The Lancet Regional Health - Europe 10 (2021) 100245

Contents lists available at ScienceDirect

The Lancet Regional Health - Europe

journal homepage: www.elsevier.com/lanepe

Commentary

Quadruple convergence – rising cannabis prevalence, intensity, concentration and use disorder treatment

Albert Stuart Reece[a,b,*], Gary Kenneth Hulse[a,b]

[a] Division of Psychiatry, University of Western Australia, Crawley, Western Australia 6009, Australia
[b] School of Medical and Health Sciences, Edith Cowan University, Joondalup, Western Australia, 6027, Australia

ARTICLE INFO

Article History:
Received 17 September 2021
Accepted 22 September 2021
Available online 25 October 2021

In collating and synthesizing several data sources on cannabis exposure, Manthey and colleagues have elegantly compiled a foundational resource for subsequent epidemiological studies on cannabis use [1]. The study includes an impressive body of evidence on cannabis use prevalence (in the month and year prior to interview), high risk cannabis use (daily or near daily), tetrahydrocannabinol (THC—the principal psychoactive constituent of cannabis) concentration in European cannabis herb and processed resin (cannabis concentrates), and treatment demand for Cannabis Use Disorder (CUD). All four domains studied show a modest to dramatic increases across 2010-2019.

The authors found large increases in cannabis use prevalence of 25% to 82% in age strata 15-24 years and 55-64 years, respectively. High risk (almost) daily use also rose in many nations and by 600%, 48% and 45% in Portugal, Spain, and France respectively. The concentration of THC in cannabis herb and resin rose 54% and 217% and in nations such as France, Sweden and Luxembourg THC concentrations in cannabis resin rose 2.3-2.5% annually. Continent-wide 30% increases were noted in admissions for CUD treatment including increases of 700%, 260%, 210% and 170% in Luxembourg, Malta, Sweden, and France respectively. These data contrast recent estimates from GBD which are generally lower and remarkably constant. This study therefore adds to others challenging GBD CUD estimates (Manthey References 67, 68 and 81).

The authors correctly list several complications of cannabis including CUD, mental illness, cognitive impairment, motor vehicle accidents, chest disease and testicular cancer. They astutely list dose-response effects for CUD, psychoses and anxiety. Dose-response effects have also been also noted for testicular cancer [2] where cannabis exposure dramatically accelerates the preclinical oncogenic phase from several decades to less than about 14 years [2]. A particular concern is the abrupt threshold effect in dose-response relationships of many toxic cannabinoid effects with sharp jumps in incidence for many malignant and congenital genotoxic outcomes at higher dose levels [2–7].

Cannabis exposure was recently implicated epidemiologically in cancers of the breast, thyroid, liver, pancreas and acute myeloid leukaemia [7] as well as in the major childhood cancer acute lymphoid leukaemia [3] and as a primary driver of the 50% rise in total paediatric cancers in the USA 1975-2017 [6]. Cannabis exposure was also recently implicated in all five longitudinally tracked chromosomal birth defects in USA: trisomy 21, 18 and 13, and Turners and DiGeorge syndromes [7]. Similar studies have confirmed a direct relationship of cannabis to dozens of congenital anomalies in Australia and Canada [7]. Importantly, given this mounting evidence that cannabinoids are genotoxic [7] and have epigenetic effects which are generationally transmissible [8], there is a major concern that much of this increased cannabinoid exposure is concentrated in adults of reproductive age.

The overall picture emerging from this study is a very concerning simultaneous quadruple confluence of rising prevalence of use, rising intensity of use, rising THC potency and rising requests for CUD treatment, all likely interacting multiplicatively. These data are particularly significant in the context of increasing international concern relating to the generationally transmissible effects of genotoxicity and epigenotoxicity from cannabinoids [7,9,10]. Moreover, data indicate that cannabis liberalisation is associated with a simultaneous intensification of several of these trends (see Figures 1-4 from Manthey and colleagues [1]). These data are therefore important to consider when planning further liberalisation of cannabinoids, their increasing penetration into the community food chain, impacts on child mental health [4] and cellular aging [8,9].

