

This paper has not been submitted for publication. It was written in response to a request from the Health and Social Policy Branch, NSW Ministry of Health. The paper provides a summary of evidence regarding modifiable risk factors in the preconception period that have adverse effects on children at birth and beyond. It also identifies interventions that have been tested in terms of their timing, their effectiveness and how best to target population segments at highest risk.

### **Preconception Care - Issues Paper**

Lum, MN and Todd, AL

Clinical and Population Perinatal Health Research, Kolling Institute, Northern Sydney Local Health District;  
Sydney Medical School Northern, University of Sydney

July 2017

# Preconception Care - Issues Paper

Lum, MN – Research Implementation Officer BA, GradDip PH, GradDip Policy  
Todd, AL – Senior Researcher BA, MBA, PhD

*Targeting  
modifiable risk  
factors in  
pregnancy*

KOLLING  
INSTITUTE  
Discovery *into* Reality™



THE UNIVERSITY OF  
SYDNEY

# Table of Contents

Executive Summary .....	iii
Purpose of this Paper .....	1
Background .....	1
Terminology .....	2
Modifiable Risk Factors .....	2
Smoking.....	3
National trends .....	3
Trends in NSW.....	3
Barriers to quitting.....	3
Interventions.....	4
Smoking among Aboriginal women .....	4
Nutrition, Physical Activity and Obesity.....	6
National trends .....	6
Barriers to behaviour change.....	7
Interventions.....	7
Obesity among Aboriginal women.....	8
Alcohol Consumption .....	10
National trends .....	10
Barriers to behaviour change.....	11
Interventions.....	11
Alcohol consumption among Aboriginal women.....	12
Mental Health.....	13
Barriers to behaviour change.....	14
Interventions.....	14
Mental health among Aboriginal women .....	15

Summary and Conclusions.....	17
Smoking.....	17
Nutrition, physical activity and obesity.....	17
Alcohol misuse .....	17
Mental health.....	18
Targeting disadvantage.....	18
Implications for policy.....	18
References .....	19

## Executive Summary

The evidence for the link between maternal risk factors (including smoking, obesity, alcohol use and maternal mental health) and perinatal morbidity and mortality rates among Australian women is clear. There is also a growing body of evidence that Indigenous women are significantly more likely than their non-Indigenous counterparts to be impacted by these risk factors. Risk factors originate from genetic, environmental and behavioural factors. In alignment with the Health and Social Policy Branch's Strategic Plan, *Healthy, Safe and Well*, the purpose of this paper is to focus on those risk factors that have a behavioural element and can, therefore, be modified, or impacted by strategies to minimise associated harms.

**Smoking** in pregnancy has been highlighted as the most significant preventable cause of morbidity and death among women and infants. The risk of smoking increases among Indigenous and other disadvantaged women. A combination of policy and social marketing interventions involving comprehensive bans on advertising and sponsorship, tobacco price increases, bans on smoking in work and public places, health warnings on packs, mass media, QUIT telephone coaching and monitoring by a physician have been found to be most effective.

**Trends in nutrition, physical activity and obesity** suggest a need for greater awareness and education of women in their reproductive years, prior to conception. Given women who are overweight or obese at conception are at increased risk of excessive gestational weight gain, parenting education and the setting of weight management goals have had some traction in antenatal care, however, the success of such programs relies on regular attendance and health practitioner skill. Although targeted health promotion interventions have increased acceptance of the importance of a healthy diet and exercise, many health practitioners lack skills to manage the problem, and evidence of the efficacy of such interventions in achieving reductions in obesity at the population level is lacking.

Aboriginal women are at increased risk of obesity and government support for culturally appropriate programs targeting lifestyle behaviours and supporting health eating and physical activity in local communities have the potential to impact positively.

**Alcohol consumption** among young women and pregnant women in NSW represents a significant risk factor potentially impacting the unborn fetus. Whilst the proportion of women engaged in heavy drinking in pregnancy is low, the adverse outcomes (including FASD) of heavy gestational alcohol consumption and the lack of evidence around safe levels of consumption highlight the issue as a high public health priority. Mandatory labelling of alcohol products and training of health professionals have been proposed as best practice interventions, in combination with addressing issues of pricing and taxation and advocating abstinence from drinking during pregnancy.

