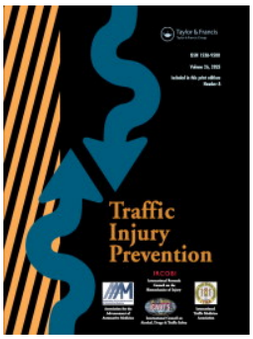

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Drug and polydrug detection in drivers suspected of driving under the influence of an intoxicant in Ireland 2012–2018: a national repeated cross-sectional study

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ABSTRACT

Objective: Driving under the influence of drugs is a major risk factor for road traffic collision deaths and injuries. We examined national trends in detection rates of cannabis, cocaine, amphetamines, methamphetamines, benzodiazepines, and opioids, alone and in combination, among drivers suspected of driving under the influence of an intoxicant (DUII) in Ireland 2012–2018.

Methods: A repeated cross-sectional study design using immunoassay results from the Medical Bureau of Road Safety (MBRS). The MBRS is responsible for the chemical testing of intoxicants in all drivers arrested under the Road Traffic Acts 1968–2016 in Ireland. Detection rates for individual drugs, and combinations of drugs, per 1,000 drivers suspected of DUII were calculated. Negative binomial regression models (Adjusted Rate Ratios (ARR), 95% Confidence Intervals (CI)) were used to estimate age and gender adjusted time trends.

Results: A total of 9,369 individuals were suspected of DUII during the study period (83% men). Annual increases in the detection of cocaine (ARR 1.21, 95% CI 1.18–1.24, $p < 0.0001$) and cannabis (ARR 1.13, 95% CI 1.09–1.17, $p < 0.0001$) were observed. Opioids, benzodiazepines, methamphetamines, and amphetamines saw minimal or no significant change over time. The co-detection of cocaine with cannabis (ARR 1.25, 95% CI 1.19–1.3, $p < 0.0001$), and cocaine with benzodiazepines (ARR 1.11, 95% CI 1.07–1.16, $p < 0.0001$) also increased.

Conclusions: Road safety is compromised by driving under the influence of drugs. The increasing detection of cocaine and cannabis, particularly among men, highlights the need for ongoing testing, and targeted interventions to reduce driving under the influence of these substances.

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Cocaine; cannabis; benzodiazepines; amphetamines; opioids; road safety; toxicological analysis

Introduction

The World Health Organization global status report on road safety reported an estimated 1.19 million road traffic deaths in 2021; with men experiencing a disproportionate burden of harm (female-to-male fatality ratio of 1 to 3) (WHO 2024). Road traffic injuries represent the leading cause of death for children and young adults aged 5–29 years, and are the 12th leading cause of death across all ages (WHO 2024). Furthermore, road traffic collisions (RTCs) are among the leading causes of global disability-adjusted life years, resulting in a significant economic and social burden (James et al. 2020; Wan et al. 2023). Consistent with many high income countries, Ireland has experienced a decline in road traffic deaths since the early 1990s, due in part to the introduction of legislation addressing intoxicated driving, seatbelt requirements, speed controls, and vehicle safety (Vecino-Ortiz et al. 2022; Wan et al. 2023). However, while the decline in road traffic deaths continued steadily in Ireland until 2012; progress appeared to slow and plateau between 2013 and 2021; with a 38% increase in road traffic deaths reported between 2021 and 2023 (Road Safety Authority 2024).

Driving is a high-performance task requiring consistent engagement, continuous divided attention, i.e., the ability to process and/or respond to information while simultaneously conducting more than one task at a time (Lengenfelder et al. 2002), and sustained information processing in dynamic conditions. Driving under the influence of drugs is widely recognized as a major risk factor for RTC deaths and injuries (Schulze et al. 2012; Blandino et al. 2022). Drug use may result in direct impairment effects, reducing motor skills, perceptual functioning, attention and decision making abilities (Schulze et al. 2012; Hetland and Carr 2014; Blandino et al. 2022), and indirect effects, including fatigue

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(Leyton et al. 2012), or lack of compliance with mitigating safety measures such as wearing a seatbelt or driving in excess of speed limits (Valen et al. 2019). Although more evidence is needed regarding dose-response relationships (Busardo et al. 2018), recognized drugs of impairment include illicit drugs such as cannabis, cocaine, heroin, amphetamines, and methamphetamines, and medications such as prescription opioids and benzodiazepines (Elvik 2013; Hetland and Carr 2014).

