



Interconnections between unintended pregnancy, alcohol and other drug use, and pregnancy, birth, infant, childhood and socioeconomic outcomes: a scoping review

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ABSTRACT

Background Unintended pregnancy (UIP) and substance use disorder share underlying root causes with similar impacts for women and their offspring in pregnancy, birth and beyond. Furthermore, intoxication with alcohol and other drugs (AOD) increases the risk of UIP.

Objectives To assess the available evidence on associations between UIP and health, social and economic outcomes, in women who use AOD.

Search strategy The review utilised the Joanna Briggs Institute Methodology for Scoping Reviews and PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) reporting guidelines. The search was conducted across multiple databases, including Scopus and Medline, and limited to studies published between January 2000 to June 2023.

Selection criteria Studies reporting on interactions between AOD use and UIP, and pregnancy, birth, infant, childhood, social or economic outcomes. All patterns and types of AOD use, except isolated use of tobacco, were included. Studies were available in English and conducted in high-income countries.

Data collection and analysis Selected articles were reviewed, and data collected by two independent reviewers using a standardised data extraction sheet. Findings were summarised and reported descriptively.

Main results A total of 2536 titles and abstracts were screened, 97 full texts were reviewed, and three studies were selected for inclusion in the scoping review. There was heterogeneity in types and patterns of AOD use, differences in study design and tools to assess pregnancy intention, and each focused on disparate outcomes. No study assessed or reported on birth outcomes.

WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ Women with substance use disorder experience high rates of unintended pregnancy (UIP).
- ⇒ Substance use disorder and UIP are both associated with similar adverse health and social outcomes following pregnancy.
- ⇒ It is unclear if UIP exacerbates outcomes for women who use alcohol and other drugs, or if adverse outcomes simply represent shared social determinants of health, such as poverty.

WHAT THIS STUDY ADDS

- ⇒ There is a substantial gap in the literature examining the intersection between UIP and alcohol and other drug use, particularly regarding the effect on short- and long-term outcomes following the pregnancy. No research is available that examines birth outcomes.
- ⇒ Social determinants of health may be more influential on outcomes from pregnancy than UIP and alcohol and other drug use.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

- ⇒ Maternity and reproductive health services are likely to benefit from a better understanding of the underlying causes of pregnancy and birth outcomes in women who use alcohol and other drugs. This is an important public health issue, for which further research should be a priority for perinatal researchers.

Conclusion There is a paucity of data examining the intersection between AOD use and UIP and further research is needed.

INTRODUCTION

Unintended pregnancy (UIP) and alcohol and other drug (AOD) use are interconnected issues that potentially impact the lives of pregnant women and their offspring. AOD intoxication is associated with risky sexual behaviour that may lead to UIP.^{1–3} AOD use is associated with higher rates of UIP compared with the general population.^{4–5} Worldwide, 44% of all pregnancies are unintended.⁶ In women with opioid use disorder, 78–86% of pregnancies are unintended,^{7–8} in women who use cannabis 64.7% are unintended,⁹ and in women with binge or heavy alcohol use 67–74% of pregnancies are unintended.^{10–11} Typically, AOD use reduces following recognition of pregnancy¹²; however, UIP is associated with delayed recognition of pregnancy.¹³ Therefore, UIP may result in fetal exposure to AOD during the first trimester.^{14–15}

Disentangling the impact of AOD on adverse pregnancy, birth, infant and childhood outcomes from socioeconomic deprivation and social determinants of disease is complex.¹⁶ Nevertheless, there are outcomes that are substance-use specific, such as the association between alcohol and fetal alcohol spectrum disorders.¹⁰ Preterm birth and low birth weight are associated with opioid use disorder, although access to integrated obstetric and AOD care, and maintenance on an opioid treatment programme (with methadone or buprenorphine) substantially reduces the risk.^{17–19} Amphetamine use is associated with pre-eclampsia and low birth weight.^{20–21}

UIP is associated with similar types of adverse pregnancy, birth, infant and childhood outcomes to AOD use. These include preterm birth, low birth weight and small-for-gestational-age neonates, although the strongest reported associations have been with unadjusted data and unwanted pregnancy.^{22–23} A range of psychosocial issues are linked to UIP including a higher risk of interpersonal physical, sexual and emotional abuse, as well as psychological morbidity.^{24–26}

AOD use encompasses low-level use as well as use within the context of a substance use disorder (SUD).^{27–28} To identify and understand all available evidence, this review takes a broad approach examining all AOD use in pregnancy. The objective of this scoping review is to investigate the relationship between UIP and AOD use, and how they interact to affect pregnancy, birth, infant, childhood, social and economic outcomes in high-income countries. The purpose of this scoping review is to identify research gaps, and to inform policy development and practice in maternity and reproductive health settings.