The estimated prevalence of harmful drinking in Indigenous populations is twice that of non-Indigenous populations and the normalisation of harmful consumption highlights the need to target Indigenous populations, Aboriginal Medical Services (AMS) and Aboriginal clinicians to give

health practitioners the skills and resources needed to advocate for reduced alcohol consumption in pre-pregnancy. Key components of effective interventions targeting Aboriginal women and health practitioners in contact with women in preconception and pregnancy are interactive community-based education, culturally appropriate printed resources and ongoing community engagement.

**Maternal mental health** issues are estimated to affect 10-15% of women in high income countries during the perinatal period. Policy frameworks in NSW reflect recognition of the need for greater awareness of maternal mental health and the requirement to integrate programs that provide support for women's well-being in the antenatal and postnatal phase into policy, planning and delivery of health services. An evidence-based health home visiting program called *Sustaining NSW Families*, developed for the identification and treatment of women at risk of antenatal and postnatal depression, has been found to be effective as an early intervention tool.

Factors impacting the health and well-being of Aboriginal people include spirituality, the relationship with family, land and culture and these factors are all intertwined. Programs targeting these women need to be culturally appropriate, driven by the community and run by a workforce who understands the psycho-social risks resulting from intergenerational trauma.

## Purpose of this Paper

The purpose of this paper is to highlight risk factors in the preconception period that have adverse effects on children at birth and beyond and that can be modified in ways that prevent or reduce those effects. The preconception period is typically defined as the reproductive years of a woman, 16-44 years (ABS, 2013; Ferguson-Hill, 2010). There is now a body of evidence indicating that male partners' risk factors also have an impact on the health of the developing fetus highlighting the importance of including strategies targeting couples (Steegers, Barker, Regine, Steegers-Theunissen, & Williams, 2016). As disparities in perinatal health outcomes are impacted by the partner's risk factors, where evidence exists, consideration is also given to these. The paper also identifies interventions aimed at modifying such risk factors that have been tested in terms of their timing, their effectiveness and how best to target population segments at highest risk.

Reflecting the Health and Social Policy Branch's Strategic Plan, *Healthy, Safe and Well*, this paper recognises the continuum and interconnectedness of preconception, pregnancy and postpartum health (Skouteris et al., 2015).

This paper is divided into the following sections:

- Background
- Terminology
- Modifiable Risk Factors
- Smoking
- Nutrition, Physical Activity and Obesity
- Alcohol Consumption
- Maternal Mental Health
- Summary and Conclusions

Because of the persistent health disparities between Indigenous and non-Indigenous women, this paper includes a focus on issues and interventions specific to Aboriginal women<sup>1</sup>.

## Background

The importance of preconception both for the trajectory of the developing child, and by association, for the health and well-being of the wider population has been highlighted:

Health in the earliest years – actually beginning with the future mother's health before she becomes pregnant – lays the groundwork for a lifetime of well-being. When developing biological systems are strengthened by positive early experiences, healthy children are more likely to grow into healthy adults (NSCDC., 2010).

---

<sup>1</sup> In this paper, the term "Aboriginal" includes Aboriginal and Torres Strait Islander peoples.

Recent research also links children's physical, intellectual and emotional outcomes directly with their mothers' health and well-being in the antenatal period (Doyle, Harmon, Heckman, & Tremblay, 2009; Marmot, 2010).

At a population level, some groups are at greater risk of poorer health outcomes. Research has consistently demonstrated a clear linear relationship between health status and socioeconomic status, reflected by indicators such as occupation, income, education and ethnicity (Marmot, 2010). In the preconception literature, vulnerable groups at increased risk of poor health outcomes include minority ethnic groups, indigenous populations, homeless women, prisoners, women who have experienced domestic violence, asylum seekers and refugees, women with mental illness and women with substance abuse problems. There is evidence that these groups suffer disproportionately higher rates of infant mortality and other adverse perinatal outcomes (Fox et al., 2015). For example, in NSW the perinatal mortality rate among babies born to Aboriginal or Torres Strait Islander mothers was 11.0 per 1,000 in 2013, higher than the rate of 7.9 per 1,000 for babies born to non-Indigenous mothers (HealthStats NSW, 2015). Among Indigenous Australian adults there is a higher prevalence of chronic diseases such as diabetes, hypertension, cardiovascular and renal disease, and these diseases have their genesis in utero and in early life (Kildea, Tracy, Sherwood, Magick-Dennis, & Barclay, 2016). There is ongoing debate about whether women of advanced maternal age constitute another group at increased risk of poorer child health outcomes such as low birth weight, pre-term birth, stillbirth, and unexplained fetal death (Kenny et al., 2013) with recent literature highlighting evidence for a higher prevalence of pre-existing co-morbidities among older women (McCall, M Nair, & Knight, 2017).