Cannabis, extracted from the cannabis plant (*Cannabis sativa L.*), contains the active substance tetrahydrocannabinol (THC) and is usually smoked or consumed orally in the form of resin or herb for euphoric and relaxing effects (Karila et al. 2014). There are conflicting findings regarding psychomotor function impairment associated with cannabis consumption (Blandino et al. 2022). However, a growing body of evidence suggests that acute cannabis intoxication was associated with driving impairment (Simmons et al. 2022) and an increased risk of motor vehicle collision (Asbridge et al. 2012). THC detection in blood was also associated with higher odds of culpability in a large sample of injured drivers in Australia (Drummer et al. 2020). Recent shifts in cannabis use have occurred globally with the liberalization of cannabis use in North America, and the onset of new synthetic and semi-synthetic cannabinoids (United Nations Office on Drugs and Crime 2024), resulting in increased use (Wang et al. 2024), including in Ireland (Manthey et al. 2021). Recent studies have examined the impact of medical cannabis legalization and recreational cannabis legalization on fatal RTCs, with the former associated with a decrease and the latter an increase in fatal collisions (Windle et al. 2022).

Cocaine is a central nervous system (CNS) stimulant consumed in either powder or "crack" form, resulting in an initial rush of increased energy and risk taking behaviors, followed by a period of withdrawal characterized by fatigue and confusion (Breiter et al. 1997). Evidence is very limited about the effect of acute intoxication with cocaine on drug-naïve drivers' performance (Blandino et al. 2022), however epidemiological studies have observed that cocaine use in drivers increases the risk of being involved in RTCs (Hels et al. 2011).

Amphetamines and methamphetamines (commonly referred to as "speed") are common street drugs with CNS stimulant effects, that can suppress appetite and induce insomnia. Some international evidence suggests that amphetamines are sometimes used outside of medical indication by professional drivers (Dini et al. 2019), to stay awake during long shifts (Leyton et al. 2012). Meta-analyses found the consumption of amphetamines to be associated with a 5-fold risk of involvement in fatal RTC (Elvik 2013), with similar estimates in truck drivers specifically (Dini et al. 2019).

Opioids are a class of drugs either deriving from, or mimicking the substances naturally occurring in opium, including morphine, heroin, and codeine. Opioid analgesics are commonly prescribed for pain management. They also produce euphoric and sedative effects, and can lead to dependence and misuse (Vowles et al. 2015). Observational studies found associations between therapeutic opioid use and RTC in younger drivers (Dassanayake et al. 2011). However, conflicting evidence exists regarding impairment of driving performance while on stable opioid therapy, partly due to unaddressed confounding factors such as pain and psychotropic co-prescriptions (Mailis-Gagnon et al. 2012). Impairment may also decrease in long-term opioid users, for example, patients with chronic pain or an opioid use disorder (Zacny 1995).

Benzodiazepines are commonly prescribed sedative and/or anxiolytic medications (Cadogan et al. 2018), which can also be sourced on the illicit drug market (Duffin et al. 2020). Benzodiazepines can affect executive and motor functions (Dassanayake et al. 2011). Evidence from a large meta-analysis suggests that benzodiazepine consumption in drivers is associated with increases in the risk of fatal (2.3-fold) and non-fatal (1.65-fold) RTC (Elvik 2013).

This study aims to examine trends in drug detection rates of cannabis, cocaine, amphetamines, methamphetamines, benzodiazepines, and opioids, alone and in combination (polydrug use), among drivers suspected of driving under the influence of an intoxicant in Ireland between 2012 and 2018; adjusting for gender and age group.

Methods

The protocol relating to this study was published elsewhere (Cousins et al. 2023). The study is reported according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines, REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) statement (Vandenbroucke et al. 2007; Benchimol et al. 2015).

