Australian and New Zealand Fetal Alcohol Spectrum Disorder Clinical Network

Annotated Bibliography

1st Edition

June 2019- June 2020

Introduction and search details

This bibliography has been prepared as a resource for members of the ANZ FASD Clinical Network. Literature searches of PubMed, Web of Science, CINAHL, and Scopus were undertaken to identify all FASD-related studies published in the last 12 months by Australian and New Zealand researchers. Searches were undertaken with date restrictions from *June 2019 – June 2020*.

We have also included an additional non-annotated section with a special mention of some international studies that we thought would be of interest to the members of the network.

This annotated bibliography has been curated by members of the **University of Queensland Programming in Developmental Disease Research Group**: Karen Moritz, Lisa Akison, Linda Gallo, Natasha Reid, Nicole Hayes, Deb Askew, Sarah Steane, Sophia Young, Kelly Skorka, May Na Erng, and Olivia Wu.

Australian and New Zealand FASD Research

Prevention

1. Stevens S, Anstice N, Cooper A, Goodman L, Rogers J, Wouldes TA. Multiple tools are needed for the detection of prenatal alcohol exposure: Findings from a community antenatal setting. *Alcoholism: Clinical and Experimental Research*. 2020;44(4):1001-1011. doi:10.1111/acer.14309

In this study, the authors aimed to (i) determine the rates and pattern of alcohol use reported before and after awareness of pregnancy and associations with early pregnancy factors; and (ii) compare a biomarker of alcohol exposure in the last trimester of pregnancy with maternal self-reports of alcohol use. By comparing the biomarker with maternal self-report, the authors also aimed to determine whether these different methods provided complementary means of increasing the understanding of alcohol use patterns during pregnancy. Screening was done using the TWEAK (Tolerance, Worried, Eye-Opener, Amnesia, K/Cut down) questionnaire and an anonymous lifestyle questionnaire. Newborn dried blood spot samples for phosphatidylehthanol (PEth) biomarker analysis were obtained at 48 hours post-delivery. The authors concluded that sensitive interviewing was superior to questionnaires in drawing out accurate self-reports of alcohol use in early pregnancy, but not later in pregnancy. PEth concentrations, which reflected prenatal alcohol exposure during late pregnancy was not found to be associated with maternal self-report of alcohol use. Hence, the findings from this study highlighted that identification of prenatal alcohol exposure at different time points during pregnancy required multiple measurement tools and methods.

2. Whitehead R, O'Callaghan F, Gamble J, Reid N. Contextual influences experienced by Queensland midwives: A qualitative study focusing on alcohol and other substance use during pregnancy. *International Journal of Childbirth*. 2019;9(2):80-91. doi:10.1891/2156-5287.9.2.80

This qualitative study used a critical realist approach. The authors aimed to investigate and understand the experiences and contextual factors that influence the ability of Queensland midwives to support pregnant women with regards to alcohol and drug use during pregnancy. Semi-structured interviews were used for data collection. Eleven midwives participated from different healthcare setting including public, private or a mixture of both. Models of care utilised were mainly shift-based care (*n*=6), caseload care (*n*=4) or a combination of both (*n*=1). Their experiences were influenced by five overarching contextual factors – patient, patient/provider, provider, organisational and systemic level factors. Among patient-level factors identified were lack of knowledge on maternity care options and complex psychosocial issues such as lack of access to hospital, fear of healthcare environment and child protection involvement. At the patient/provider level, healthy midwife-pregnant women relationships built upon trust and further enhanced by provision of continuity of care were deemed important in improving women's engagement with antenatal care services. At the provider level, use of non-judgemental and supportive approaches in addition to casual and conversational assessment styles were also important in facilitating discussion of sensitive information with pregnant women. From an organisational perspective, participants highlighted lack of available support, training, and education of midwives. At a systemic level, lack of effective support services for pregnant women encountering alcohol or drug issues was prominent. Overall, this study has highlighted the multilevel contextual influences experienced by Queensland midwives in the provision of appropriate support to pregnant women with regards to alcohol and drug use during pregnancy.

3. Hocking M, O'Callaghan F, Reid N. Women's experiences of messages relating to alcohol consumption, received during their first antenatal care visit: An interpretative phenomenological analysis. *Women and Birth*. 2020;33(2):e122-e128. doi:10.1016/j.wombi.2019.02.002

This qualitative study aimed to explore women's experiences of alcohol-related messages received during their first antenatal care visit. Twelve female participants who had attended an initial antenatal care visit

within the previous two years participated in semi-structured interviews, and data was analysed using Interpretative Phenomenological Analysis. Two superordinate themes were identified: (1) messages received about alcohol consumption; and (2) ways of interpreting messages relating to alcohol use. The majority of women reported receiving verbal information about pregnancy alcohol use at their first antenatal care visit, but the content of messages was inconsistent. Consistent with national guidelines, written information conveyed messages that there is no safe level of alcohol use during pregnancy. This information was embedded within the sheer amount of information pertaining to other aspects of pregnancies. In addition, there was inconsistent follow-up on the written information received during subsequent antenatal visits. Though participants were aware of the risks of pregnancy alcohol use, differences in interpretation of risk influenced their choice of alcohol use during pregnancy. In addition, participants also contextualised information on drinking recommendation; decision to drink was influenced by personal, social, and cultural factors. This study has highlighted the importance of understanding how messages about alcohol abstinence during pregnancy were interpreted and providing antenatal care that is tailored to an individual's needs.

4. Lim AWY, van Schalkwyk MCI, Maani Hessari N, Petticrew MP. Pregnancy, fertility, breastfeeding, and alcohol consumption: An analysis of framing and completeness of information disseminated by alcohol industry-funded organizations. *Journal of Studies on Alcohol and other Drugs*. 2019;80(5):524-533. doi:10.15288/jsad.2019.80.52

Alcohol industry–funded organisations disseminate information on alcohol and pregnancy, but there are emerging concerns about its accuracy. This review analysed the completeness and framing of information on reproductive health topics (fertility, pregnancy, breastfeeding, and fetal health) provided by international alcohol industry corporate social responsibility organizations when compared with information provided by national public health information websites from a sample of English-speaking countries (United States, United Kingdom, Canada, Australia, Ireland, and New Zealand). Alcohol industry–funded organizations were statistically significantly less likely than public health websites to provide information on fetal alcohol spectrum disorder and less likely to advise that no amount of alcohol is safe during pregnancy. They were significantly more likely to emphasize uncertainties and less likely to use direct language (e.g., "don't drink"). Some alcohol industry–funded (and no public health) websites appear to use "alternate causation" arguments, similar to those used by the tobacco industry, to argue for causes of alcohol harms in pregnancy other than alcohol. Alcohol industry–funded websites omit and misrepresent the evidence on key risks of alcohol consumption during pregnancy which may "nudge" women toward continuing to drink during pregnancy. These findings suggest that alcohol industry–funded bodies AI entities to ambiguity and misinformation regarding the harmful effects of prenatal alcohol exposure, and therefore, may increase the likelihood of alcohol consumption during pregnancy. Public health organization websites and other sources should clearly inform the public that there is no known safe amount, safe time, or safe type of alcohol to use during pregnancy or while trying to get pregnant.