One of the major challenges in targeting women at preconception is the difficulty of defining who those women are in the general population. The majority of pregnancies in Australia are unplanned and women in the child bearing years are not necessarily aware of, or consciously contemplating risky health factors that have the potential to impact a future unborn fetus.

## Terminology

Preconception care has been defined as the process of identifying risk factors that have the potential to adversely impact a woman's health or pregnancy outcome (Centers for Disease Control CDC, 2006). Specifically, preconception care targets women of reproductive age with appropriate, biomedical (screening), behavioural and social (health promotion) prevention and management interventions to reflect the overall goal of modifying risk factors to improve health outcomes for women, children and families. The optimum 'window' for this care is considered to be prior to conception (periconception) or early in pregnancy (Centers for Disease Control CDC, 2006).

## Modifiable Risk Factors

In the preconception stage identifiable risk factors for poorer health outcomes can be categorised as genetic, environmental or behavioural in origin (Temel, van Voorst, Jack, Denktas, & Steegers, 2014; Ussher et al., 2015). The most common modifiable risk factors for Australian women include smoking, obesity, alcohol misuse and mental health, with smoking and obesity the two major



modifiable risk factors for maternal pregnancy complications and adverse birth outcomes (Cnattingius & Lambe, 2002). Links between these factors and perinatal morbidity and mortality rates are well recognised, as is the need to intervene early targeting women prior to conception and in early pregnancy (Sidebotham & Fraser, 2014b). Young women at preconception age are currently being targeted in health promotion interventions aimed at the overall population.

## Smoking

Smoking in pregnancy has been identified as the main preventable cause of morbidity and death among women and infants. Smoking during pregnancy presents serious risks of adverse outcomes for both mother and baby, including miscarriage, still birth, prematurity, low birth weight, congenital abnormalities, and neonatal or sudden infant death (South Eastern Sydney Local Health District SESLHD, 2014; Ussher et al., 2015). The prevalence of smoking during pregnancy continues to rise in low and middle income countries whilst in high income countries it remains at around 10% (Ussher et al., 2015). Socially disadvantaged women who are more likely to have lower levels of education are more likely to be exposed to social cues to smoke (Johnston, Thomas, McDonnell, & Andrews, 2011).

### National trends

In Australia in 2015 the proportion of women who smoked while pregnant was 8.9% representing a decrease since 2011 from 11.1% (Centre for Epidemiology and Evidence, 2016). The smoking rate is significantly higher for teenage pregnancies, and among women with lower socioeconomic status, less education and who are unmarried (National Preventative Health Taskforce, 2009b). Though the differences in smoking rates for men and women have fluctuated over the years and have often been non-significant, in 2010 smoking was significantly more prevalent among women in all age groups (Scollo & Winstanley, 2016). At least half of women who are smokers before pregnancy quit smoking during pregnancy, but 30% or more do not. It is worth noting that approximately one in five pregnant smokers quit by the time of their first antenatal visit.

### Trends in NSW

The proportion of mothers reporting any smoking during pregnancy declined from 12.7% in 2008 to 10.4% in 2012. Of mothers who smoked during pregnancy in 2015, 27% stopped smoking in the first half of pregnancy. Among those who smoked in the second half of pregnancy, there was a trend towards smoking fewer cigarettes per day (Centre for Epidemiology and Evidence, 2016). Evidence in another NSW population based cohort study found the majority of women who smoke continue to do so across two consecutive pregnancies. Older mothers, those who were married and more socio-economically advantaged were more likely to quit smoking between pregnancies (Tran, Roberts, Jorm, Seeho, & Havard, 2014).

### Barriers to quitting

Barriers to quitting smoking during pregnancy include: lack of willpower, limited access to cessation services, stigma, stressful life events and relationships, and smoking among family and friends (Abroms et al., 2015; Centre for Epidemiology and Evidence, 2016). Having a partner who smokes has also been found to be predictive of continued smoking during pregnancy (Giglia, Binns, &

Alfonso, 2006). Pregnant smokers are less likely than their non-pregnant counterparts to receive smoking cessation counselling and are not given access to treatment medications as these are not recommended during pregnancy (Abroms et al., 2015).

