

Viewpoint

Standard THC units as a unit of measurement: differences & complementarity with other THC metrics

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Cannabis products are becoming increasingly potent and diverse (Freeman, Craft et al., 2021). Various metrics exist to report the strength of cannabis products based on the amount of amount of delta-9-tetrahydrocannabinol (THC), including but not limited to: Standard THC Units, milligrams of THC, % THC, serving size/total THC; and maximum serving size (outlined in detail below and in Table 1). Such metrics can be conflated, with implications for discussing how to report THC content in cannabis products. This viewpoint outlines the distinction between Standard THC Units and other metrics of THC content, to advance knowledge in research, public health and for consumers.

A Standard THC Unit is a metric used to report the amount of THC, in milligrams (mg), across all cannabis products (Freeman & Lorenzetti, 2019). The Standard THC Unit is comprised of 5 mg of THC and has been endorsed as a requirement for reporting THC in research studies, by the United States federal agency National Institute of Drug Abuse (NIDA), and other health organisations (e.g., National Heart, Lung, and Blood Institute [NHLBI], National Institute of Mental Health [NIMH], National Cancer Institute [NCI] (Volkow & Weiss, 2020)). The implementation of the Standard THC unit has several potential benefits for multiple disciplines: research (e.g., harmonising methodology to strengthen the quality of evidence on the benefits and risks of THC consumption), public health (i.e., inform the development of guidelines for harmful level of THC use), and individual health (e.g., inform consumers on how

much THC a product contains and support decision making regarding use). Importantly, the amount of THC in a standard THC unit may vary between countries to reflect the unique context and objectives of distinct jurisdictions in order to align to distinct policy and public health strategies, akin to how standard drinks represent different amounts of pure alcohol in distinct countries (e.g., 8 g in the UK, 10 g in Australia, 13.45 g in Canada and 14 g in the US). For example, a 2.5 mg THC unit has been recommended as a more suitable option for the Canadian context (Wood et al., 2024). Inconsistencies in the standard THC unit across different jurisdictions could be a barrier for consumer understanding (e.g., when consumers travel or move to a new country) as is the case for jurisdictions with varying amounts of alcohol per unit or standard drink around the world. The benefits of harmonising THC reporting include the ability to track the strength of cannabis products across jurisdictions; and standardizing evidence on the risks and benefits of consuming specific products/amounts of THC.

Some confusion can arise surrounding the concept of a Standard THC unit as a metric (Freeman & Lorenzetti, 2019), which may obfuscate dialogue and implementation of the THC Units in research and clinical settings, as well as consumer education and cannabis product labels. A key consideration is that a Standard THC Unit was not designed to replace other measures of the amount and effects of THC in cannabis products (e.g., % THC, milligrams of THC, traffic light colouring system, serving sizes for packaging cannabis products, or the effects of different

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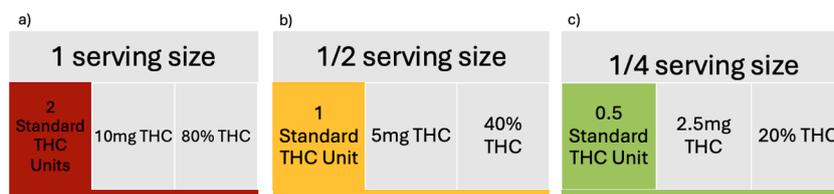
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Table 1

Definitions of metrics to report the amount of THC in cannabis products, alongside minimum dose and serving size / total THC.