5. Gibson S, Nagle C, Paul J, McCarthy L, Muggli E. Influences on drinking choices among Indigenous and non-Indigenous pregnant women in Australia: A qualitative study. *PLoS One*. 2020;15(4):e0224719. doi:10.1371/journal.pone.0224719

This qualitative study aimed to explore influences on pregnant women's choices around alcohol use. A particular focus of this study was to understand why messages to abstain from alcohol may not always be effective with pregnant women and to inform a more tailored approach to health promotion. Interviews and group discussions were held with 14 pregnant Indigenous women from two settings (one remote service in the Northern Territory and one regional service in Victoria) and 14 pregnant non-Indigenous women from four services in Victoria (three public and one private health services) – thus women were recruited from a range of socioeconomic settings. All interviews and group discussions were audiotaped with participants' consent and transcribed verbatim with field notes added where relevant. Inductive content analysis identified five main influences on pregnant women's alcohol use: (i) Understanding - level

and detail of women's understanding of harm; (ii) Informing - women's information sources on alcohol use in pregnancy; (iii) Choosing - how this information influenced their choices; (iv) Conceptualising - how women conceptualised their pregnancy; and (v) Enabling - whether the social and cultural environment supported abstinence. Results provide insight into how Indigenous Australian and non-Indigenous pregnant women understand and conceptualise the harms from drinking alcohol when making drinking choices, including how their social and cultural environments impact their ability to abstain. Strategies for behaviour change need to: correct misinformation about supposed 'safe' timing, quantity and types of alcohol; develop a more accurate perception of Fetal Alcohol Spectrum Disorder; reframe messages about harm to messages about optimising the child's health and cognitive outcomes; and develop a holistic approach encompassing women's social and cultural context.

Physical health impacts of prenatal alcohol exposure

1. Akison LK, Reid N, Wyllie M, Moritz KM. Adverse health outcomes in offspring associated with fetal alcohol exposure: A systematic review of clinical and preclinical studies with a focus on metabolic and body composition outcomes. *Alcoholism: Clinical and Experimental Research*. 2019;43(7):1324-1343. doi:10.1111/acer.14078

This is the first in a series of systematic reviews summarising preclinical and clinical studies to-date that document adverse health outcomes in offspring associated with prenatal alcohol exposure. The review excludes studies that focus on the already well-documented neurobehavioural deficits, finding 139 studies across five health domains – metabolic/body composition, cardiovascular/renal, reproductive, liver/intestinal, and allergy/infection/immune function. There was also one study reporting on lung function. Only ~20% of these were clinical studies. This article focused on summarising the offspring outcomes associated with metabolism (glucose and lipid) and body composition (% fat mass/BMI) across 32 of the included articles (3 clinical and 29 preclinical). All clinical studies had heavy exposure or evidence of fetal alcohol syndrome (FAS), while preclinical studies covered a range of exposure dosages and timings across gestation. There was some evidence of glucose intolerance and insulin resistance in one case-control study of children with FAS and leaner body composition reported in children exposed to prenatal alcohol in two other clinical studies. Preclinical studies provided evidence of glucose intolerance and/or insulin resistance; dyslipidemia and/or hypercholesterolemia; and increased adiposity in offspring with prenatal alcohol exposure. The authors identified that further clinical studies are required, particularly in children within the broader group diagnosed with FASD.

2. Reid N, Moritz KM, Akison LK. Adverse health outcomes associated with fetal alcohol exposure: A systematic review focused on immune-related outcomes. *Pediatric Allergy and Immunology*. 2019;30(7):698-707. doi:10.1111/pai.13099

This article is part of a series of systematic reviews documenting adverse health outcomes in offspring exposed to prenatal alcohol, with a specific focus in this paper on immune-related outcomes. Amongst the included studies, there were 12 clinical studies covering outcomes related to allergy (6), infection (4) or both (2). Atopic outcomes (eczema, dermatitis, and/or asthma) were reported, but there were mixed findings on their association with prenatal alcohol exposure. Dermatitis and eczema appeared to show the strongest association, especially in younger children. There were also reports of increased incidence of sepsis and other major infections (e.g. pneumonia and meningitis) in newborns and/or young children, particularly up to 2 years of age. Thirty-nine preclinical studies were also identified, examining a wide range of immune outcomes. The majority of these studies reported that prenatal alcohol exposure had an immunosuppressive effect, providing a potential explanation for the increased susceptibility to allergy and infection identified in the clinical studies. However, >70% of these studies were published over 20 years ago. The authors concluded that compared to the comprehensive body of previous research on neurobehavioural outcomes associated with prenatal alcohol exposure, the impact on the developing immune system has been neglected and requires further research.

3. McReight EK, Liew SH, Steane SE, Hutt KJ, Moritz KM, Akison LK. Moderate episodic prenatal alcohol does not impact female offspring fertility in rats. *Reproduction*. 2020;159(5):615-626. doi:10.1530/REP-20-0039

Most preclinical studies examining the effects of prenatal alcohol exposure on offspring outcomes use high doses of alcohol throughout pregnancy. This article describes a relatively moderate, episodic (days 13.5 and 14.5 of a 22-day pregnancy) exposure of ethanol that only results in a peak blood alcohol concentration of ~0.04%. This model was designed to mimic 'Special Occasion' drinking, commonly reported by pregnant women and therefore clinically relevant. Despite male littermates from this model developing insulin resistance (see Nguyen et al. 2019 *J Physiol*), there was no evidence that this exposure impacted on female ovarian development or fertility. A broad range of reproductive outcomes were examined, including ovarian reserve (i.e. primordial follicle counts) in neonates, molecular regulators of follicle recruitment and death, puberty onset, estrous cyclicity and pregnancy success/implantation number. However, there were no significant differences between the alcohol-exposed and control female offspring for any of these measures. Although this animal study may provide some reassurance for women who have consumed a small amount of alcohol during their pregnancy, the authors cautioned against alcohol use during pregnancy, given the previously published effects on male offspring metabolism using this identical model.

4. Akison LK, Probyn ME, Gray SP, Cullen-McEwen LA, Tep K, Steane SE, Gobe GC, Wlodek ME, Bertram JE, Moritz KM. Moderate prenatal ethanol exposure in the rat promotes kidney cell apoptosis, nephron deficits, and sex-specific kidney dysfunction in adult offspring. *The Anatomical Record*. 2020; [published online ahead of print]. doi:10.1002/ar.24370

This article used a rat model to examine the effects of a relatively low dose of alcohol (6% ethanol) throughout pregnancy on kidney development. The blood alcohol content of the pregnant rats only reached ~0.05%, but this caused cells in the fetal kidney to undergo cell death (apoptosis). In addition, expression of genes that controlled branching morphogenesis and cell proliferation in the kidney were reduced compared to control levels. These changes that occurred in the fetal kidneys of alcohol-exposed pregnancies resulted in alterations to the postnatal kidney, with a reduction in kidney volume and the formation of less nephrons (the functional unit of the kidney) in young rat offspring. Finally, the authors determined that there were minor impairments in renal function, in particular the excretion of sodium, in female but not male offspring exposed to alcohol during pregnancy. These findings suggest that even a relatively low dose of alcohol can impair kidney development, at least in this rat model, although the long-term effects are relatively subtle and indicate that renal dysfunction could depend on the sex of the baby.