METHODS

Protocol, search strategy and eligibility criteria

Development of this scoping review used the Joanna Briggs Institute (JBI) Methodology for Scoping Reviews.²⁹ An *a priori* protocol was registered on Open Science Framework.³⁰ The reporting of the review adhered to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) extension for scoping reviews.³¹

The main search included Medline (via Ovid), Embase, Scopus, CINAHL, Google Scholar, Cochrane Database of Systematic Reviews and TRIP electronic databases. The key search terms were: unplanned pregnancy; unwanted pregnancy; substance-related disorders; addiction medicine; alcohol drinking; illicit drugs; designer drugs; drug misuse. The search strategy for all included databases has been included in online supplemental appendix 1. An internet search was also included to identify any relevant international guidelines, including from the WHO, US Centre for Disease Control and Prevention (CDC), the European Centre for Disease Prevention, and national guidelines from Europe, Australia and North America.

Studies were eligible for inclusion if they were:

- ▶ Published from January 2000 to June 2023
- ▶ Conducted in high-income countries (as defined by World Bank online supplemental appendix 2)³²
- ▶ Written in, or translated into, English. (The initial protocol excluded studies not written in the English language; however, the search strategy did not apply this limit and Google Translate was used to review journal articles written in languages other than English.³³)
- ▶ Primary research studies, including quantitative and descriptive epidemiological studies, prospective and retrospective cohort studies, case-control studies and analytical cross-sectional studies, or health economic analyses
- ▶ Conducted in pregnant women who use alcohol, illicit or illegal drugs and non-medical use of prescription drugs, including, but not limited to, pregnant women who are engaged in alcohol and other drug treatment, including any pattern of AOD use
- ▶ Reported on interactions between AOD use and UIP.

Studies were excluded if:

- ▶ There was no comparison to intended pregnancy
- ▶ They were case series, reviews, audits or qualitative research
- ▶ Tobacco was the only drug used.

Search

The search was conducted in February 2021, in accordance with the developed search strategy. Due to the interval between the search and publication, an updated search was conducted in Medline (via Ovid) in June 2023.

Screen

All identified studies were uploaded into Endnote.³⁴ A pilot title and abstract screen was conducted of 25 citations by two authors (KM and KB) to define the process for screening. All identified citations were uploaded into Covidence Systematic Review Software and duplicates were removed.³⁵ The titles and abstracts were screened according to the eligibility criteria by two reviewers (KM, KB, BM and/or PF). For the updated search in June 2023, title and abstract screening was performed by one author (KM). Selected full texts were assessed for eligibility by two reviewers (KM, KB, PF or DB). Conflicts at both the title and abstract stage and full-text review were resolved by discussion between the screening reviewers, or a third reviewer.

Following the selection of studies for inclusion, reference lists of included sources were screened; authors from two included sources were contacted, and an international expert in AOD use and UIP was contacted to identify additional evidence sources. Additional sources were then screened by two reviewers (KM, KB, PF or DB).

Data extraction

The data extraction template was adapted from the JBI Template Source of Evidence Detail, Characteristics and Results extraction instrument and modified for input into Covidence Systematic Review Software.^{29 35} The template included information on the type of evidence sources; countries of research; time period, participant characteristics; classification of outcomes (maternal/fetal/neonatal/childhood, health/social/economic); the measure of frequency of UIP in the source population; and the measure of effect on UIP on the outcomes of interest. The data domains for extraction were defined in the protocol *a priori*; however, two additional domains were added prior to the extraction (type of publication; frequency of outcome(s) in the study population). Online supplemental appendix 3 shows the data extraction template. A quality assessment tool was developed using the JBI Critical Appraisal Checklist for Cohort Studies and imported into Covidence Systematic Review Software.^{35 36} Data extraction and quality assessment for included sources was performed by two reviewers (KM, KB) with conflicts resolved by discussion. A pilot data extraction was unnecessary as only three articles were identified for inclusion in the study.

Data collation and summary

Extracted data were summarised into tables, and given the limited number of studies identified and the heterogeneity of the findings, results were summarised and reported descriptively. A systematic synthesis of results was not possible due to the heterogeneity of measured outcomes. The PRISMA reporting checklist for scoping reviews is provided in online supplemental appendix 4.³¹

RESULTS

The search identified 4045 citations. Following the removal of duplicates, the titles and abstracts of 2536 evidence sources were screened, 97 full texts were identified for full-text review and three studies selected for inclusion in the scoping review. Figure 1 shows the PRISMA 2020 flow diagram for study selection.³⁷ The three included studies varied in terms of methodology, population characteristics, measured outcomes, and results (table 1). The first study was a secondary analysis of prospectively collected cohort data from a randomised controlled trial of opioid treatment therapies in pregnancy^{38 39}; the second a retrospective cohort study using antenatal and paediatric datasets of women with known AOD use in pregnancy⁴⁰; and the third a subanalysis of Pregnancy Risk Assessment Monitoring System (PRAMS) survey data limited to women with alcohol use in pregnancy.⁴¹ The studies were conducted in the late 1990s and early 2000s with the first two involving data collection during pregnancy and the third requiring retrospective recall.^{38 40 41} Studies were conducted across North America and Europe and included 175 to 95 728 participants.

