannabis exposure. Integrating items of the iCannToolkit into current and new surveys can help to map changes in the risks and benefits of diverse modes of cannabis use. International collaborations using harmonized tools will enable the evaluation of natural experiments resulting from diverging policy approaches and help to understand the health consequences of legal cannabis retail and rapid changes in its legal status internationally. Such quality evidence is needed to inform decisions by jurisdictions about which policies to adopt if they make changes to the legal status of cannabis.

Kuhns & Kroon [3] outline important regional and cross-cultural differences in many features of cannabis use: potency, legislation, cultural costumes, mode of use, cannabinoid content, tobacco use and different labels for the same product and inter-individual differences in bioavailability. These were acknowledged by Volkow & Weiss and in our previous work [4, 5]. We agree that there are important cross-cultural variations in use. We also agree that international validation of enhanced time-line follow-back methods are needed to ensure comparability of data collected in different world regions in which cannabis potency, products and use patterns may differ.

Cannabis products and use practices have also changed substantially over time. This means that evidence from older cohorts may be less relevant in assessing the health effects of contemporary cannabis use. It also means that there will be a need to periodically adapt and update tools such as the iCannToolkit over time, in different world regions and to school students and adolescents. Harnessing the iCannToolkit to assess the 5-mg standard Δ^9-tetrahydrocannabinol (THC) unit (recommended by Freeman &