5. Reid N, Akison LK, Hoy W, Moritz KM. Adverse health outcomes associated with fetal alcohol exposure: A systematic review focused on cardio-renal outcomes. *Journal of Studies on Alcohol and other Drugs*. 2019;80(5):515-523.

This systematic review brought together clinical and preclinical studies that had examined impacts of prenatal alcohol exposure on cardiovascular and renal function. The authors identified 22 studies that met inclusion criteria. While prenatal alcohol exposure was found to affect many aspects of cardiovascular and renal function (including blood pressure, heart rate control and urinary excretion), most studies (~60%) were conducted in animal models. A major limitation, discussed by the authors, was not only the very small number of clinical studies in this area, but also that these studies were generally of poor quality and/or had small sample sizes. Despite this, the authors conclude that emerging preclinical data demonstrate evidence of high blood pressure and impaired kidney and heart development in offspring with prenatal alcohol exposure. This study is important because it highlights that further research is urgently required to provide more detailed evidence regarding potential impacts of prenatal alcohol on cardio-renal functioning, particularly in a clinical setting.

6. Dorey ES, Walton SL, Kalisch-Smith JI, Paravicini TM, Gardebjer EM, Weir KA, Singh RR, Bielefeldt-Ohmann H, Anderson ST, Wlodek ME, Moritz KM. Periconceptional ethanol exposure induces a sex specific diuresis and increase in AQP2 and AVPR2 in the kidneys of aged rat offspring. Physiol Rep. 2019 Nov;7(21):e14273. doi: 10.14814/phy2.14273.

The purpose of this article was to determine if alcohol consumption, limited to the time around conception, could alter kidney development in a rat model. The authors exposed rats to alcohol for four days before pregnancy until the time of implantation (day 5 of pregnancy). A number of measures were examined including kidney size, kidney gene expression and renal function in the offspring at various ages throughout life. The authors found that the alcohol exposure resulted in formation of less nephrons in the kidneys of young rats. Although this did not affect renal function in younger adults, as the animals aged, the female rats that had been exposed to alcohol lost the ability to concentrate their urine. This was likely due to dysregulation of the channel protein aquaporin-2 (AQP2) within the collecting ducts of the kidney. Aquaporins, as their name suggests, facilitate the transport of water between cells. The authors highlight that these results show that alcohol consumption may affect organ development, even when exposure is limited to early pregnancy, prior to implantation of the embryo. This work is of particular relevance to women who have consumed alcohol prior to pregnancy recognition and strengthens the need for health messaging around abstinence from alcohol as part of pregnancy planning.

7. Moritz KM, Reid N, Akison LK. Can fetal alcohol exposure increase the risk of hypertension? A new study in children and adolescents diagnosed with fetal alcohol spectrum disorder suggests it can. *Alcoholism: Clinical and Experimental Research*. 2019;43(10):2057-2059. doi:10.1111/acer.1417

This invited "Comment" piece accompanied a landmark paper by Cook and colleagues (Alcohol Clin Exp Res. 2019 Aug;43(8):1727-1733. doi: 10.1111/acer.14121), which was the first study to demonstrate an association between hypertension and children/adolescents diagnosed with fetal alcohol spectrum disorder (FASD). The authors highlight that although animal studies have demonstrated an association between prenatal alcohol exposure and high blood pressure, similar data was lacking in cohorts of people with a FASD diagnosis. The authors draw attention to the strengths of the study, including the relatively large sample size (125 children with FASD) and a control group that used data from the National Health and Nutrition Examination Survey. Data from four typically developing children, well-matched for age and sex, were used for each child with FASD. Limitations were noted, including the inability to perfectly match for race/ethnicity, medication use, and obesity status. Overall, this commentary highlights the need for further research in this area, including non-invasive measurement of blood pressure, renal function and body composition in children with FASD.

8. Nguyen TMT, Steane SE, Moritz KM, Akison LK. Prenatal alcohol exposure programmes offspring disease: insulin resistance in adult males in a rat model of acute exposure. *The Journal of Physiology*. 2019;597(23):5619-5637. doi:10.1113/JP278531

This article used a rat model to examine the effects of an acute, but moderate dose of alcohol (18% ethanol vol:vol) during mid-pregnancy on metabolic health of adolescent and adult offspring. The timing of alcohol exposure was only on two days during the equivalent of the first trimester human pregnancy, when women may not be aware they are pregnant. The authors found that this prenatal alcohol exposure resulted in a blood alcohol concentration of only 0.05-0.06%. This level of exposure did not affect fasting blood glucose concentrations of offspring at any age, or blood glucose concentrations during a glucose tolerance test performed at 6 months of age. However, 6-month-old male offspring exposed to alcohol displayed hallmarks of a pre-diabetic state, including insulin resistance, reduced insulin sensitivity and alterations in insulin signalling in adipose tissue. These findings suggest that even this relatively moderate dose of prenatal alcohol can program metabolic dysfunction in a manner dependent on the sex of the baby. This highlights that alcohol consumption during pregnancy has the potential to affect the health of offspring in the long-term.

9. Kalisch-Smith JI, Steane SE, Simmons DG, Pantaleon M, Anderson ST, Akison LK, Wlodek ME Moritz KM. Periconceptional alcohol exposure causes female-specific perturbations to trophoblast differentiation and placental formation in the rat. *Development*. 2019;146(11):dev172205. doi:10.1242/dev.172205

This article characterised the impacts of alcohol exposure around the time of conception on developmental processes that may contribute to the previously reported fetal growth restriction and offspring metabolic dysfunction in a rat model (see Gårdebjer et al. 2014 *Placenta*; Gårdebjer et al. 2015 *FASEB J*). Rats were exposed to alcohol for four days before pregnancy up until the time of implantation (day 5 of pregnancy). The authors examined the differentiation of cells during formation of the preimplantation embryo, also known as the blastocyst. and the subsequent development of the placenta throughout pregnancy. The authors found that prenatal alcohol caused female-specific defects in trophoblast cell differentiation, the cells that will go on to develop into the placenta. This resulted in reduced placental vascularization by mid-pregnancy and markedly reduced placental volume. The prenatal alcohol also decreased placental nutrient exchange in both male and female fetuses, as measured by radiotracer transport assays. The authors highlighted that their findings provide mechanistic insight into the origins of placental defects and may explain the fetal growth restriction associated with this model. This work is particularly relevant to women who have consumed alcohol prior to pregnancy recognition and demonstrates the need for greater health focus on drinking habits prior to and around conception.

