

Short Report

Hexahydrocannabinol (HHC) use and harms in Ireland: New findings from the 2024 European Web Survey on Drugs



Deirdre Mongan^{a,*}, Nicki Killeen^b, Seán R. Millar^{a,c}, João Matias^d, Eamon Keenan^b, Brian Galvin^a

^a Health Research Board, Dublin, Ireland

^b Health Service Executive National Social Inclusion Office, Dublin, Ireland

^c School of Public Health, University College Cork, Cork, Ireland

^d European Union Drugs Agency, Lisbon, Portugal

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ABSTRACT

Background: Hexahydrocannabinol (HHC) is a semi-synthetic cannabinoid which was marketed and sold openly in Ireland as a legal alternative to cannabis products until it was controlled in July 2025. There have been reports of psychotic illness precipitated by HHC use. Consequently, there are fears that HHC may become a public health issue. This study's aim was to measure the extent of HHC use and patterns of use among adults in Ireland who use drugs.

Methods: Data on HHC use in Ireland were collected from participants aged 18+ years ($N = 2314$) who had used drugs in the previous year via the 2024 European Web Survey on Drugs, which included questions on frequency of use; reasons for starting and using; how HHC was obtained and administration method; and harms arising from use.

Results: In total, 36.2 % reported lifetime HHC use, 33.5 % last-year use, and 17.8 % last-month use. The primary motive for first using HHC was its easy availability in stores and the main source of HHC reported was a high street shop (62.4 %). Negative consequences arising from HHC use were reported by 89.9 % of respondents: 14.7 % reported anxiety or panic reactions, while 13.4 % felt faint or dizzy and 11.9 % reported dissociation or depersonalisation. Hallucinations or psychosis were reported by 3.9 %, depression by 3.6 %, and withdrawal symptoms by 3.2 %.

Conclusions: These data suggest that HHC has become a prominent feature of the Irish drug landscape. Given its harm potential, it will be important to monitor HHC use and related health harms.

Introduction

Hexahydrocannabinol (HHC) is a semi-synthetic cannabinoid (SSC) that is synthesised from cannabidiol (CBD), which in turn is extracted from low-THC cannabis (hemp). While it was first described in the scientific literature in 1940, it first emerged on the drug market in the United States in late 2021, and in Europe in 2022 (European Monitoring Centre for Drugs & Drug Addiction, 2023). It is generally accepted that the market for SSCs is linked to the passage of the US Agriculture Improvement Act of 2018, commonly known as the 2018 Farm Bill, which legalised hemp cultivation. This led to the immediate mass production and subsequent surplus of CBD derived from hemp that can be

used as a precursor for SSCs (Zawatsky et al., 2024). In some countries HHC is marketed and sold openly as a legal alternative to cannabis products and has been produced in various forms. These include low-THC cannabis flower and resin, onto which HHC has been sprayed or mixed; ready-to-use disposable vape pens, e-liquids and e-liquid cartridges for use in electronic cigarettes; food products, especially flavoured sweets (gummies and marshmallows) and tinctures resembling food supplements; and, HHC oils or distillates (European Monitoring Centre for Drugs & Drug Addiction., 2023).

In March 2025, following recommendations by the World Health Organization, the United Nations Commission on Narcotic Drugs placed HHC under international control, adding it to Schedule II of the

* Corresponding author at: Deirdre Mongan, Health Research Board, Grattan House 67–72 Lower Mount Street, Dublin, Ireland.

E-mail addresses: dmongan@hrb.ie (D. Mongan), Nicki.Killeen@hse.ie (N. Killeen), s.millar@ucc.ie (S.R. Millar), joao.matias@euda.europa.eu (J. Matias), eamon.keenan@hse.ie (E. Keenan), bgalvin@hrb.ie (B. Galvin).