Design

We used a repeated cross-sectional study design to examine national trends in drug detection rates of cannabis, cocaine, amphetamines, methamphetamines, benzodiazepines, and opioids, alone and in combination, among drivers suspected of driving under the influence of an intoxicant in Ireland between 2012 and 2018; adjusting for gender and age group.

Data source

The Medical Bureau of Road Safety (MBRS) is the statutory body responsible for the chemical testing of intoxicants (alcohol and drugs) in drivers arrested under the Road Traffic Acts 1968–2016 and suspected of driving under the influence of an intoxicant. Toxicological analysis is carried out on samples below the alcohol threshold (80 mg/100 ml in blood, 107 mg/100 ml in urine during the study period), or by request from the Garda Siochána (Irish Police Service). The laboratory used immunoassay screening tests for cannabis (11-nor-9-carboxy -Δ^9-THC), cocaine (benzoylecgonine, cocaethylene, cocaine), amphetamines (3,4-methylenedioxyamphetamine, amphetamine), methamphetamines (Methamphetamine, Fenfluramine, N-methyl-1,3-benzodioxolylbutanamine, 3,4-Methylenedioxy methamphetamine), benzodiazepines, and opioids on blood

and/or urine samples. A Best BioKit Robotic analyzer and Reader with Alere Forensic Microplate Enzyme Immunoassay Cannabinoids, Amphetamine, Methamphetamine, Benzodiazepine, Opiates, Methadone, Cocaine Metabolite, alongside Revelations Software for data analysis were used. Immunoassay tests are capable of detecting benzodiazepine drugs and metabolites from benzodiazepine classes such as triazolo (e.g., Alprazolam, Alpha-hydroxyalprazolam), 2-keto (e.g., Diazepam. Nordiazepam), and 3-hydroxy (e.g., Oxazepam, Temazepam) benzodiazepines. For opioids, the assay is capable of detecting morphine, dihydrocodeine, codeine, hydrocodone, heroin, and hydromorphone.

Anonymized individual-level data was included on all samples analyzed for cannabis, cocaine, methamphetamine, amphetamines, benzodiazepines, and opioids with immunoassay by the MBRS between January 2012 and December 2018; including age and gender. Age classes were defined as 16–24/25–34/35–44/45 years and over. Samples from individuals aged less than 16 years and those with incomplete gender data were excluded ($N = 98$). Drug class immunoassay results were coded into a binary outcome (detected/not detected) for each sample. The number of individual drivers providing at least one sample (blood or urine), and testing positive for each drug/drug class were calculated overall and each year, by age and gender. If an individual provided a sample on more than one occasion in a given year, they were counted only once in that year (one time per year for annual numbers), including all their samples results.

Outcomes

Overall and annual detection rates were calculated as the number of individuals (drivers) providing at least one sample (blood or urine) testing positive for each drug/drug class divided by the number of individuals (drivers) providing at least one (blood or urine) sample for toxicological analysis, multiplied by 1,000.

The five most frequent combinations for within sample co-detection of two drug classes were determined over the study period. Annual co-detection rates were calculated as the number of individuals (drivers) providing at least one sample (blood or urine) testing positive for two drug classes simultaneously, divided by the number of individuals (drivers) providing at least one (blood or urine) sample for toxicological analysis that year, multiplied by 1,000.

The yearly total of drivers providing at least one sample for toxicological analysis was selected as the denominator to account for variations in the level of activity of the road traffic enforcement testing in a given year.

Statistical analysis

We report annual detection rates, overall and by gender, and annual co-detection rates overall. Negative binomial regression models were used to evaluate time trends in detection and co-detection rates, adjusting for gender and age class to control for potential confounding related to demographic changes in the study population over time. The rates' numerator was used as the dependent variable and the logarithm of the denominator as an offset term in the regression models. The key predictor was calendar year, modeled as a continuous variable to assess linear trends. Graphs were inspected for evidence of non-linearity. We report adjusted rate ratios (ARR) for time (per year), gender, and age class, with 95% confidence intervals (CIs) for each detection and co-detection outcome.