10. Reid N, Hayes N, Young SB, Akison LK, Moritz KM. Caregiver-reported physical health status of children and young people with fetal alcohol spectrum disorder. *Journal of Developmental Origins of Health and Disease*. 2020;1-8. doi:10.1017/S2040174420000537

Fetal alcohol spectrum disorder (FASD) is primarily considered a neurodevelopmental condition associated with prenatal alcohol exposure (PAE). However, more recently, research is beginning to highlight the potential effects of PAE on other organs and systems of the body. The purpose of this article was to provide a snapshot of health problems in children diagnosed with FASD. Caregivers of children with an FASD diagnosis were invited to participate in an online survey. Survey data was collected from 197 participants from several countries including Australia (40.2%), United States (27.7%), New Zealand (15.2%), Canada (13.6%), United Kingdom/Europe (2.1%) and South Africa (1.1%). The most commonly diagnosed health conditions reported by caregivers were: eye conditions (44.7%), asthma (34.5%), heart problems (34%) and skin conditions (27.4%). Furthermore, the authors compared the prevalence of health problems in the FASD sample against Australian national prevalence data. Binomial testing showed that there was generally a higher proportion of children diagnosed with these conditions in the FASD sample compared to the national prevalence data. These findings highlight the importance of comprehensive health evaluations of children and adolescents with FASD by clinicians to ensure that potential health conditions or risk factors can be identified and addressed as early as possible.

Neurodevelopmental impacts of prenatal alcohol exposure

1. Cluver CA, Charles W, van der Merwe C, Bezuidenhout H, Nel D, Groenewald C, Brink L, Hesselman S, Bergman L, Odendaal H. The association of prenatal alcohol exposure on the cognitive abilities and behaviour profiles of 4-year-old children: a prospective cohort study. *BJOG: An International Journal of Obstetrics and Gynaecology*. 2019;126(13):1588-1597. doi:10.1111/1471-0528.15947

High levels of prenatal alcohol exposure (PAE) have long been known to have a teratogenic influence on fetal development. Studies assessing the effects of low to moderate PAE however, have reported conflicting results. In this large prospective cohort study (*n* = 500), Cluver and colleagues examined the association of different levels of PAE on cognitive abilities and behaviour profiles of 4-year-old children in South Africa. When compared to no PAE, the researchers found low to moderate PAE (defined as three

or fewer standard drinks in one siting) had no effect on cognitive ability and behaviour. Very heavy PAE (defined as more than two binge episodes during pregnancy, with a binge episode defined as four or more standard drinks in one sitting) was associated with problems performing simultaneous as well as sequential functions, lower scores in the language and sensorimotor domain, and more attention and pervasive developmental problems. These results remained significant after adjusting for confounding factors, including maternal age, maternal education and other substance use during pregnancy. The researchers recommend that very heavy PAE should be avoided in pregnancy, however it is noted that future research should assess the longer-term effects of PAE as some effects may not persist and others may only present at an older age as cognition develops.

2. McDonald BW, Watson PE. Maternal alcohol intakes before and during pregnancy: Impact on the mother and infant outcome to 18 months. *Nordic Studies on Alcohol and Drugs*. 2020;37(2), 153–171. https://doi.org/10.1177/1455072520905404

In this prospective study, McDonald and Watson examined the prevalence of maternal alcohol intake before and during pregnancy and assessed the impact on mother and infant outcomes. The study included 504 pregnant mothers in New Zealand and 370 children at follow-up when aged 18 months. The authors reported that 19% of pregnant mothers never drank alcohol, 53% stopped when they knew they were pregnant, and 29% continued to drink. Of the women who reported drinking alcohol, 22% binge drank (defined as drinking more than 50g alcohol per session) before pregnancy and 10% binge drank during pregnancy. The study found health implications of alcohol intake for pregnant women and their infants. Daily drinking before pregnancy recognition was associated with increased obesity in mothers during pregnancy. Alcohol consumption before or during pregnancy was not associated with the median age at which infants achieved gross development milestones such as sitting, crawling and walking. However, an association was found between the number of words spoken by the infant at 18 months, and the maternal alcohol intake before pregnancy. The data showed impaired vocal development if the women's alcohol intake exceeded 50 g per session before or (non-significantly) during pregnancy. There was some evidence that this association may be moderated by maternal energy intake during pregnancy. The results provide health professionals with further evidence to encourage drinking cessation or moderation of intake before and during pregnancy.

3. San Martin Porter M, Maravilla JC, Betts KS, Alati R. Low-moderate prenatal alcohol exposure and offspring attention-deficit hyperactivity disorder (ADHD): systematic review and meta-analysis. *Archives of Gynaecology and Obstetrics*. 2019;300(2):269-277. doi:10.1007/s00404-019-05204-x

There is strong evidence that heavy PAE and binge drinking during pregnancy are associated with attention-deficit-hyperactivity-disorder (ADHD) symptoms in offspring. What is less clear is the potential effects that low-to-moderate levels of alcohol during pregnancy may have on the development of ADHD symptoms. This study by San Martin Porter and colleagues evaluated the available evidence on the association between low-to-moderate prenatal alcohol exposure and the development of ADHD symptoms in offspring and found that there was no increased risk of ADHD symptoms in offspring born to mothers who drank alcohol up to 70 g/week during pregnancy. Ten studies were included in the systematic review and six in the meta-analysis. Eight studies found no association and two studies suggested an apparent protective effect of low PAE in hyperactivity/inattention symptoms in boys. These results were confirmed by the meta-analysis showing no association between ≤ 20 g/week, ≤ 50 g/week and ≤ 70 g/week and ADHD symptoms. Analysis by sex showed that alcohol consumption of up to 50g/week during pregnancy decreased the odds of ADHD-like symptoms in male offspring, although the authors note that this small beneficial effect found may have been affected by residual confounding or other post-natal exposure that studies did not account for, such as the protective effect from socio-economic status rather than PAE. The authors conclude that the results should not be seen as suggesting that there is a clear safe threshold limit of alcohol consumption during pregnancy. Rather, they should be

seen as an objective appraisal of the current, perhaps limited, literature in this area and that future research on the relationship of low alcohol consumption during pregnancy and ADHD-like symptoms using more sophisticated epidemiological techniques is warranted.

4. Burgess DJ, Moritz KM. Prenatal alcohol exposure and developmental programming of mental illness. *Journal of Developmental Origins of Health and Disease*. 2020;11(3):211-221. doi:10.1017/S2040174420000082

It is now well established that the maternal milieu during pregnancy, including stress, mental illness, lifestyle factors and substance use, is critical in determining long-term offspring health and disease outcomes. This review paper by Burgess and Moritz discusses evidence from both preclinical and clinical studies that indicates low-dose and early prenatal alcohol exposure can increase the risk of mental illness in offspring and explores the mechanistic pathways that may be involved. The review notes a number of clinical studies have revealed that children and adults exposed to high levels of alcohol prenatal and/or diagnosed with FAS or FASD also display psychiatric conditions including depression, anxiety and mood disorders. Importantly, the review provides evidence that relatively low-dose alcohol exposure (1-2 drinks per occasion and/or < 2 drinks per week throughout pregnancy) and early exposure restricted to the first trimester or even confined to the periconceptional period, prior to neurological development, has a significant impact on programming mental illness outcomes. The review notes that preclinical models of in utero alcohol exposure resulting in offspring behavioural changes are often associated with altered neurological pathways, including the limbic and neuroendocrine systems. Central nervous system disorganisation, including deformities in the hippocampus, as well as gross microcephaly and migration errors have also been observed. Abnormal hippocampal and the hypothalamus– pituitary–adrenal axis (HPA) function are known to contribute to several cognitive and mental illness outcomes, including depression and stress dysregulation. An emerging hypothesis on the mechanism underlying how mental illness and altered behaviour occur following early exposure, considering that this exposure occurs prior to brain development, is that early prenatal alcohol exposure impacts epigenetic processes, resulting in altered gene expression during development.