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Convention on Psychotropic Substances 1971 (United Nations Office on Drugs & Crime, 2025). Prior to this, 22 European countries had already prohibited or restricted HHC use due to concerns about known and potential risks (European Union Drugs Agency, 2025a). HHC was formally identified in Ireland through a law enforcement seizure in January 2023 (Forensic Science Ireland, 2024). The Misuse of Drugs Acts, 1977 and 1984, and the Regulations made there under, are the main laws regulating drugs in Ireland. These include controls relating to cultivation, licensing, possession, administration, supply, record-keeping, prescription-writing, destruction and safe custody. The Psychoactive Substances Act 2010 was developed following the emergence of new psychoactive substances (NPS) being sold in 'head shops' in Ireland and is intended to restrict the sale of substances which are not specifically proscribed under the Misuse of Drugs Acts, but which have psychoactive effects (Irish Statute Book, 2010). HHC was categorised as a controlled drug under the Misuse of Drugs Act in July 2025 (Department of Health, 2025), but prior to this, HHC was easily accessible online or via retail stores in most large urban centres in Ireland (Naughton & Clarke, 2024). Drug seizure data now indicate that there are signals of HHC also emerging on the illicit drug market in Ireland (Forensic Science Ireland, 2024).

To date, most published literature on HHC has been based on laboratory studies and the extent of HHC use and patterns of use, is not well documented. While *in vitro* and *in vivo* studies have demonstrated HHC's pharmacological activity (Lucuta et al., 2025; Persson et al., 2025), the potential health risks of HHC use are poorly understood (Holt, 2024). In an online survey of 109 self-reporting users of HHC in the United States, 17.0 % of respondents reported adverse effects, including sleepiness, red eyes, dry mouth and stomach problems (Ferretti et al., 2024). A recent study among psychiatric admissions at an Irish hospital identified that out of 214 psychosis admissions from May 2023 to December 2024, 13.1 % were preceded by HHC use, with HHC being the second most common drug involved in psychosis presentations (O'Mahony et al., 2025). There have also been reports of adolescents becoming ill and being hospitalised after vaping HHC (Forensic Science Ireland, 2024).

Given the recent ease of obtaining HHC, and the lack of knowledge and public discourse around its effects, there are concerns in Ireland that HHC may become a public health issue (Naughton & Clarke, 2024). The aim of this study was to measure the extent of HHC use and patterns of use among adults in Ireland using data from the European Web Survey on Drugs (EWSD). In particular, we sought to determine why people use HHC, how it is sourced and methods of administration. Finally, we aimed to assess the extent of adverse effects due to HHC use.

Methods

Study design

The EWSD is co-ordinated by the European Union Drugs Agency (EUDA) and is an online survey of people who use drugs that aims to identify emerging trends in drug use, behaviours and markets. The fifth EWSD was conducted across 24 European Union (EU) countries (including Ireland), and 11 non-EU countries or territories, between May and July 2024. Data were collected from participants aged 18 years and over who had used drugs in the previous year via EU Survey, the European Commission's official survey management tool. Irish participants were recruited using opportunistic sampling through Drugs.ie, which is Ireland's national drug information and support website; paid advertisements on Facebook, X/Twitter, Instagram, and other social media channels; subculture magazines; national print and broadcast media; and advertising at treatment and harm reduction services. Participation was self-selected and voluntary. The main questionnaire was developed by the EUDA, but individual countries were given the option of including extra modules after the EUDA questions.

An HHC module was added to the Irish survey and respondents were

provided with a brief description of HHC. The HHC questions used in this module were adapted from Ferretti et al. who conducted a survey among self-reporting HHC users in the United States (Ferretti et al., 2024). A more detailed account of the EWSD methodology has been previously described elsewhere (Matias et al., 2019). All participants provided informed consent. Anonymity and confidentiality were guaranteed for all participants; no personal data were collected, and IP addresses were not recorded. Ethical approval for conducting the EWSD in Ireland was obtained from the Royal College of Physicians of Ireland.

Measures and analysis

Participants who completed the HHC module were asked questions about frequency of use; reasons for starting using HHC; how they sourced HHC; methods of administration; reasons for using; and harms arising from their HHC use. Sociodemographic variables included sex (assigned at birth), age, ethnicity, level of education, employment, residence location and income. Last year use of other drugs was also recorded. Descriptive statistics were calculated using Stata SE Version 18.0 (Stata Corporation, College Station, TX, USA) for Windows.