The first study was small, but otherwise of high quality.³⁸ The second study had no discussion of the reliability of pregnancy intention measurement (obtained from retrospective datasets) and did not present demographic factors according to the exposure groups (intended/unintended pregnancy) or adjust for confounders.⁴⁰ The third study was a population-based study that required retrospective recall of alcohol use during pregnancy, which is likely to underestimate alcohol use.⁴¹⁻⁴³

Assessment of pregnancy intention during pregnancy varied across the three studies. The first used a non-validated screening questionnaire and then reclassified responses as an intended or unintended pregnancy³⁸; the second used dichotomous responses (intended or unintended pregnancy) as recorded in a maternity dataset⁴⁰; and the third study retrospectively assessed pregnancy intention in the postpartum period using a four-point question, then reclassified responses as intended, mistimed (unintended but would have liked the pregnancy to occur later than it did) or unwanted (unintended and did not want the pregnancy to occur at all). The differences between unwanted and intended/mistimed pregnancies were reported.⁴¹

Table 2 presents the population characteristics of the included studies, with the first study limited to women with opioid use disorder,³⁸ the second to women with known SUD and a mix of types of AOD,⁴⁰ and the third included women who used alcohol in the 3 months prior to pregnancy.⁴¹ Unemployment rates of up of 81–96% were reported in the first study³⁸ and 72.9% in the second.⁴⁰

There were limited and selected outcomes reported by pregnancy intention, which differed for each study

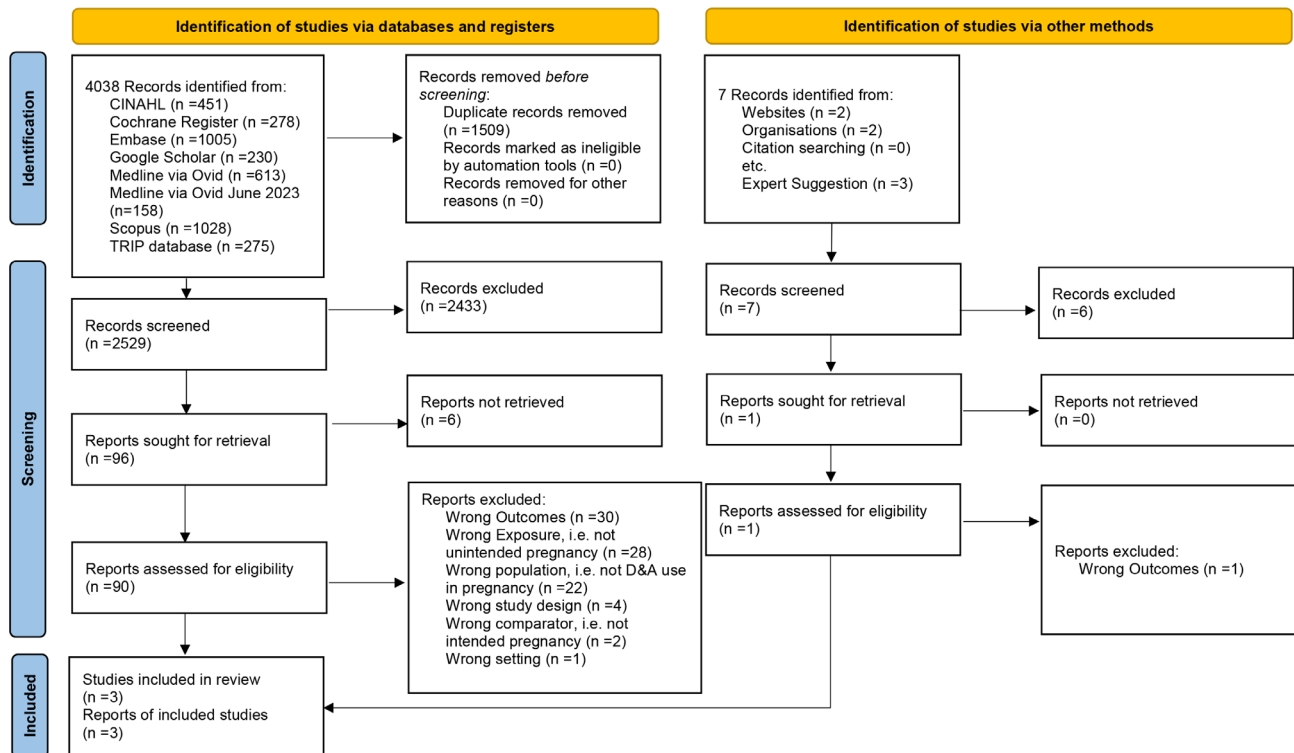


Figure 1 PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) 2020 flow diagram for studies investigating pregnancy intention among women using drugs and alcohol and their health, social and economic outcomes.