Reporting THC in cannabis	Definition
% THC	The percentage or concentration of THC in a product (0–100 %).
Milligrams of THC	The quantity of THC measured in milligrams.
Serving size / Total THC	The amount of THC contained in a pre-packaged cannabis product (Health Canada, 2024).
Maximum serving size	The maximum amount of THC allowed or up to the maximum amount in a pre-packaged cannabis product (e.g., 10 mg of THC for pre-packaged cannabis edibles in Canada, at the time of writing).
Standard THC Unit	A metric of the quantity of THC, which includes a set amount of THC content. The quantity of the primary active pharmacological constituent in cannabis (THC); a set amount measured in milligrams applied to all cannabis products and methods of administration. For example, in some jurisdictions, this might be 5 mg of THC, based on experimental and ecological data, public health considerations and existing policy (Freeman & Lorenzetti, 2019).
Minimum dose	The minimum amount of THC required to produce intoxication, which varies between individuals.

**Fig. 1.** Example of reporting various levels of Standard THC units (a, b, c) alongside other metrics of level of THC (serving size, milligrams, %, traffic light colouring system) in labels of cannabis products.

routes of administration such as inhaled or oral administration; see Table 1 for an overview).

Instead, the Standard THC Unit can complement and can be presented alongside other metrics quantifying other aspects of THC to inform researchers, clinical practitioners and consumers on the amount of THC the product contains in a way that can be applied across product formats. This is illustrated in the examples in Fig. 1.

First, metrics of THC amount— such as **% of THC, total THC milligrams** – are important to inform consumers of the amount of THC a specific product contains, based on the method most appropriate for that product format (e.g., % of THC for dried flower, mg for edible products, etc.). Standard THC Units can be reported on cannabis products alongside other metrics to provide consumers with a clear understanding of the amount of THC in the product to help them track their consumption and make informed decisions about their cannabis use. Notably, alcohol products often report similar information (e.g., % and number of standard drinks in the UK) with the goal of informing consumers on the level of alcohol a product contains. Second, the Standard THC Unit is not equivalent to a **serving size/total THC** used to package cannabis products, and both information can be reported on cannabis labels. For example, serving sizes include 10 mg of THC in one package of edibles in Washington State and Colorado (Kosa, Giombi et al., 2017); and up to 10 mg of total THC in Canada. Thus, labels of products with serving sizes of 10 mg, can also report the equivalent amount of Standard THC Units per piece of edible contained and/or per package to inform consumers.

Third, the Standard THC unit does not reflect a **recommended dose** required to produce intoxication with minimum adverse reactions. The amount of THC required to produce intoxication varies between and within individuals (e.g., based on pre-existing vulnerability, level of cannabis use and other variables). For example, experimental studies demonstrate that THC doses lower than 5 mg can produce intoxication (e.g., from 2.6 mg) (McCartney, Arkell et al., 2021). Meanwhile, frequent cannabis use can increase tolerance to the psychoactive effects of THC; therefore people who use cannabis more frequently require a greater amount of THC to achieve intoxication (e.g., 10–20 mg or > 2–4 Standard THC Units) (Ramaekers, Theunissen et al., 2011). Consumers should be informed that the level of intoxication can vary between individuals so to not conflate a single Standard THC Unit with a recommended dose or minimum dose with a precise level of intoxication across all consumers.

Further, we must acknowledge that the Standard THC Unit has been informed by experimental evidence from infrequent cannabis users in normative samples, as well as ecological data, public health considerations and existing policy. Therefore, it is not to be used as a tool to convey the amount of THC required to achieve intoxication with minimal adverse effects in vulnerable people – including but not limited to those with a family history of psychopathology, or who endorse elevated subclinical elevated levels of psychopathologies or who meet a diagnosis of a psychiatric disorders. Finally, as Standard THC Units have been developed based on the notion of standard drinks, it is possible that such Units may encounter similar advantages (e.g., mandatory labelling to improve consumer guidance, development of low risk consumption guidelines) and limitations (e.g., lack of engagement, understanding, or behaviour change from some consumers).

Overall, a clear definition of the Standard THC Unit and its differentiation from other measures of THC content, is critical to inform on the goals of implementing the Unit in research, clinical and public health settings.

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Declaration of competing interest

Valentina Lorenzetti, David Hammond, Shea Wood, Robert Gabrys and Tom P Freeman have no competing interests to declare.

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