Results

Of the 2406 eligible participants who completed the Irish EWSD, 2314 (96.2 %) completed the HHC module. In total, 36.2 % had ever used HHC (lifetime use), 33.5 % reported last-year use, and 17.8 % reported last-month use. Characteristics of the study population for the full sample (who completed the HHC module), and by lifetime, last-year and last-month HHC use, are presented in Table 1. The sociodemographic profiles of HHC users were very similar across these groups.

The primary motive for first using HHC was its easy availability in stores (61.5 %), followed by a sense of safety in buying from a store (46.1 %), and friends using HHC (36.1 %) (Table 2). The most common reasons for using HHC were to get high or for fun (62.9 %), and to reduce stress or relax (51.9 %). Respondents reported using HHC to treat a number of physical and mental ailments: 27.3 % used it to manage depression or anxiety, 18.2 % used HHC to reduce pain or inflammation, and 5.6 % to manage cannabis withdrawal symptoms. The main source of HHC reported was a high street shop (62.4 %); 19.6 % typically sourced HHC from friends or family and 15.7 % bought HHC from an online store. Just 2.1 % sourced HHC from a dealer. Vapes were the most commonly used method of administration (85.4 %), followed by edibles in the form of candies and gummies (34.1 %), and smoked dried plant or flower (14.5 %).

Among survey respondents who indicated using HHC in the last year, 31.5 % used it 1–10 days, 33.7 % used it 11–50 days, 31.5 % used it 51–250 days, and 3.4 % reported use on at least 251 days. Negative consequences arising from the use of HHC in the last year were reported by 89.9 % of survey respondents, with 24.0 % reporting at least two harms. The most frequently reported harm was anxiety or panic reactions, which was reported by 14.7 % of survey respondents, followed by feeling faint or dizzy (13.4 %), and dissociation or depersonalisation (11.9 %). Hallucinations or psychosis were reported by 3.9 %, depression was reported by 3.6 %, and withdrawal symptoms were reported by 3.2 % of respondents. Frequent HHC users were more likely than occasional users to report HHC-related harms (Fig. 1). Of those who reported experiencing harm, only 1.7 % had sought medical help.

Discussion

HHC has become increasingly available in Europe and the results presented in this study suggest that, in a relatively short period of time, HHC use has become widespread in Ireland. Among our convenience sample of 2406 people who had used drugs in the last year, 33.5 % reported last-year HHC use. In the 2024 Irish EWSD, HHC was the fourth most commonly reported drug used by participants (after cannabis,

Table 1

Characteristics of the study population—full sample and according to lifetime, last-year and last-month HHC use.

	Total sample n (%)	Lifetime HHC users n (%)	Last-year HHC users n (%)	Last-month HHC users n (%)
Sex				
Male	1455 (63.1)	520 (62.1)	479 (61.9)	254 (61.8)
Female	830 (35.7)	307 (36.7)	286 (35.7)	152 (37.0)
Other/prefer not to say	29 (1.2)	10 (1.2)	9 (1.2)	5 (1.2)
Age group				
18–24	712 (30.9)	277 (33.2)	262 (34.0)	133 (32.5)
25–34	754 (32.7)	269 (32.3)	247 (32.0)	131 (32.0)
35+	841 (36.5)	288 (34.5)	262 (34.0)	145 (35.5)
Employment status				
Employed	1666 (74.5)	598 (74.3)	547 (73.6)	307 (78.1)
Unemployed	79 (3.5)	32 (4.0)	32 (4.3)	14 (3.6)
Student	357 (16.0)	121 (15.0)	114 (15.3)	50 (12.7)
Other	133 (6.0)	54 (6.7)	50 (6.7)	22 (5.6)
Highest level of education				
Primary/secondary	565 (25.3)	204 (25.4)	197 (26.6)	95 (24.4)
Tertiary	1669 (74.7)	599 (74.6)	544 (73.4)	295 (75.6)
Ethnicity				
White Irish	1917 (84.0)	690 (84.0)	634 (83.5)	336 (83.8)
Other white background	260 (11.4)	88 (10.7)	83 (10.9)	45 (11.2)
Other	105 (4.6)	43 (5.2)	42 (5.5)	20 (5.0)
Residence location				
City	819 (36.7)	275 (34.2)	249 (33.6)	142 (36.1)
Village/countryside	480 (21.5)	175 (21.8)	167 (22.5)	89 (22.7)
Town	484 (21.7)	172 (21.4)	157 (21.2)	71 (18.1)
Suburb	450 (20.2)	182 (22.6)	169 (22.8)	91 (23.2)
Income				
<€1000	393 (17.9)	148 (18.8)	143 (19.7)	73 (19.1)
€1000–€1999	447 (20.3)	158 (20.1)	146 (20.1)	71 (18.6)
€2000–€2999	581 (26.4)	203 (25.8)	187 (25.8)	98 (25.7)
€3000+	777 (35.4)	279 (35.4)	250 (34.4)	140 (36.7)
Last year drug use				
Cannabis	1979 (85.6)	730 (87.3)	678 (87.7)	356 (86.6)
Cocaine	1068 (45.9)	394 (47.1)	363 (47.0)	199 (48.5)
Ecstasy/MDMA	833 (36.0)	311 (37.2)	285 (36.8)	169 (41.1)
Magic mushrooms	621 (30.6)	244 (32.8)	224 (32.7)	126 (33.7)
Ketamine	497 (24.7)	187 (25.4)	173 (25.6)	103 (27.9)