FASD diagnosis and support

1. Tan DW, Foo YZ, Downs J, Finlay-Jones A, Leonard H, Licari MK, Mullan N, Symons M, Varcin KJ, Whitehouse AJ, Alvares GA. A preliminary investigation of the effects of prenatal alcohol exposure on facial morphology in children with Autism Spectrum Disorder. *Alcohol*. 2020;86:75-80. doi:10.1016/j.alcohol.2020.03.010

In this article, the authors investigate the relationship between prenatal alcohol exposure (PAE) and face shape in children with a clinical diagnosis of autism spectrum disorder. Alcohol use during pregnancy was assessed retrospectively to distinguish between those with (n = 37; mean age = 8.21 years, SD = 2.72) and without (n = 100; mean age = 8.37 years, SD = 2.47) PAE. To allow for facial analyses, anthropometric data was extracted using 3D photogrammetry. While a face shape linked to PAE was identified in autistic children, including smaller forehead, larger right axilla on the orbital surface, shorter and upturned nose, and increased asymmetry, this was not significantly associated with behavioral or cognitive outcomes despite a positive correlation between alcohol-related facial variation and social communication difficulties. These findings suggest PAE may influence facial morphology, and emphasise the need for further research into the link between PAE and facial structure in neurodevelopmental conditions.

2. Skorka K, McBryde C, Copley J, Meredith PJ, Reid N. Experiences of children with fetal alcohol spectrum disorder and their families: A critical review. *Alcoholism: Clinical and Experimental Research*. 2020;44(6):1175-1188. doi:10.1111/acer.14335

This critical review explores how FASD can influence child and adolescent functioning during regular activities across various environmental contexts. The authors examined a total of 11 mostly qualitative

texts, with three quantitative and one a literature review. The author's identified that while there was an abundance of research on identifying person-level factors experienced by children with FASD, limited consideration has been made for activity, contextual, and environmental factors, and how the child's own perspectives and strengths may play into this. The authors point out that an understanding of the impact of FASD on child's functioning is needed to develop an integrated system of care, facilitating support for their typically complex needs. Consequently, further research into the strengths of children with FASD and the challenges that impact their daily functioning is required in order to support the development of more holistic and interprofessional intervention practices.

3. Connor S, Tan KY, Pestell CF, Fitzpatrick JP. The demographic and neurocognitive profile of clients diagnosed with fetal alcohol spectrum disorder in PATCHES Paediatrics Clinics across Western Australia and the Northern Territory. *Alcoholism: Clinical and Experimental Research*. 2020;44(6):1284-1291. doi:10.1111/acer.14345

The authors describe the cohort profile of patients living with FASD in Western Australia, as identified through their paediatrics clinic between 2013 and 2018. Individuals attending the clinic who received an affirmative diagnosis were predominantly male (66.8%) adolescents (mean age 10.5 yrs) of Aboriginal Australian background (73.9%) from remote areas of Western Australia. Diagnoses spanned low, medium, and high socioeconomic (SE) backgrounds. The majority of participants (59.8%) were of low SE circumstances, a predictor of the number of sentinel facial features (Wald $\chi 2$ (1) = 4.03, $p < 0.05$). The majority of those receiving a diagnosis had less than 3 sentinel features (82.9%), and typically had impaired neurocognitive domains of executive functioning (79.4%) and sleep disturbance (61%). ADHD was a commonly observed comorbidity (41.7%). The authors noted it was difficult to tease apart the neurocognitive sequelae of prenatal alcohol exposure and negative life experiences in addition to FASD, an important area for future research. This study both improves understanding of individuals with FASD referred for clinical diagnosis, and highlights the importance of prevention, early diagnosis, and guidance regarding targeted interventions.

4. Fitzpatrick J, Dudley A, Pedruzzi RA, Councillor J, Bruce K, Walker R. Development of a referral pathway framework for fetal alcohol spectrum disorder in the Pilbara. *Rural and Remote Health.* 2020; 20: 5503. https://doi.org/10.22605/RRH5503

The authors' purpose in this article was to develop a map of current referral pathways for FASD. This resource will likely improve the progression to diagnosis, treatment and support for those with the condition living in a regional or remote community setting. The resource was developed through the Hedland FASD network, with guidance on cultural issues acquired through a community reference group. The referral pathway was split into the health, education and justice systems and was between a seven and eight step process. A number of aspects were included: reasons for referral, screening, who can refer (education system only), assessment service providers, assessment team, diagnoses, services and funding for those diagnosed with significant functional impairment, and services and support. The authors note that while a significant challenge to implementing the referral pathway is access to trained staff, mechanisms to enable this include upskilling locally based clinicians through online training and accessing Commonwealth and NDIS funding to support both outreach specialist services and telehealth processes. Ultimately, they hope the development of this referral framework will facilitate early intervention and parent and carer support, improving outcomes for children with a diagnosis of FASD or other neurodevelopmental disorders.

5. Doak J, Katsikitis M, Webster H, Wood A. A fetal alcohol spectrum disorder diagnostic service and beyond: Outcomes for families. *Research in Developmental Disabilities*. 2019;93:103428. doi:10.1016/j.ridd.2019.103428.

Using semi-structured interviews and a phenomenological approach, the authors of this study investigated the experiences of seven caregivers of children with FASD in relation to the Australian diagnostic process and access to supports and services. Thematic analysis revealed the five themes: "receiving a diagnosis of FASD had a positive impact", "caregivers' evaluation of the assessment process", "positive support services relative to FASD", "ongoing difficulties regardless of diagnosis", and "need for societal knowledge of FASD". Although this study included only a small sample, results provided further insight into the experiences of Australian caregivers in receiving a diagnosis and supporting their children with FASD. The authors also discuss the need for global standards for diagnosing individuals with FASD and reporting accurate prevalence rates.

6. Reid N, Moritz KM. Caregiver and family quality of life for children with fetal alcohol spectrum disorder. *Research in Developmental Disabilities*. 2019;94:103478. doi:10.1016/j.ridd.2019.103478.

This study investigated the use of the assessment tool, Pediatric Quality of Life Inventory (PedsQL) for families of children with FASD. 109 caregivers of children with FASD were recruited to complete an online survey, which asked questions relating to topics such as caregiver and family quality of life, caregiver mental health, and child behaviour. Results indicated that family activities and feelings of worry were the most significant areas of impact for caregivers, whilst predictors of caregiver and family quality of life included country of residence, caregiver mental health, child gender, and level of child behaviour problems. The authors emphasised the importance of having effective tools to measure and improve understanding of caregiver and family quality of life for families of children with FASD. They recommended that further research be conducted to determine the appropriateness of the PedsQL in use with this population.