(table 3). The first study examined retention in AOD treatment during pregnancy³⁸; the second focused on placement of the child into out-of-home care⁴⁰; and the third study focused on continued and binge drinking during the last 3 months of pregnancy.⁴¹ No included studies examined pregnancy and birth outcomes, childhood health outcomes, or postpartum or long-term maternal health, and no economic evaluations were included.

For women who were engaged in an opioid treatment programme, women with an UIP had an average 5-week shorter duration in antenatal AOD treatment compared with those with an intended pregnancy (16.3 vs 21.3 weeks, $p=0.01$). However, analysis showed that after adjusting for confounders there was no association between pregnancy intention and likelihood of remaining in an opioid treatment programme until the birth of a live baby (72% for UIP, 82% for intended pregnancy, $p=0.28$).³⁸

For women who received antenatal care in specialised AOD services, those with an UIP had an almost two-fold higher rate of a child being placed into out-of-home care by the age of 2 years (42.5%) compared with an intended pregnancy (24.1%) (crude odds ratio (OR) 1.76, 95% CI 1.25 to 2.48, $p=0.01$).⁴⁰

For women who drank alcohol in the 3 months prior to pregnancy, compared with women with an intended or mistimed pregnancy, women with an unwanted pregnancy showed no difference in the likelihood of continued drinking into the final 3 months of pregnancy (adjusted OR (aOR) 1.15, 95% CI 0.99 to 1.33).

However, they did show an increase in binge drinking, defined as any episode of drinking five or more standard alcohol drinks at a time, in the final 3 months of pregnancy (aOR 1.40, 95% CI 1.07 to 1.83).⁴¹

Critical analysis

Main findings

AOD and UIP are both important public health issues and this scoping review shows there are very limited data available examining the intersection between the two issues. There were only three studies identified and these included women using different types and patterns of AOD use, used different tools to assess pregnancy intention, and focused on disparate outcomes. Importantly, no study assessed or reported on birth outcomes. Although there were unadjusted associations between UIP and remaining in AOD treatment during pregnancy,³⁸ UIP and children entering out-of-home care,⁴⁰ and adjusted associations between UIP and persistent binge drinking into the third trimester of pregnancy, data overall were limited.⁴¹ Where studies adjusted for confounders, the size of effect either substantially reduced or disappeared altogether, indicating that social determinants of health may be more influential than UIP and AOD use on outcomes.

Strength and limitations

This main strength of this scoping review is that it identified a research gap that had not been previously identified. The methodology involved a comprehensive, systematic search of scientific literature across

Table 1 Methodology of included studies

	Study		
	1*	2	3
General information	Martin <i>et al</i>³⁸	Sarkola <i>et al</i>⁴⁰	Terplan <i>et al</i>⁴¹
Type of publication	Peer-reviewed publication	Peer-reviewed publication	Peer-reviewed publication
Research question(s)	To compare treatment continuation and duration (in opioid treatment programmes) before delivery of a live infant in women with UIP vs IP	To identify risk factors for children being placed into out-of-home care	To examine the relationship between pregnancy intention and continued drinking, or binge drinking, in last 3 months of pregnancy
Population	Pregnant women in opioid treatment programme	Pregnant women in specialised AOD antenatal care services (mix of types of AOD)	Postpartum women who drank alcohol in the 3 months prior to pregnancy
Methodology			
Study design	Prospective cohort study	Retrospective cohort study	Retrospective cohort study
Study setting	Recruited in antenatal period from AOD treatment clinics	Antenatal datasets and paediatric datasets	Recruited in postpartum period from PRAMS telephone survey
Geographical region	North America (USA and Canada) and Europe (Austria)	Europe (Finland)	North America (33 USA states)
Time period of recruitment	4 May 2005 to 31 October 2008	1992 to 2001	2004 to 2008
Timing of recording of pregnancy intention	During pregnancy	During pregnancy	Retrospective (after pregnancy)
Reporting of AOD use/SUD	Addiction severity index as a measure of impairment. Overall AOD intake not reported	AOD use recorded in maternal records pre-conception, during pregnancy and postpartum. Alcohol use recorded as daily, weekly, less than daily. Opioid use recorded as 'regular' (daily or weekly) Urine toxicology results recorded	Self-reported using retrospective recall during the 3 months prior to pregnancy and final 3 months of pregnancy for: <ul style="list-style-type: none"> ▶ Average number of standard alcohol drinks per week drinking ▶ Any binge drinking episodes (five or more standard drinks at a time)
Tools used to assess UIP	Non-validated screening questionnaire Categorised: intended/unintended Unintended subgroups: mistimed, ambivalent or unwanted	Dichotomous: intended/unintended	Four-point questions. Reclassified into intended/mistimed or unwanted
Total number of participants	175	626	95 728
*Demographic data obtained from primary study (this study is a secondary analysis). ³⁹ AOD, alcohol or other drugs; IP, intended pregnancy; PRAMS, Pregnancy Risk Assessment Monitoring System; SUD, substance use disorder; UIP, unintended pregnancy.			

multiple databases and facilitated a broad search of all possible short-term and long-term outcomes, including pregnancy, birth, infant and childhood health outcomes, as well as social and economic outcomes. The broad criteria of all AOD use and UIP, and the search across databases of multiple disciplines, means there is unlikely to be a substantive body of literature on this topic that has not been identified. The search was restricted to the 21st century to ensure only contemporaneous concepts relating to AOD use and pregnancy intention were included.