cocaine and ecstasy/MDMA). Due to the limited published data on HHC use, it is not possible to conclude if HHC use in Ireland is high by international standards. However, among 24 EU countries, and Norway, that participated in the 2024 EWSD, the prevalence of SSC use in the last year was 14.0 % (European Union Drugs Agency, 2025b), considerably lower than the percentage of Irish respondents reporting HHC use.

Table 2

HHC use—reasons for use, source, methods of administration, frequency of use, and harms among those who reported last-year HHC use.

What influenced your decision to first use HHC?	n (%)	Frequency of HHC use in the last year	n (%)
It is easily available in stores (accessibility)	476 (61.5)	1–10 days	129 (31.5)
Sense of safety buying from a store	357 (46.1)	11–50 days	138 (33.7)
My friends were using	279 (36.1)	51–250 days	129 (31.5)
The type of effects	214 (27.7)	251+ days	14 (3.4)
My usual drug of choice was not available	206 (26.6)		
Price	136 (17.6)	Methods of administration	
The media made me aware of it	48 (6.2)	Vapes (e.g. pen)	661 (85.4)
User forums	40 (5.2)	Edibles (candies, gummies)	264 (34.1)
		Smoked dried plant or flower	112 (14.5)
Why do you use HHC?		Edibles (baked goods and other foods)	40 (5.2)
To get high/for fun	487 (62.9)	Oils/concentrates-oral use (tinctures)	31 (4.0)
To reduce stress/relax	402 (51.9)		
Out of curiosity/to experiment	324 (41.9)	Harms experienced in the last year	
To improve sleep	310 (40.1)	Anxiety or panic reactions	114 (14.7)
To avoid/reduce illegal cannabis use	235 (30.4)	Feeling faint or dizzy or passing out	104 (13.4)
To socialise	221 (28.6)	Dissociation or depersonalisation	92 (11.9)
To manage depression/anxiety	211 (27.3)	Memory issues	88 (11.4)
To reduce pain/inflammations	141 (18.2)	Problems concentrating	80 (10.3)
To manage cannabis withdrawal symptoms	43 (5.6)	Nausea and/or vomiting	79 (10.2)
To enhance performance*	43 (5.6)	Lung or breathing problems	62 (8.0)
		Heart or blood pressure problems	30 (3.9)
Main source of HHC		Hallucinations or psychosis	30 (3.9)
High street shop	477 (62.4)	Depression	28 (3.6)
Friends/family	150 (19.6)	Withdrawal symptoms	25 (3.2)
Online store	120 (15.7)	Weight gain/weight loss	17 (2.2)
Dealer	16 (2.1)	Flashbacks	15 (1.9)
Other	2 (0.3)	Suicidal thoughts	10 (1.3)
		Experienced 2+ harms	186 (24.0)

Note: Respondents could select more than one option for all questions except for frequency of use, and source of HHC.