SAS Enterprise Guide (v 7.1) (SAS Institute, Cary, NC, USA) was used for all analyses and significance at $p < 0.05$ was assumed.

Sensitivity analysis

Since April 2017, An Garda Síochána are permitted to conduct a preliminary drug test (PDT), using oral fluid, at the roadside for opioids, cocaine, cannabis, and benzodiazepines without requiring evidence of intoxication/impairment. Following arrest, it is also possible to administer this test in a police station. A PDT positive for cocaine, cannabis, or opioids provides sufficient grounds to collect a blood sample for toxicological analysis. However, a negative PDT does not rule out toxicological analysis if the Gardaí form the opinion a driver is intoxicated. The introduction of PDT in 2017 may result in selection bias toward the end of the study period. It is plausible that after April 2017, additional samples were sent for toxicological analysis on the basis of positive PDT's without evidence of intoxication/impairment, and therefore likely positive for drugs. In order to assess the impact of this change on study results a sensitivity analysis was conducted comparing unadjusted time trends (rate ratio (RR) and 95% CI) between all included drivers and excluding samples from drivers who underwent PDT prior to toxicological analysis.

Results

Between January 2012 to December 2018 toxicological analysis was conducted on 9,886 samples (40% urine/60% blood), collected from 9,369 individuals aged >16 years. The majority of drug testing involved men (83.1%), with almost one third (31.5%) of samples collected from drivers aged 25–34 years. A total of 417 (4.45%) individuals provided more than one sample for toxicological analysis over the study period, with a maximum of six samples ($n \leq 5$).

Drug detection rates

Overall detection rates were highest for cannabis during the study period, with 49.3% of individuals testing positive for cannabis, followed by benzodiazepines (26%), cocaine (16.5%), opioids (13.8%), amphetamines (3.8%), and methamphetamines (2.5%). Annual detection rates for cannabis, cocaine, amphetamines, methamphetamines, benzodiazepines, and opioids are represented overall (a) and by gender (b) in Figure 1.

Adjusted estimates for time trends in the detection of cannabis, cocaine, amphetamines, methamphetamines,