The limitations of this scoping review are the overall paucity of studies, heterogeneity in sample size, methodology, assessment of pregnancy intention, and variation in AOD use definitions and patterns, making it difficult to draw general conclusions. Another limitation is that no study assessed the role of underlying factors, such as poverty, education or access to health-care, in the development of SUD and UIP. Additionally, the first study was likely underpowered to detect

an association between UIP and remaining in AOD treatment during pregnancy.³⁸ The second study did not adjust for social determinants of health and therefore was not able to demonstrate a causative pathway between UIP and children entering into out-of-home care.⁴⁰ The third study assessed alcohol consumption during pregnancy using retrospective recall in the postpartum period, which may have biased the results.⁴¹ Finally, the purpose of this study was to examine outcomes from pregnancy, which are typically assessed using quantitative data. While the exclusion of qualitative studies represents a limitation and review of the qualitative literature would be interesting, it was beyond the scope of our review.

Interpretation

This scoping review was not able to clarify the relationship between UIP and AOD use. There was a lack of consistency of the populations examined, with some studies examining all women who use AOD, and

Table 2 Population characteristics of included studies

Population characteristic	Study		
	1*	2	3
	Martin <i>et al</i> ³⁸	Sarkola <i>et al</i> ⁴⁰	Terplan <i>et al</i> ⁴¹
Age (years)	18–41	Mean: 27 (SD±6) 12% teenage.	≤19: 6.2% 20–39: 91.1% ≥40: 2.7%
Education level	Mean number of years in education: ~11	Completed secondary education or vocational training: 25.2%	Less than high school: 10.6% High school only: 26.1% Greater than high school: 63.2%
Employment	Employed: 4–19%	Unemployed at time of birth: 72.7%	NR
Out-of-home care: mothers as children	NR	9.4%	NR
Out-of-home care: previous child	NR	7.3%	NR
Other socioeconomic characteristics	Criminally unencumbered: 71–88%	Homeless or living in institution: 21.6%	Annual income (USD) <10 000: 14.1% 10 000–14 999: 7.5% 15 000–24 000: 12.0% 25 000–50 000: 20.1% ≥\$50 000: 46.3%
Ethnicities	White 83% Black 14% Other 2%	NR	White 74.9%, Black 11.9%, Hispanic 7.9%, Other 5.3%
Gravidity	NR	NR	NR
Parity	NR	NR	NR
Gestational age at recruitment	16–20 weeks	NR	Postpartum
Tobacco smoking	~95%	78.4%	NR
Principal drug(s) of choice	Opioids: 100% Multidrug use common - including heroin, cocaine, alcohol, benzodiazepines.	▶ Alcohol: 25% before pregnancy, 11% during pregnancy, ▶ Opioids: 12% before pregnancy, 6% during pregnancy, ▶ 15%: anxiolytics/hypnotics	Alcohol
Pattern of drug use	NR	NR	Mixed - reports on binge and non- binge drinking
Severity of drug use	Mean addiction severity index 0.29–0.34	14% have a history of regular contact with AOD healthcare	All alcohol use reported, subset of heavy use

*Demographic data obtained from primary study (this study is a secondary analysis).³⁹
NR, not reported; SD, standard deviation; USD, US dollars.

others focusing specifically on women with SUD. The effects of social determinants of health are likely very different between those with low-level AOD use and SUD, and the impact of differences were not assessed in this study. The factors that contribute to UIP in women with SUD include a perception of low risk of pregnancy, sexual coercion, poor reproductive health knowledge, cost and access to services, and mental illness.⁴⁴ People who use illicit drugs are more likely to live in poverty,⁴⁵ and women living in poverty are more than twice as likely to experience an UIP.⁴⁶ Previously, a comprehensive model found almost all the effect of illicit drug use on low birth weight can be attributed to psychological, physical and behavioural factors. These factors include unwanted pregnancy, finances, nutritional status, and exposure to violence.¹⁶ SUD and UIP are likely intrinsically linked by shared causative pathways, involving social determinants of health such as

poverty, and access to healthcare and education, which have not been examined in any study.