* Examples include school, work, and sport.

A high proportion of HHC users reported negative health harms arising from their HHC use, with 24.0 % reporting two or more harms. The most frequently reported harms were anxiety or panic reactions, feeling faint or dizzy or passing out, and dissociation or depersonalisation. It is not possible from this survey to assess the severity of these harms; however, just 1.7 % indicated seeking medical help for HHC-related harms. Cases of HHC-induced psychosis have previously been reported in Ireland (O'Mahony et al., 2024) and our survey found that 3.9 % of HHC users experienced hallucinations or psychosis following HHC use.

These data suggest that accessibility may be an important factor that has led to the use of HHC in Ireland, with 61.5 % of respondents

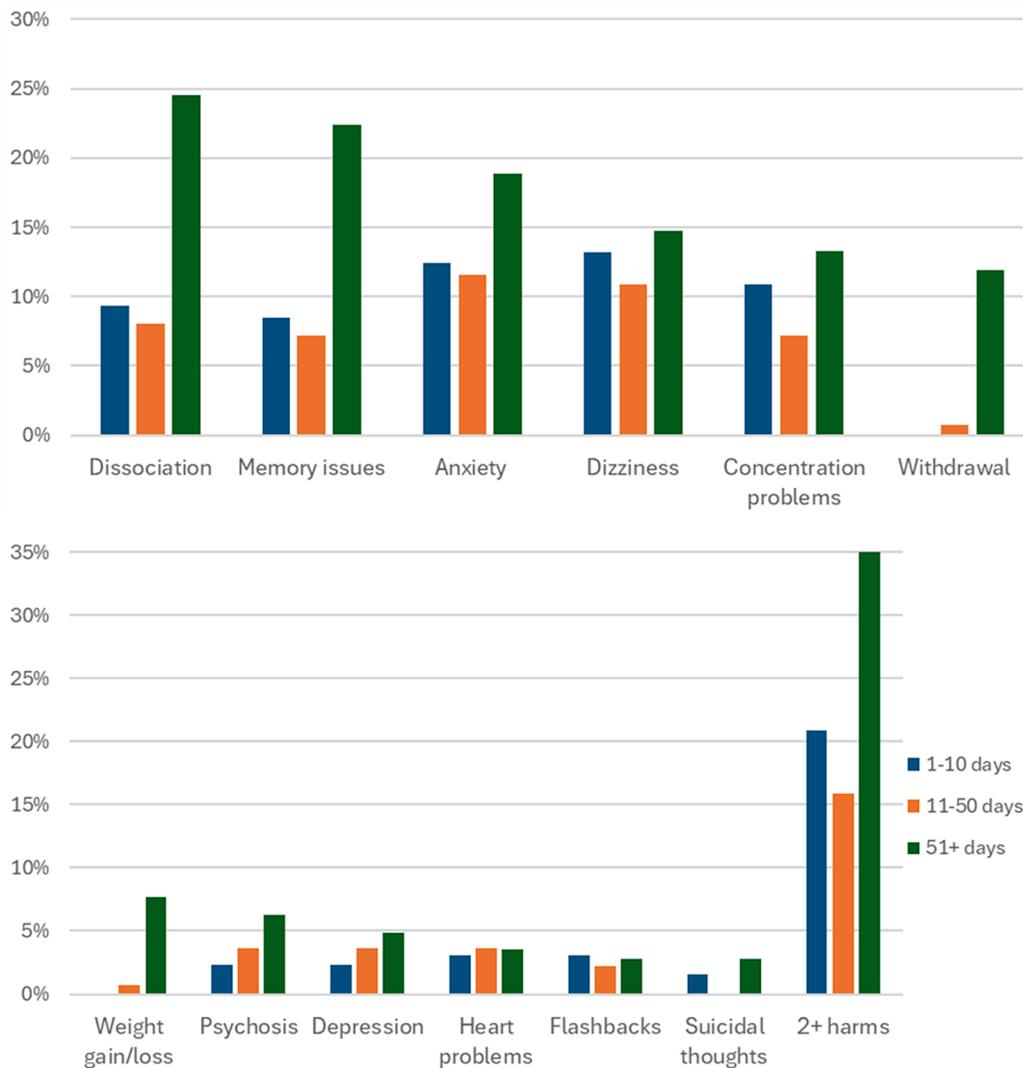


Fig. 1. HHC harms by frequency of HHC use in the last year.