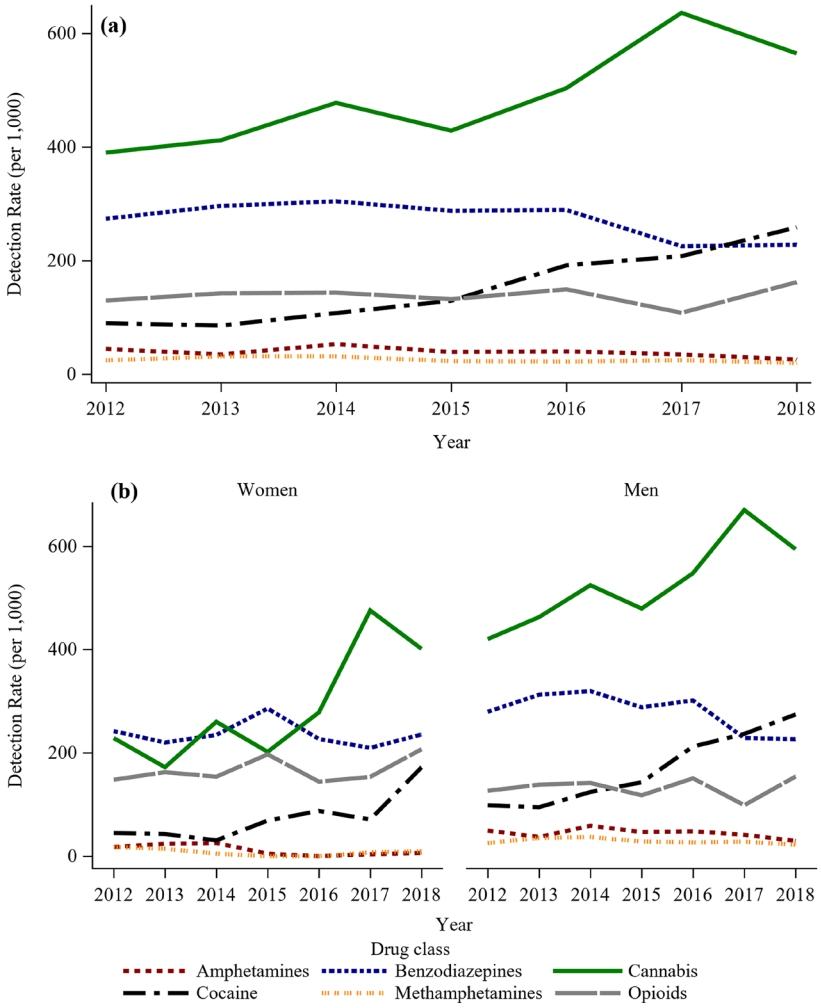

Figure 1. Annual detection rates per 1,000 drivers providing a sample for toxicological analysis for cannabis, cocaine, amphetamines, methamphetamines, benzodiazepines, and opioids overall (a) and by gender (b).

Table 1. Adjusted estimates for time trends in the detection of amphetamines, benzodiazepines, cannabis, cocaine, methamphetamines, and opioids and co-detection of benzodiazepines; cannabis, benzodiazepines; cocaine, benzodiazepines; opioids, cannabis; cocaine, and cannabis; opioids in drivers providing samples for toxicological analysis (2012–2018).

	ARR* [95% CI] Time (per year)	*p*-value
Detected drug class		
Amphetamines	0.92 [0.87–0.98]	0.0068
Benzodiazepines	0.96 [0.94–0.98]	0.0002
Cannabis	1.13 [1.09–1.17]	<0.0001
Cocaine	1.21 [1.18–1.24]	<0.0001
Methamphetamines†	0.94 [0.84–1.04]	0.2387
Opioids	1.01 [0.97–1.04]	0.7719
Co-detected drug classes		
Benzodiazepines; Cannabis	0.99 [0.95–1.02]	0.4397
Benzodiazepines; Cocaine	1.11 [1.07–1.16]	<0.0001
Benzodiazepines; Opioids	0.95 [0.91–0.99]	0.0273
Cannabis; Cocaine	1.25 [1.19–1.3]	<0.0001
Cannabis; Opioids	1.03 [0.99–1.08]	0.1586

*Adjusted on gender and age class.
†Adjusted on gender only due to small numbers.

benzodiazepines, and opioids are presented in Table 1 and Supplementary Figure. The detection of cocaine increased by 21% annually (ARR 1.21, 95% CI 1.18 – 1.24, $p < 0.0001$). A 13% annual increase was also observed for cannabis detection (ARR 1.13, 95% CI 1.09 – 1.17, $p < 0.0001$). In contrast, the detection of amphetamines decreased by 8% annually (ARR 0.92, 95% CI 0.87 – 0.98, $p = 0.0068$), and benzodiazepines by 4% (ARR 0.96, 95% CI 0.94 – 0.98, $p = 0.0002$).

Detection rates for cannabis (ARR 0.63, 95% CI 0.55 – 0.73, $p < 0.0001$), cocaine (ARR 0.52, 95% CI 0.43 – 0.62, $p < 0.0001$), amphetamines (ARR 0.29, 95% CI 0.18 – 0.48, $p < 0.0001$) and methamphetamines (ARR 0.3, 95% CI 0.16 – 0.56, $p = 0.0002$) were lower in women than in men (Supplementary Table 1). In contrast, the detection of opioids was higher in women than men (ARR 1.19, 95% CI 1.01 – 1.4, $p = 0.0333$).

Co-detection rates

Overall co-detection rates of 17.2% for benzodiazepines and cannabis, 10.9% for cannabis and cocaine, 8.2% for benzodiazepines and cocaine, 8.0% for benzodiazepines and opioids, and 6.6% for cannabis and opioids were found. Annual co-detection rates for benzodiazepines and cannabis, benzodiazepines and cocaine, benzodiazepines and opioids, cannabis and cocaine, cannabis and opioids are represented overall in Figure 2.