This scoping review identified no studies that reported on associations between UIP and long-term health problems in the offspring of women who use AOD during pregnancy. However, there were two other studies, excluded from the scoping review after full-text review, that examined the effects of alcohol following an UIP. The Avon Longitudinal Study of Parents and Children (ALSPAC) cohort study reported that children born following an UIP pregnancy were more likely to have fetal alcohol spectrum disorder (FASD) compared with children born following an intended pregnancy. However, it was excluded as the analysis was not limited to children of women who consumed alcohol during pregnancy.⁴⁷ The Growing Up in New Zealand cohort study reported changes in infant and childhood behavioural scores for those

Table 3 Results of included studies

Results	Study		
	1*	2	3
	Martin <i>et al</i>³⁸	Sarkola <i>et al</i>⁴⁰	Terplan <i>et al</i>⁴¹
Outcome types	Health: maternal	Social	Health: maternal
Outcomes ¹	Mean duration in prenatal AOD treatment duration (crude): UIP: 16.3 weeks vs IP: 21.3 weeks (p=0.01)*	Cumulative placement into out-of-home care at less than 2 years of age UIP: 42.5% vs IP: 24.1% (no p-value provided)† Crude OR 1.76 (1.25–2.48, p=0.01)	Continued drinking during pregnancy (during the last 3 months of pregnancy) aOR‡ 1.15 (0.99–1.33)
Outcomes ²	Treatment continuation before delivery of a live infant UIP: 72% vs IP: 82% (p=0.28) Cox proportional hazard ratio (adjusted) 0.73, p=0.21	Cumulative placement into out-of-home care for more than half their life UIP: 23% vs IP: 11.2% (no p-value provided)‡ Crude OR 2.06 (1.19–3.45, p=0.021)	Binge drinking during pregnancy (during the last 3 months of pregnancy) aOR‡ 1.40 (1.07–1.83)
Summary			
Association between outcome and UIP	In pregnant women in opioid treatment programmes, UIPs are associated with: <ul style="list-style-type: none"> ▶ A 5-week reduction in the duration spent in opioid treatment programmes† ▶ No difference in the likelihood of staying in opioid treatment programmes until birth 	In pregnant women with AOD use, UIPs are associated with: <ul style="list-style-type: none"> ▶ 1.76 the odds of the child being placed into out-of-home care by the age of 2 years† ▶ Twice the odds of the child being placed into out-of-home care for more than half their life† 	In women who drank alcohol in the 3 months prior to pregnancy, unwanted pregnancy, compared with intended and mistimed pregnancies, is associated with: <ul style="list-style-type: none"> ▶ 1.4 the odds of binge drinking, in the final 3 months of pregnancy ▶ No difference in continued drinking in the final 3 months of pregnancy
*Demographic data obtained from primary study (this study is a secondary analysis). ³⁹			
†Adjustment for confounders not provided.			
‡Unwanted vs intended/mistimed pregnancies			
AOD, alcohol or drugs; aOR, adjusted odds ratio; IP, intended pregnancy; OR, odds ratio; UIP, unintended pregnancy.			

whose mothers drank alcohol in pregnancy and had a UIP. Although this study did stratify the effects according to the quantity and pattern of alcohol use, the comparison group was to mothers who did not drink alcohol, not mothers with an intended pregnancy, and therefore it was not suitable for inclusion in the scoping review.⁴⁸ These and other cohort studies indicate that existing datasets may contain information that could be analysed to assess interconnections between AOD use and UIP on pregnancy, birth, infant and childhood outcomes.

Additional Educational Resources

Schempf AH, Strobino DM. Illicit drug use and adverse birth outcomes: is it drugs or context? *J Urban Health* 2008;85(6):858–73.

Nelson HD, Darney BG, Ahrens K, *et al*. Associations of unintended pregnancy with maternal and infant health outcomes. *JAMA* 2022;328(17):1714.

Chang G. Maternal substance use: consequences, identification, and interventions. *Alcohol Res* 2020;40(2):06.

Louw K-A. Substance use in pregnancy: the medical challenge. *Obstet Med* 2018;11(2):54–66.

Shafique S, Umer A, Innes E, *et al*. Preconception substance use and risk of unintended pregnancy: Pregnancy Risk Assessment Monitoring System 2016–17. *J Addict Med* 2022;6(3):278–85.

CONCLUSIONS

Future research could involve analysis of existing datasets, including from prospectively collected cohort studies such as ALSPAC or Growing up in New Zealand.^{47 48} Other sources of existing data are maternity datasets, which often record pregnancy intention, AOD use, sociodemographic factors, and labour and birth outcomes. Data linkage using paediatric datasets would also enable more comprehensive and longitudinal follow-up of both maternal and infant outcomes. Importantly, future research should examine and compare differences between women with low-level AOD use and SUD. Future research should also consider how the complexity of women's lives, in relation to social determinants of health, impact outcomes. Review of qualitative studies could provide a more contextual and subjective response around the intersection between pregnancy intention and AOD use. Future research could also incorporate a validated tool of UIP, such as the London Measure of Unplanned Pregnancy that is more stable over time. This can be used during pregnancy or the postnatal period, and can capture differences between an unintended, but wanted pregnancy and an unwanted pregnancy.⁴⁹

To our knowledge this is the only review to report on the associations between UIP and health, social or economic outcomes in women who use AOD. It highlights a substantial gap in the literature. Less is known about the causal pathways, including potential confounders such as poverty, education and

access to healthcare including contraception. There is also little known about the long-term impacts on women and their children. Maternity and reproductive health services are likely to benefit from a better understanding of the underlying causes of pregnancy and birth outcomes in women who use AOD. This is an important public health issue, for which further research should be a priority for perinatal researchers.