reporting that ease of availability influenced their decision to first use HHC, and 46.1 % reporting that a sense of safety in buying it from a store was a factor. Our results also demonstrate that the majority of HHC users purchased it from a high street shop (62.4 %) or an online store (15.7 %). Consequently, it is possible that the delay in controlling HHC in Ireland has contributed to its popularity. Importantly, as HHC could be freely and legally purchased in Ireland until very recently, there may have been a perception among users in our sample that it is ‘safer’ than cannabis or synthetic cannabinoids that were controlled by legislation. This is of concern as, in addition to the unknown short and long-term effects of HHC, the EUDA have noted that HHC products may contain harmful contaminants from production (European Union Drugs Agency, 2025a).

The current situation regarding HHC in Ireland mirrors that seen for NPS prior to the introduction of The Psychoactive Substances Act 2010. Before this legislation was enacted, NPS could be easily purchased on the high street from ‘head shops’, and data from Irish general population surveys on drug use indicate that the last-year prevalence rate of NPS among those aged 15–24 years was 9.7 % pre legislation, but declined to 1.9 % post the introduction of legislation (Doyle et al., 2022). Other Irish studies that assessed the impact of NPS legislation have reported that its introduction led to a 30 % reduction in the number of drug-related emergency hospital admissions that were associated with NPS use (Smyth et al., 2021) and a substantial reduction in the rate of NPS-related addiction treatment episodes among young adults (Smyth

et al., 2017). Nevertheless, despite this legislation being in place, HHC remained legal to purchase in Ireland long after its psychoactive properties were confirmed (Höfert et al., 2024; Russo et al., 2023), and ultimately HHC was controlled under the Misuse of Drugs Act rather than the Psychoactive Substances Act. Consequently, a review of current Irish legislation, with regard to emerging psychoactive substances, is likely required to ensure that it is fit for purpose. This may enable Ireland to more swiftly respond to the rapidly evolving drug market.

Strengths and limitations

To the best of our knowledge this is the first European analysis of HHC use in a population sample. In the absence of official surveillance data on HHC, this study provides some insights into the extent of use, motivations for use, and the types of harms experienced by HHC users. A strength of this study is the large sample of current HHC users that was recruited using a wide variety of sources. Notwithstanding this, our study has limitations. Given the sampling employed, it is not possible to conclude if this sample is generalisable to the population of HHC users in Ireland. Previous waves of the EWSD have found that the survey attracted a higher proportion of participants reporting frequent drug use than is found in the general population. The EWSD also excluded respondents under 18 years of age. Importantly, based on anecdotal reports, this is a population that is likely to use HHC (Murphy, 2025). Finally, the high prevalence of other drug use among the sample, in

particular cannabis, should be noted. The survey did not ask about concurrent use of other drugs with HHC. Therefore, it is not possible to differentiate the reported HHC harms from those that may have arisen due to the use of other substances.

Conclusion

The results from this survey suggest that HHC has become a prominent feature of the Irish drugs market. Given its potential for health harms, monitoring of HHC use, and new varieties of semi-synthetic cannabinoids, through general population surveys, web surveys and school-based surveys, will be required. The collection of data on HHC-related hospitalisations, psychiatric presentations, treatment entries and mortality, is also recommended.

Ethics approval

The authors declare that they have obtained ethics approval from an appropriately constituted ethics committee/institutional review board where the research entailed animal or human participation.

CRedit authorship contribution statement

Deirdre Mongan: Writing – original draft, Formal analysis, Conceptualization. **Nicki Killeen:** Writing – review & editing, Project administration, Data curation, Conceptualization. **Seán R. Millar:** Writing – review & editing, Methodology. **João Matias:** Writing – review & editing, Project administration. **Eamon Keenan:** Writing – review & editing, Supervision. **Brian Galvin:** Writing – review & editing, Supervision, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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