Adjusted estimates for co-detection time trends are presented in Table 1 and Supplementary Table 2. No significant trend was observed for the co-detection rates of

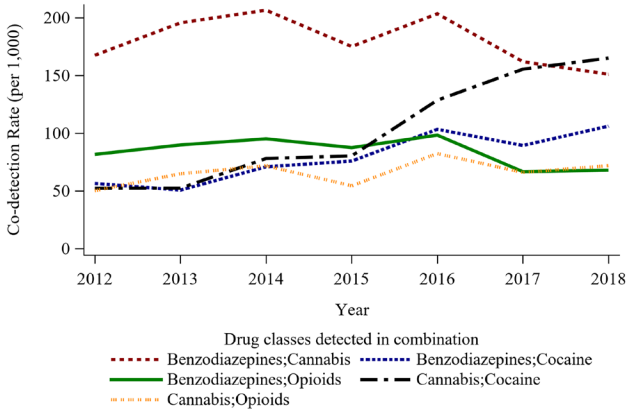

Figure 2. Annual co-detection rates per 1,000 drivers providing a sample for toxicological analysis of benzodiazepines; cannabis, benzodiazepines; cocaine, benzodiazepines; opioids, cannabis; cocaine, and cannabis; opioids.

benzodiazepines and cannabis (ARR 0.99, 95% CI 0.95 – 1.02, $p = 0.4397$), and cannabis and opioids (ARR 1.03, 95% CI 0.99 – 1.08, $p = 0.1586$). The co-detection of benzodiazepines and opioids decreased by 5% annually (ARR 0.95, 95% CI 0.91 – 0.99, $p = 0.0273$). In contrast, sharp annual increases were observed for the co-detection of benzodiazepines and cocaine (ARR 1.11, 95% CI 1.07 – 1.16, $p < 0.0001$), and of cannabis and cocaine (ARR 1.25, 95% CI 1.19 – 1.3, $p < 0.0001$). For the latter, rates tripled during the study period, ranging from 52 per 1,000 testing positive for both drugs in 2012 to 165 per 1,000 in 2018.

Sensitivity analysis

The annual number of drivers providing toxicology samples excluding those subjected to PDT are presented in Supplementary Table 3. Unadjusted RRs and 95% CIs for time trends, in the detection and co-detection of cannabis, cocaine, amphetamines, methamphetamines, benzodiazepines, and opioids using original and data excluding drivers who provided a sample after a PDT are presented in Supplementary Table 4. Little deviation from the main analysis was observed, however a modest increasing trend was found in the detection of opioids (ARR 1.03, 95% CI 1–1.06, p 0.0354).

Discussion

Main results in context

Driving under the influence of drugs is a growing issue in Ireland. The E-Survey of Road Users' Attitudes (ESRA), an international road safety research initiative, was conducted in 2023 and found that almost one in 10 (9.2%) of 901 regular car drivers in Ireland reported driving within one hour of taking drugs (other than prescribed or over the counter medication) over the last 30 days, compared to 8% reporting driving over the legal alcohol limit (Vias Institute 2023). This contrasts with the previous iteration of the survey in 2018 where drink-driving was more common than drug-driving in Ireland (Vias Institute 2021). To our knowledge this is the first study to examine national time trends in the detection of cannabis, cocaine, amphetamines, methamphetamines, benzodiazepines and opioids, alone and in combination, among drivers suspected of driving under the influence of drugs in Ireland.

Cannabis was the most commonly detected drug, followed by benzodiazepines, cocaine, opioids and amphetamines/methamphetamines. By 2018, cannabis was detected in more than half of drivers providing a sample for toxicological analysis. This result reflects the relative availability and use of cannabis in Ireland, being the most commonly reported illicit drug used in the National Drugs and Alcohol Survey with an estimated prevalence of 5.9% for last year drug consumption (Mongan et al. 2021). This is also in line with European (Simonsen et al. 2022), North American (Beirness et al. 2024), and prior Irish (Fitzpatrick et al. 2006) findings for road toxicology, whereas Australian studies report methamphetamine as the most commonly detected drug followed by cannabis (Mills et al. 2021). Benzodiazepines were detected in over a quarter of drivers providing a sample for toxicological analysis and rates were stable or decreasing slightly, which reflects prescribing trends in the community during the study period (Cadogan et al. 2018). Opioid detection rates were also stable, despite increasing community prescribing in Ireland (Norris et al. 2021). It is important to note that the scope of the immunoassay test for opioids does not include tramadol and oxycodone which are commonly prescribed opioids (Norris et al. 2021). However, these results are consistent with stable to decreasing reports of problem opioid use (Lynch et al. 2024).