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REFERENCES

- 1 Bryan AD, Schmiede SJ, Magnan RE. Marijuana use and risky sexual behavior among high-risk adolescents: trajectories, risk factors, and event-level relationships. *Dev Psychol* 2012;48:1429–42.
- 2 Cheng T, Johnston C, Kerr T, *et al.* Substance use patterns and unprotected sex among street-involved youth in a Canadian setting: a prospective cohort study health behaviour, health promotion and society. *BMC Public Health* 2016;16:4.
- 3 Lundsberg LS, Peglow S, Qasba N, *et al.* Is preconception substance use associated with unplanned or poorly timed pregnancy. *J Addict Med* 2018;12:321–8.
- 4 Oulman E, Kim THM, Yunis K, *et al.* Prevalence and predictors of unintended pregnancy among women: an analysis of the Canadian Maternity Experiences Survey. *BMC Pregnancy Childbirth* 2015;15:260.
- 5 Shafique S, Umer A, Innes KE, *et al.* Preconception substance use and risk of unintended pregnancy: pregnancy risk assessment monitoring system 2016–17. *J Addict Med* 2022;16:278–85.
- 6 Bearak J, Popinchalk A, Alkema L, *et al.* Global, regional, and subregional trends in unintended pregnancy and its outcomes from 1990 to 2014: estimates from a Bayesian hierarchical model. *Lancet Glob Health* 2018;6:e380–9.
- 7 Auerbach SL, Agbemenu K, Ely GE, *et al.* A review of unintended pregnancy in opioid-using women: implications for nursing. *J Addict Nurs* 2021;32:107–14.
- 8 Black KI, Stephens C, Haber PS, *et al.* Unplanned pregnancy and contraceptive use in women attending drug treatment services. *Aust N Z J Obstet Gynaecol* 2012;52:146–50.
- 9 Short VL, Hand DJ, Gannon M, *et al.* Maternal characteristics associated with preconception marijuana use. *Am J Prev Med* 2020;59:555–61.
- 10 Mullally A, Cleary BJ, Barry J, *et al.* Prevalence, predictors and perinatal outcomes of peri-conceptual alcohol exposure - retrospective cohort study in an urban obstetric population in Ireland. *BMC Pregnancy Childbirth* 2011;11:27.
- 11 Mallard SR, Houghton LA. Socio-demographic characteristics associated with unplanned pregnancy in New Zealand: implications for access to preconception healthcare. *Aust N Z J Obstet Gynaecol* 2013;53:498–501.
- 12 Kendler KS, Ohlsson H, Svikis DS, *et al.* The protective effect of pregnancy on risk for drug abuse: a population, co-relative, co-spouse, and within-individual analysis. *Am J Psychiatry* 2017;174:954–62.
- 13 Ayoola AB. Late recognition of unintended pregnancies. *Public Health Nurs* 2015;32:462–70.