A primary limitation of the current study concerns the data gaps for some of the studied variables. This is inevitable given the multi-jurisdictional nature of data collection across Europe. It also necessitates some form of data completion procedure. The option chosen by the authors is limited linear interpolation which is a reasonable choice here. It is also highly important that measures from some high use nations such

DOI of original article: http://dx.doi.org/10.1016/j.lanepe.2021.100227, http://dx.doi.org/10.1016/j.lanepe.2021.100269.
* Corresponding author. Albert Stuart Reece, 39 Gladstone Rd., Highgate Hill, Brisbane, Queensland, Australia
E-mail address: stuart.reece@bigpond.com (A.S. Reece).

https://doi.org/10.1016/j.lanepe.2021.100245

as Belgium, Luxembourg and France are incomplete, particularly indices relating to high intensity daily consumption. Additionally, data on concentration of cannabinoids other than THC is not available which would be highly relevant to the current context.

These major gaps in the data constitute important areas for future research in this very important dataset. Given the above-mentioned concerns relating to generationally transmissible impacts of cannabinoids, burning questions which urgently require addressing concern the epidemiological effects of high level cannabinoid exposure, and the effects of the various cannabinoids. Moreover, since frequency, intensity and concentration data are concurrent and often simultaneous across space and time, their multiplicative and interactive effects also need to be assessed. The data also lend themselves to spatiotemporal investigation and application of the techniques for formal causal inference to eventually support formulation of rational drug policies.

Contributors

ASR wrote the first manuscript draft. GKH provided technical and logistic support, co-wrote the paper, provided advice on manuscript preparation and general guidance to study conduct. ASR is the guarantor for the article.

Declaration of interests

None to declare.

References

[1] Manthey J, Freeman TP, Kilian C, Lopez-Pelayo H, Rehm J. Public health monitoring of cannabis use in Europe: prevalence of use, cannabis potency, and treatment rates. The Lancet Regional Health - Europe 2021. doi: 10.1016/j.lanepe.2021.100227.
[2] Reece AS, Hulse GK. Causal inference multiple imputation investigation of the impact of cannabinoids and other substances on ethnic differentials in US testicular cancer incidence. BMC Pharmacol Toxicol 2021;22(1):40.
[3] Reece AS, Hulse GK. Cannabinoid exposure as a major driver of pediatric acute lymphoid Leukaemia rates across the USA: combined geospatial, multiple imputation and causal inference study. BMC Cancer 2021;21(1):684.
[4] Reece AS, Hulse GK. Effect of Cannabis Legalization on US Autism Incidence and Medium Term Projections. Clinical Pediatrics: Open Access 2019;4(2):1–17.
[5] Reece AS, Hulse GK. Contemporary epidemiology of rising atrial septal defect trends across USA 1991-2016: a combined ecological geospatiotemporal and causal inferential study. BMC Pediatr 2020;20(1):539.
[6] Reece AS, Hulse GK. A geospatiotemporal and causal inference epidemiological exploration of substance and cannabinoid exposure as drivers of rising US pediatric cancer rates. BMC Cancer 2021;21(1):197.
[7] Reece AS, Hulse GK. Epidemiological overview of multidimensional chromosomal and genome toxicity of cannabis exposure in congenital anomalies and cancer development. Sci Rep 2021;11(1):13892.
[8] Murphy SK, Itchon-Ramos N, Visco Z, Huang Z, Grenier C, Schrott R, et al. Cannabinoid exposure and altered DNA methylation in rat and human sperm. Epigenetics 2018.
[9] Lu Y, Brommer B, Tian X, Krishnan A, Meer M, Wang C, et al. Reprogramming to recover youthful epigenetic information and restore vision. Nature 2020;588(7836):124–9.
[10] Reece AS, Hulse GK. Cannabis teratology explains current patterns of coloradan congenital defects: The contribution of increased cannabinoid exposure to rising teratological trends. Clin Pediatr (Phila) 2019;58(10):1085–123.