7. Wagner B, Cross D, Adams E, Symons M, Mazzucchelli TG, Watkins R, Wright E, Latimer J, Carapetis J, Boulton J, Fitzpatrick JP. RE-AIM evaluation of a teacher-delivered programme to improve the self-regulation of children attending Australian Aboriginal community primary schools. *Emotional and Behavioural Difficulties.* 2020;25:1, 42-58. doi: 10.1080/13632752.2019.1672991.

The authors of this study aimed to evaluate the effectiveness of the Alert Program in developing self-regulation and executive function skills in primary school Aboriginal children in a remote Western Australian community. The Alert Program was delivered to children enrolled in years 1-6 across eight primary schools, with the program being implemented at one of four time points, randomly assigned to each school. Participants included 36 teachers (29 delivered the Alert Program), 12 school leaders (i.e., principals, deputy principals, and student service coordinators), and 36 Aboriginal and Torres Strait Islander education officers, education workers, and education assistants. Using a mixed methods approach, the authors measured outcomes using staff attendance at training and teacher-report questionnaires. Results indicated that teachers noticed improvements in their own understanding of self-regulation and their ability to manage the needs of their students. The authors highlighted the importance of implementing effective, contextually appropriate interventions for students and schools with high rates of self-regulation difficulties. In addition, it is essential that teachers and other school staff receive adequate training to ensure that they are confident in delivering the intervention and have resources available to support their students. The authors noted a number of limitations of this study, impacting the generalisability of the results, including a low response rate on questionnaires, a small sample size, and a short follow-up period. However, this study has provided valuable insights into the use and appropriateness of the Alert Program in classroom settings to support teachers in managing their students' self-regulation needs.

8. Reid N, White C, Hawkins E, Crawford A, Liu W, Shanley D. Outcomes and needs of health and education professionals following fetal alcohol spectrum disorder-specific training. *J Journal of Paediatrics and Child Health*. 2020;56(2):317-323. doi:10.1111/jpc.14608.

This study utilised an online survey to explore the experiences of Australian and New Zealand education and health professionals working with individuals with FASD. 52 participants completed the survey regarding their training in intervention for individuals with FASD, changes to their practice following training, and their use of the Australian Guide to FASD Diagnosis. Participants reported implementing changes to their practice by becoming involved in FASD assessments, asking about alcohol use during pregnancy, and providing referrals for assessment. These results support the provision of training to education and health professionals regarding FASD and diagnosis as professionals who have completed the training felt an increased understanding and awareness of FASD, and confidence in their service delivery. Participants also identified barriers to their practice, such as a lack of time and resources to complete assessments and single-disciplinary, rather than multidisciplinary, teams. Overall, the authors concluded that FASD-specific training is beneficial to education and health professionals in order to improve their knowledge and awareness of FASD, and their confidence in assessing individuals with FASD.

9. McRae T, Adams E, Clifton E, Fitzpatrick J, Bruce K, Councillor J, Pearson G, Walker R. Overcoming the challenges of caring for a child with foetal alcohol spectrum disorder: a Pilbara community perspective. *Rural and Remote Health*. 2019;19(4):5206. doi:10.22605/RRH5206

The authors describe the experiences of caregivers of children with FASD living in remote Australia – the Pilbara region of Western Australia. Seven participants were recruited through a FASD diagnostic clinical and family support organization, and semi-structured interviews were conducted. The caregivers highlighted the difficulties they faced when their child with FASD first came into their care. Various strategies, involving trial and error, allowed the caregivers to calmly manage their child's behavior. Four major themes were identified as being integral to the care of a child with FASD: 1) routine and structure which reduced stress and disruptive beahviour, 2) family support providing caregivers some space while the child maintained connections to their biological families, 3) peer support to share strategies, and 4) social and community influences such as caregivers having the appropriate understanding of the child's biological family and culture. Whilst first-hand experiences in caring for a child with FASD provides invaluable insight and knowledge, support services when the child first comes into their care would be of great benefit. Formal respite services with other trained caregivers and inclusion of biological families would also be of benefit to maintain parenting consistency, and family and cultural connections.

10. Webster H, Doak J, Katsikitis M. Community-based child development service fetal alcohol spectrum disorder assessment: A retrospective clinic audit. *Journal of Paediatrics and Child Health*. 2020;56(5):777-785. doi:10.1111/jpc.14744

This study aimed to retrospectively describe the diagnostic profile of children assessed for FASD in a community child development service in Australia, and to provide information and recommendations to health care professionals on how to do a FASD assessment using the Australian Guide to the Diagnosis of FASD. There were consistent effects of FASD on cognitive impairment, and the majority of children also had attention deficit hyperactivity disorder. Other co-morbidities were revealed in children diagnosed with FASD including, but not limited to, autism spectrum disorder, intellectual disability, specific learning disorder in mathematics, and speech language impairment. The authors provide a set of recommendations to assist healthcare professionals in the assessment of child development, including: 1) FASD should be considered in any developmental and behaviour assessment along with other causes, 2) any paediatric health care professional and child development clinic can assess for FASD with little additional training, 3) diagnostic capacity should be increased in non-metropolitan areas in particular,

such that healthcare professionals in these areas need to upskill and/or utilise telemedicine to be able to undertake FASD diagnoses, 4) AUDIT-C is best practice in gathering information related to alcohol consumption in pregnancy, and that this should be completed multiple times throughout a pregnancy as an opportunity for early intervention, and 5) paediatric health professionals should be trained to enquire and record alcohol consumption during pregnancy as part of routine care.

11. Dossetor PJ, Thorburn K, Oscar J, Carter M, Fitzpatrick J, Bower C, Boulton J, Fitzpatrick E, Elliott EJ, Martiniuk ALC. Review of Aboriginal child health services in remote Western Australia identifies challenges and informs solutions. *BMC Health Services Research*. 2019;19(1):758. doi:10.1186/s12913-019-4605-0

The authors describe the challenges and inequities in child health services in a very remote Aboriginal community in Western Australia, the Fitzroy Valley. They report that no document existed in providing an overview of the child health services available in the community, that there were few health professionals, and, of these, they had limited experience, and staff turnover was high. Services were also poorly coordinated, funding and administrative processes were complex, public and private transport was lacking which affected service delivery, attending to acute illness was prioritised over primary and preventative care, and chronic disease management, and Aboriginal Health Workers were lacking. The authors conclude that child health services in this remote Aboriginal community would benefit from a coordinated, capacity-building effort from government and community-based health and education sectors, in consultation with the local communities. The authors advise that a prospective audit should be undertaken to inform innovative planning of new and existing child health services.