- 14 McCormack C, Hutchinson D, Burns L, *et al.* Prenatal alcohol consumption between conception and recognition of pregnancy. *Alcohol Clin Exp Res* 2017;41:369–78.
- 15 Lemasters GK, Perreault SD, Hales BF, *et al.* Workshop to identify critical windows of exposure for children's health: reproductive health in children and adolescents work group summary. *Environ Health Perspect* 2000;108(Suppl. 3):505–9.
- 16 Schempf AH, Strobino DM. Illicit drug use and adverse birth outcomes: is it drugs or context. *J Urban Health* 2008;85:858–73.
- 17 Goodman DJ, Saunders EC, Frew JR, *et al.* Integrated vs nonintegrated treatment for perinatal opioid use disorder: retrospective cohort study. *Am J Obstet Gynecol MFM* 2022;4:100489.
- 18 Maeda A, Bateman BT, Clancy CR, *et al.* Opioid abuse and dependence during pregnancy: temporal trends and obstetrical outcomes. *Anesthesiology* 2014;121:1158–65.
- 19 Krans EE, Kim JY, Chen Q, *et al.* Outcomes associated with the use of medications for opioid use disorder during pregnancy. *Addiction* 2021;116:3504–14.
- 20 Admon LK, Bart G, Kozhimannil KB, *et al.* Amphetamine- and opioid-affected births: incidence, outcomes, and costs, United States, 2004–2015. *Am J Public Health* 2019;109:148–54.
- 21 Shah R, Diaz SD, Arria A, *et al.* Prenatal methamphetamine exposure and short-term maternal and infant medical outcomes. *Am J Perinatol* 2012;29:391–400.
- 22 Nelson HD, Darney BG, Ahrens K, *et al.* Associations of unintended pregnancy with maternal and infant health outcomes. *JAMA* 2022;328:1714.
- 23 Hall JA, Benton L, Copas A, *et al.* Pregnancy intention and pregnancy outcome: systematic review and meta-analysis. *Matern Child Health J* 2017;21:670–704.
- 24 Lukasse M, Laanpere M, Karro H, *et al.* Pregnancy intendedness and the association with physical, sexual and emotional abuse – a European multi-country cross-sectional study. *BMC Pregnancy Childbirth* 2015;15:120.
- 25 Pallitto CC, García-Moreno C, Jansen H, *et al.* Intimate partner violence, abortion, and unintended pregnancy: results from the WHO multi-country study on women's health and domestic violence. *Int J Gynaecol Obstet* 2013;120:3–9.
- 26 Abajobir AA, Maravilla JC, Alati R, *et al.* A systematic review and meta-analysis of the association between unintended pregnancy and perinatal depression. *J Affect Disord* 2016;192:56–63.
- 27 Australian Institute of Health and Welfare (AIHW). National Drug Strategy Household Survey 2016: detailed findings. Drug Statistics Series No. 31. Cat. No. PHE 214. Canberra, Australia AIHW; 2017.
- 28 Peacock A, Leung J, Larney S, *et al.* Global statistics on alcohol, tobacco and illicit drug use: 2017 status report. *Addiction* 2018;113:1905–26.
- 29 Peters MDJ, Godfrey C, McInerney P, *et al.* Chapter 11: Scoping reviews (2020 version). In: Aromataris E, Munn Z, eds. *JBI Manual for Evidence Synthesis*. JBI, 2020. Available: <https://synthesismanual.jbi.global>
- 30 McNamara KA, Nassar N, Oei J, *et al.* Unintended pregnancy in women who use alcohol and other drugs in pregnancy in high income countries: a scoping review. 2020. Available: <https://osf.io/fvkmd/>
- 31 Tricco AC, Lillie E, Zarin W, *et al.* PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med* 2018;169:467–73.
- 32 The World Bank. World Bank country and lending groups. n.d. Available: <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>
- 33 Google translate. n.d. Available: <http://translate.google.com>
- 34 The EndNote Team. Endnote. In: EndNote X9.2(Bld 13018), ed. Philadelphia, PA: Clarivate, 2013.
- 35 Covidence systematic review software. Melbourne, Australia Veritas Health Innovation; Available: www.covidence.org
- 36 Moola S, Munn Z, Tufanaru C, *et al.* Systematic reviews of etiology and risk In: Aromataris E, Munn Z, eds. *JBI Manual for Evidence Synthesis*. JBI, 2020. Available: <https://synthesismanual.jbi.global>
- 37 Page MJ, McKenzie JE, Bossuyt PM, *et al.* The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71.
- 38 Martin CE, Terplan M, O'Grady KE, *et al.* Brief report: pregnancy intention and opioid use disorder treatment retention in the MOTHER study. *Am J Addict* 2018;27:372–4.
- 39 Jones HE, Kaltenbach K, Heil SH, *et al.* Neonatal abstinence syndrome after methadone or buprenorphine exposure. *N Engl J Med* 2010;363:2320–31.
- 40 Sarkola T, Kahila H, Gissler M, *et al.* Risk factors for out-of-home custody child care among families with alcohol and substance abuse problems. *Acta Paediatr* 2007;96:1571–6.
- 41 Terplan M, Cheng D, Chisolm MS. The relationship between pregnancy intention and alcohol use behavior: an analysis of PRAMS data. *J Subst Abuse Treat* 2014;46:506–10.
- 42 Alvik A, Haldorsen T, Groholt B, *et al.* Alcohol consumption before and during pregnancy comparing concurrent and retrospective reports. *Alcohol Clin Exp Res* 2006;30:510–5.
- 43 Chin HB, Baird DD, McConaughy DR, *et al.* Long-term recall of pregnancy-related events. *Epidemiology* 2017;28:575–9.
- 44 Stone RH, Griffin B, Fusco RA, *et al.* Factors affecting contraception access and use in patients with opioid use disorder. *J Clin Pharmacol* 2020;60 Suppl 2:S63–73.
- 45 Baptiste-Roberts K, Hossain M. Socioeconomic disparities and self-reported substance abuse-related problems. *Addict Health* 2018;10:112–22.
- 46 Finer LB, Zolna MR. Declines in unintended pregnancy in the United States, 2008–2011. *N Engl J Med* 2016;374:843–52.
- 47 McQuire C, Mukherjee R, Hurt L, *et al.* Screening prevalence of fetal alcohol spectrum disorders in a region of the United Kingdom: a population-based birth-cohort study. *Prev Med* 2019;118:344–51.
- 48 Schoeps A, Peterson ER, Mía Y, *et al.* Prenatal alcohol consumption and infant and child behavior: evidence from the Growing Up in New Zealand Cohort. *Early Hum Dev* 2018;123:22–9.
- 49 Hall JA, Barrett G, Copas A, *et al.* London Measure of Unplanned Pregnancy: guidance for its use as an outcome measure. *Patient Relat Outcome Meas* 2017;8:43–56.