Furthermore, we observed a large year-on-year increase in the detection of cocaine, both alone and in combination with cannabis and with benzodiazepines. By 2018, cocaine detection was higher than that of benzodiazepines in male drivers providing a sample for toxicological analysis, reaching 259 per 1,000, a 10-fold increase compared to Irish figures published in 2006 (Fitzpatrick et al. 2006). Other indicators point to an increase in cocaine use (Mongan et al. 2021), and problem cocaine use (Lynch et al. 2024) in Ireland. Similar trends are observed in Western Europe (Antoine et al. 2021). In addition, cocaine is increasingly implicated in drug-related deaths in Ireland (+31.15% annually between 2012 and 2021) and most commonly in men (Kelleher et al. 2024). Amphetamine and methamphetamine detection rates remained low throughout the study period which is consistent with low levels of use observed across the general population (Mongan et al. 2021), treatment demand (Lynch et al. 2024), people attending addiction services (Durand et al. 2024), and drug-related mortality (Kelleher et al. 2024) in Ireland. Consistent with international evidence (Pelletti et al. 2022), men and younger age classes were more likely to use illicit drugs (cannabis, cocaine, amphetamines, and methamphetamines) when driving than women and older people. In contrast, opioids were more likely to be detected in women, which reflects a greater use of opioid pain relievers in women than men observed in the general population (Mongan et al. 2021).

Strengths and limitations

This national study included all drivers' samples analyzed for toxicology over 7 years in Ireland. This complete dataset of a relatively large sample size, allowed for robust and relevant trend analysis. Over the study period, the consistent use of immunoassay techniques further strengthens the study by ensuring longitudinal consistency. A sensitivity analysis, to account for potential changes in decision making for sending samples for toxicological analysis after 2017 was conducted, with results largely similar to the main analysis. Finally, all analyses were adjusted for gender and age. Gender and age sensitive monitoring of trends is important for developing targeted prevention and enforcement efforts (Pelletti et al. 2022).

However, this study is not without limitations. First, toxicological analysis is conducted only when drivers are stopped, exhibit signs of intoxication or a positive PDT (since April 2017), and when blood or urine alcohol concentration is below a specified legal limit. This practice leads to both overestimation (due to observed impairment, or positive PDT) and underestimation (due to the alcohol threshold) (Fitzpatrick et al. 2006) of the observed drug detection rates among drivers. Differences between substances could arise, for example the detection of drugs frequently consumed with alcohol is likely to be more underestimated than those typically consumed on their own or in combination with other drugs. The number of road arrests that lead to sample collection can also fluctuate based on law enforcement resources, current traffic enforcement policies, and targeted checkpoints for example, at high risk periods such as public holiday weekends. To mitigate bias, we analyzed annual detection and co-detection rates rather than raw numbers, and nationally aggregated, annual data, therefore smoothing out short-term and regional variations. Second, immunoassay testing only provides information at the drug class level (e.g., powder cocaine or crack cocaine, multiple benzodiazepines), and carries a low risk of cross reactivity, where substances with similar molecular structures may trigger a positive test result. Third, with respect to opioids and benzodiazepines, we cannot determine whether drugs were prescribed, or sourced illicitly or misused. In the case of opioids, a positive test may indicate use of illicit opioids (heroin) or common medications such as codeine. Fourth, we do not have information on driver impairment levels or whether the person was involved in a RTC. Finally, the time period examined does not allow for an assessment of more recent trends, including the potential impact of COVID-19 on drug-driving in Ireland.