12. Wagner B, Latimer J, Adams E, Carmichael-Olson H, Symons M, Mazzucchelli TG, Jirikowic T, Watkins R, Cross D, Carapetis J, Boulton J, Wright E, McRae T, Carter M, Fitzpatrick J. School-based intervention to address self-regulation and executive functioning in children attending primary schools in remote Australian Aboriginal communities. *PLoS One*. 2020;15(6):e0234895. doi:10.1371/journal.pone.0234895

This study examines the use of the Alert Program for improving self-regulation in primary school children in remote, predominantly Aboriginal communities in the Fitzroy Valley region of Western Australia. This region is known to have high rates of FASD and early life trauma, both of which are known to produce deficits in self-regulation. Researchers partnered with the local Aboriginal Health Organization and schools to adapt and deliver the Alert Program with a 1-hour class per week, over 8 weeks. This cluster randomised trial was conducted during 2016-2017 at four government, and 4 independent community schools. Of the 363 students in the study population, 271 (75%) consented to participate in the research. Students were taught to recognise their own state of arousal and the use of strategies involving sensorimotor categories to help them adapt their arousal level appropriately for different situations. The primary outcome, frequency of disruptive behaviour at school, was evaluated by teachers before and after the intervention, using the Sutter-Eyberg Student Behaviour Inventory-Revised (SESBI) scale for intensity. The results indicated that the Alert Program had no effect on student behaviour. However, a secondary outcome was the evaluation of behaviour at home using parent-rated standardised scales, and this indicated that the Alert Program reduced disruptive behaviour and improved executive functioning. Due to poor school attendance, only 50% of students in this study completed more than half of the Alert Program. The authors point out that given the known association between behavioural problems and low school attendance, those children that may have benefited most from the program likely had the lowest attendance.

13. Bagley K, Badry D. How personal perspectives shape health professionals' perceptions of fetal alcohol spectrum disorder and risk. *International Journal of Environmental Research and Public Health*. 2019;16(11):1936. doi:10.3390/ijerph16111936

This article discusses attitudes and assumptions regarding prenatal alcohol consumption amongst a diverse group of health professionals in New Zealand. Data was soured from a larger qualitative study on knowledge and practices around FASD which recruited attendees of FASD workshops. Information was collected from 34 participants, during recorded interviews, regarding their attitudes to, and personal experiences with FASD. Four broad themes were identified from these discussions: personal experiences of alcohol consumption and pregnancy; perceptions of alcohol use in others (partners, friends, acquaintances, societal); cultural norms around alcohol use and misuse; alcohol use in relation to other drugs and the perceived links between harm and legality. Issues raised included the normalisation of alcohol use in society, difficulty and discomfort in discussing alcohol use, fear of creating stigma and marginalisation, perceived harm of alcohol compared with illicit drugs and women's rights. The authors conclude that these four non-clinical frames of reference provide mixed messaging and whilst they are often contradictory to the health professionals' knowledge of FASD, they are nevertheless influential in decision-making in a professional setting.

14. Crawford A, Te Nahu Rongomaiwahine Rāua Ko Kahungunu LTH, Peterson ER, McGinn V, Robertshaw K, Tippett L. Cognitive and social/emotional influences on adaptive functioning in children with FASD: Clinical and cultural considerations. *Child Neuropsychology*. 2020;1-33. doi:10.1080/09297049.2020.1771296

The primary hypothesis for this study was that impaired social cognition, executive function and adverse childhood experiences, but not IQ, would be associated with impaired adaptive behaviour in children with FASD. Secondly it was hypothesised that social cognition would predict adaptive behaviour independently of executive function and communication ability. This research was conducted as a partnership between the research group (Hawke's Bay DHB Child Development Service and University of Auckland) and Hawke's Bay DHB Te Wāhanga Hauora Māori (Māori Health Service). Study participants were 30 male and 9 female children aged between 9 and 12 years with diagnosed FASD. The matched comparison group consisted of 20 males and 9 females, typically developing children, who did not differ significantly from the FASD group by age, gender, ethnicity, socioeconomic status or maternal tertiary education. Children diagnosed with FASD had severe impairments in IQ, executive function, social cognition, communication and adaptive function. Multiple regression analyses revealed that social cognition, and in particular the child's ability to recognise facial emotions (using the DANVA facial recognition test), was the only predictor of teacher-rated adaptive functioning in FASD children. The authors concluded that a focus on development of social and emotional skills in children diagnosed with FASD is crucial to success in the school environment and beyond, with IQ and executive functioning of lesser importance. The authors also noted a range of important cultural implications of the findings. For example, highlighting that the structure and values within Māori society requires and demonstrates a very developed level of social and emotional abilities. In traditional society, members of the whānau (family) lived together, therefore, if people needed support this was easily able to be provided. However, in today's society the impacts of colonization and urbanization mean that people are often living away from their whanau and therefore, support systems may not be as easily accessible. Children with FASD, who are experiencing significant challenges in their social and emotional abilities are required manage without the support of their whanau. The authors highlighted that interventions and supports based on holistic Māori models, may be the most effective approaches to reduce disparity and improve quality of life for children with FASD and their families.

15. McDougall S, Finlay-Jones A, Arney F, Gordon A. A qualitative examination of the cognitive and behavioural challenges experienced by children with fetal alcohol spectrum disorder. *Research in Developmental Disabilities*. 2020;104:103683. doi:10.1016/j.ridd.2020.103683

This qualitative research examines the caregivers' perspective on the cognitive and behavioural challenges experienced by young children aged 4-12 years with FASD in Australia. Given that a single FASD behavioural phenotype has not been described, this study aimed to identify commonly experienced behaviours, not captured by quantitative clinical measures, which may aid with development of a screening tool for FASD in school aged children. Participants were 14 non-biological caregivers to 17 children who had a diagnosis or provisional diagnosis of FASD. Interviews were conducted by telephone and caregivers were asked about how their children with FASD functioned at home and at school, their relationships, strengths and the cognitive or behavioural symptoms first noted by the caregiver. Three major themes emerged: self-regulation (behavioural, emotional and attention regulation); cognitive (learning, memory and academic) and adaptive functioning (communication, language, social, motor and sleep concerns). Being 'young for age' and having 'inconsistent behaviour' were recurring features across all three themes. The authors suggest that these results could be useful in the development of screening tools for FASD as well as help in targeting support for affected children.

FASD and the justice system

1. Hamilton S, Reibel T, Maslen S, Watkins R, Freeman J, Passmore H, Mutch R, O'Donnell M, Braithwaite V, Bower C. Disability "in-justice": The benefits and challenges of "yarning" with young people undergoing diagnostic assessment for fetal alcohol spectrum disorder in a youth detention center. *Qualitative Health Research*. 2020;30(2):314-327. doi:10.1177/1049732319882910

This is a qualitative study that examines the views of non-custodial staff (e.g. psychologists, educators, Aboriginal welfare officers, case managers) who provided support and rehabilitation services to young people who were involved in the FASD prevalence study (Bower et al 2018). Data were predominately collected via focus groups (participant *n* = 43) combined with a small number of individual interviews (*n* = 3). Data were analysed using thematic network analysis (Attride-Stirling, 2001). The findings were summarised with three major themes: (1) FASD assessments (which included the sub-theme of: impact on service delivery i.e. from the research study); (2) assessment results and recommendation reports; and (3) identified barriers to maximising benefit from the prevalence study (which included sub-themes of: limited professional development opportunities, inadequate resourcing and insufficient staffing and poor communication and information access). This study provides a helpful overview regarding some of the challenges and considerations when undertaking FASD research in a custodial setting and will be informative for future research in similar settings.

2. Hamilton SL, Reibel T, Watkins R, Mutch RC, Kippin NR, Freeman J, Passmore C, Safe B, O'Donnell M, Bower C. 'He has problems; he is not the problem . . .' A qualitative study of non-custodial staff providing services for young offenders assessed for foetal alcohol spectrum disorder in an Australian youth detention centre. *Youth Justice.* 2019;19(2), 137–157. https://doi.org/10.1177/1473225419869839

This is a qualitative study that examines the challenges and benefits of yarning as a data collection method. The study was undertaken concurrently with the Banksia Hill prevalence study (Bower et al., 2018), with data collection for this study commencing 12 months into the prevalence study. Of the 99 participants in the prevalence study, 38 agreed to participate in this study (27 participants identified as Aboriginal). 24% had FASD and 90% had additional diagnoses. Data were collected using social and research topic yarning. Some of the participants in the study had not completed all of the clinical assessments and at the time of the interviews only 7 participants had received feedback regarding their assessments. The authors suggested that yarning provided process to gather information about the young

people's experiences in a way that facilitated relationship building between the young person and the researcher and provided flexibility and some control for the young person. This study provides support for the incorporation of yarning as research methodology with vulnerable young people and useful suggestions for future researchers who may be considering or planning to incorporate yarning into their research study.

3. Reid N, Kippin N, Passmore H, Finlay-Jones A. Fetal alcohol spectrum disorder: the importance of assessment, diagnosis and support in the Australian justice context, Psychiatry, Psychology and Law. 2020;27:2, 265-274. doi: 10.1080/13218719.2020.1719375

This is a commentary article that reviews some of the current considerations for individuals with FASD who are involved in the Australian justice system. The article provides an overview of some of the challenges individuals with FASD can experience and how this challenges can impact their engagement in the justice process, the potential benefits that could be conferred through assessment, diagnosis and support that is FASD-informed and a discussion regarding the need for health and justice partnerships to facilitate the provision of services for individuals with FASD who are involved in the justice system. The propositions provided in the commentary are supported by research evidence and could assist in informing practice and policy changes and future research in the field.

Protocol papers

1. Betts J, Dawe S, Eggins E, Shelton D, Till H, Harnett P, Chandler-Mather N. Protocol: Interventions for improving executive functions in children with fetal alcohol spectrum disorder: Systematic review and meta-analysis. *Campbell Systematic Reviews*. 2019; 15:e1009. doi:10.1002/cl2.1009
2. Andersson E, McIlduff C, Turner K, Thomas S, Davies J, Elliott EJ, Einfeld S. Jandu Yani U 'For All Families' Triple P-positive parenting program in remote Australian Aboriginal communities: a study protocol for a community intervention trial. *BMJ Open*. 2019;9(10):e032559. doi:10.1136/bmjopen-2019-032559
3. Shanley DC, Hawkins E, Page M, Shelton D, Liu W, Webster H, Moritz KM, Barry L, Ziviani J, Morrissey S, O'Callaghan F, Wood A, Katsikitis M, Reid N. Protocol for the Yapatjarrathati project: a mixed-method implementation trial of a tiered assessment process for identifying fetal alcohol spectrum disorders in a remote Australian community. *BMC Health Services Research*. 2019;19(1):649. doi:10.1186/s12913-019-4378-5

International Research Highlights

1. Pruner M, Jirikowic T, Yorkston KM, Olson HC. The best possible start: A qualitative study on the experiences of parents of young children with or at risk for fetal alcohol spectrum disorders. *Research in Developmental Disabilities*. 2020;97:103558. doi:10.1016/j.ridd.2019.10355
2. Boroda E, Krueger AM, Bansal P, Schumacher MJ, Roy AV, Boys CJ, Lim KO, Wozniak JR . A randomized controlled trial of transcranial direct-current stimulation and cognitive training in children with fetal alcohol spectrum disorder. *Brain Stimulation*. 2020;13(4):1059-1068. doi:10.1016/j.brs.2020.04.015
3. McLachlan K, Flannigan K, Temple V, Unsworth KL, Cook JL. Difficulties in daily living experienced by adolescents, transition-aged youth, and adults with fetal alcohol spectrum disorder. *Alcoholism: Clinical and Experimental Research*. 2020; [published online ahead of print] doi:10.1111/acer.14385

4. O'Connor MJ, Portnoff LC, Lebsack-Coleman M, Dipple KM. Suicide risk in adolescents with fetal alcohol spectrum disorders. *Birth Defects Research*. 2019;111(12):822-828. doi:10.1002/bdr2.1465

5. Rutman D, Hubberstey C. National evaluation of Canadian multi-service FASD prevention programs: Interim findings from the co-creating evidence study. *International Journal of Environmental Research and Public Health*. 2019;16(10):1767. doi:10.3390/ijerph16101767

6. Mattson SN, Bernes GA, Doyle LR. Fetal alcohol spectrum disorders: A review of the neurobehavioral deficits associated with prenatal alcohol exposure. *Alcoholism: Clinical and Experimental Research*. 2019;43(6):1046-1062. doi:10.1111/acer.14040

7. Hen-Herbst L, Jirikowic T, Hsu LY, McCoy SW. Motor performance and sensory processing behaviors among children with fetal alcohol spectrum disorders compared to children with developmental coordination disorders. *Research in Developmental Disabilities*. 2020;103:103680. doi:10.1016/j.ridd.2020.103680

8. Wozniak JR, Fink BA, Fuglestad AJ, et al. Four-year follow-up of a randomized controlled trial of choline for neurodevelopment in fetal alcohol spectrum disorder. *Journal of Neurodevelopmental Disorders*. 2020;12(1):9. doi:10.1186/s11689-020-09312-7

9. Kautz C, Parr J, Petrenko CLM. Self-care in caregivers of children with FASD: How do caregivers care for themselves, and what are the benefits and obstacles for doing so? *Research in Developmental Disabilities*. 2020;99:103578. doi:10.1016/j.ridd.2020.103578

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12. Kable JA, Coles CD, Mattson SN. Neurodevelopmental outcomes associated with prefrontal cortical deoxygenation in children with fetal alcohol spectrum disorders. *Developmental Neuropsychology*. 2020;45(1):1-16. doi:10.1080/87565641.2020.1712604

13. Petryk S, Siddiqui MA, Ekeh J, Pandey M. Prenatal alcohol history - setting a threshold for diagnosis requires a level of detail and accuracy that does not exist. *BMC Pediatrics*. 2019;19(1):372. doi:10.1186/s12887-019-1759-1

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16. Poole N, Schmidt RA, Bocking A, Bergeron J, Fortier I. The potential for fetal alcohol spectrum disorder prevention of a harmonized approach to data collection about alcohol use in pregnancy cohort studies. *International Journal of Environmental Research and Public Health*. 2019;16(11):2019. doi:10.3390/ijerph16112019

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18. Frazer Z, McConnell K, Jansson LM. Treatment for substance use disorders in pregnant women: Motivators and barriers. *Drug and Alcohol Dependence*. 2019;205:107652. Doi: 10.1016/j.drugalcdep.2019.107652

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