Implications

Our findings indicate increasing detection of cocaine and cannabis in drivers providing a sample for toxicological analysis in Ireland between 2012 and 2018; suggesting increased use among drivers. This is a cause for concern, as the purity and potency of both cannabis and cocaine reported in European markets is also increasing (European Monitoring Centre for Drugs and Drug Addiction 2023), potentially affecting levels of impairment associated with the consumption of these drugs. The increasing co-detection of cocaine with benzodiazepines and cocaine with cannabis should also be addressed, as poly-drug use may increase impairment (Simmons et al. 2022).

The most commonly used interventions to reduce RTCs include legislative (criminalization of risky behaviors, high penalties), law enforcement (intoxicant testing, speed cameras), road safety (infrastructure improvement), and education (Akbari et al. 2024). Trends and demographic characteristics of populations engaging in driving under the influence of drugs identified in this study can inform these interventions, aiming to reduce RTC deaths and injuries (Road Safety Authority 2020).

While there are legislative penalties for driving under the influence of drugs including disqualification, fines, and possible custodial sentences (Road Traffic Act 2010 2024), there is currently no polydrug offense in Irish law. However, this is included in the current national road safety strategy (Road Safety Authority 2020).

Evidence suggests that individuals are less likely to engage in prohibited behavior if they believe there is a substantial probability of detection and that the consequences of such detection will be negative. This highlights the importance of detection mechanisms, such as drug testing, and the strategic targeting of such mechanisms, as well as effective communication regarding the penalties incurred (Elliott 2003) to reduce drug-driving. Widespread, visible roadside drug testing operations and well targeted drug testing campaigns including roadside PDT (Mills et al. 2022) may contribute to deterring road-users from engaging in drug-driving and lower the risk of RTC.

Despite improvements in driving performance, self-perceived driving abilities, and decreased traffic offenses (Razaghizad et al. 2021), educational interventions did not demonstrate a statistically significant impact on crash or injury rates (Akbari et al. 2021). However this should be interpreted with caution, as major confounders, and ineffective implementation were pointed out (Akbari et al. 2021).

Current education programs in Ireland are primarily directed toward youth as well as general media campaigns (Road Safety Authority 2020). Additional populations could include people who use drugs, as well as prescribing and dispensing medical staff (Lemaire-Hurtel et al. 2015), who are the primary patient point of contact for prescription medications. In addition, content of the education programs should be adapted to include emerging drug trends, such as new psychoactive substances, including nitazenes and illicit benzodiazepines, and the changes in potency observed in established drugs.

Analyzing trends in drug detection data can also provide insights into broader population behaviors. Evidence from Australia suggests a correlation between roadside drug testing results and general population trends, as demonstrated by correlations found with wastewater analysis for methamphetamine and MDMA (Bade et al. 2018). In Ireland, driving remains the primary mode of commuting, with the 2016 Census reporting that over 60% of workers commute by car.

In 2021, 81.6% of individuals aged 18 and older were holding a valid driving license (Driving Licences Travel Behaviour Trends 2021 - Central Statistics Office), representing a vast proportion of the population potentially exposed to road checks. Although limited to drivers, road toxicology results can serve as a valuable data source for monitoring trends in drug and polydrug use, complementing other population-level indicators of drug use such as treatment burden, or drug-related deaths.

Furthermore, continuous improvement of analytical techniques is necessary to keep up with a rapidly changing illicit drug landscape. Liquid Chromatography-Mass Spectrometry techniques, enabling precise drug detection and quantification, were introduced in the MBRS in 2019 as the analytical method for drug screening and holds significant potential for future monitoring. Further work is warranted using this data to quantify poly-drug use and characterize profiles of people driving under the influence of drugs.

Conclusion

This study examined trends in the detection of cannabis, cocaine, amphetamines, methamphetamine, benzodiazepines, and opioids, alone and in combination, among drivers suspected of driving under the influence of an intoxicant, adjusting for gender and age. We observed large increases in the detection of cocaine and cannabis in Ireland between 2012 and 2018. Increases in the co-detection of cocaine with cannabis, and cocaine with benzodiazepines were also noted. While these results can inform public interventions and road safety measures, future research should identify patterns in intoxicant use and quantify associations with RTC, to support the efficient targeting of these interventions.

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The authors do not have permission to share data.

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