## Interventions

The WHO Report on the Global Tobacco Epidemic (The MPOWER Package) highlights strategies that combine policy and social marketing approaches as most effective: tobacco price increases; bans on smoking in public and work places; adequately funded mass media education campaigns; comprehensive bans on advertising and promotion; health warning labels on tobacco packages; and cessation assistance (Freeman, Gartner, Hall, & Chapman, 2010). All of these strategies have been used in Australia. California implemented the world's first tobacco control program in 1989 at around the same time Australia launched the National Tobacco Campaign (Freeman et al., 2010; J. Pierce, Cummins, White, Humphrey, & Messer, 2012; J Pierce & Messer, 2011). Other specific strategies that have contributed to success both in Australia and the US have included Quitlines, telephone coaching following a Quitline call, and physician monitoring (J. Pierce et al., 2012). Together, these initiatives have increased the chances that a heavy smoker will quit by up to 50%.

In Australia, current policy supports access to smoking cessation advice for pregnant women as well as referral to targeted programs facilitated through antenatal clinics (Li, Zeki, Hilder, & Sullivan, 2013), however there is evidence that such advice is not routine (Giglia et al., 2006). In 2012-13, the Australian Government launched an initiative targeting women in preconception and pregnancy including printed material 'Quit for you, Quit for two' and 'give your baby a healthy start' flyer. Evaluation findings indicated that over a third (38%) of women who were pregnant or were planning to become pregnant in the next 12 months recognised 'Quit for you, Quit for two' (relative to 15% of the general community , highlighting the **added value in using targeted messages** (Social Research Centre, 2015).

## Smoking among Aboriginal women

### *National trends*

Across Australia, 52% of Aboriginal and Torres Strait Islander women smoke during pregnancy compared to 16% of non-Indigenous women. Smoking rates among Aboriginal and Torres Strait Islander teenagers is even higher (Eades et al., 2012). This suggests that smoking in pregnancy is a norm for many Aboriginal women who also often experience high rates of 'multiple stressors' (including teenage pregnancy and single motherhood) that serve to reinforce smoking behaviour and act as a barrier to quitting (Gould, Watt, McEwen, Cadet-James, & Clough, 2015; Thomas & Stevens, 2014).

### *Trends in NSW*

In NSW 45.0% of Aboriginal women smoked in pregnancy compared to 8.9% of non-Aboriginal women (Australian Health Ministers' Advisory Council AHMAC, 2012; Centre for Epidemiology and Evidence, 2016). Whilst the smoking rate has declined in recent years, it remains very high in comparison to non-Aboriginal women (Centre for Epidemiology and Evidence, 2016).

### *Barriers to quitting*

Aboriginal and Torres Strait Islander women are more likely to smoke during pregnancy and are less likely to access antenatal care in the first trimester, when many risk factors could be addressed – a national trend that remained unaltered between 2006-2011 (Australian Health Ministers' Advisory Council AHMAC, 2012). Smoking during pregnancy among Indigenous women was found to be associated with the number of smokers in the household (Johnston et al., 2011). Whilst awareness and acceptance of messages about the impact of both smoking and second hand smoke on a newborn baby has increased among Indigenous populations, there appears to be less knowledge and/or acceptance of the negative impacts of smoking on the developing fetus (Johnston et al., 2011).

### *Interventions*

Among Australian Indigenous peoples there is a lack of evidence of predictors of intentions to quit smoking, effective strategies to reduce smoking, or attempts at quitting and cessation success (Gould et al., 2015; Johnston et al., 2011).

In recent years collaborative efforts across Aboriginal communities, government and non-government agencies have aimed to reduce smoking prevalence among Aboriginal people reflecting population health priorities (South Eastern Sydney Local Health District SESLHD, 2014). The NSW Government has set targets to reduce smoking rates by 4% for all Aboriginal people by 2015, and 2% per year for pregnant Aboriginal women (Sarin, Hunt, Ivers, & Smyth, 2015). In order to achieve these targets, recent literature highlights the need for increased efforts to reduce rates of smoking in preconception and prevent postpartum relapse (Johnston et al., 2011; South Eastern Sydney Local Health District SESLHD, 2014).

Leveraging the work of the Aboriginal Maternal and Infant Health Service (AMIHS), Building Strong Foundations (BSF) and New Directions (ND) are two interventions launched by the Health and Social Policy Branch - *Quit for New Life* and *Yarning about Quitting Learning Package*. *Quit for New Life* is a state-based intervention targeting pregnant women in NSW who identify as having an Aboriginal baby as well as other members of their households. *Yarning about Quitting Learning Package* is an information resource and an e-learning module targeting Aboriginal health workers and midwives in NSW with messages about how to deliver culturally appropriate smoking advice to pregnant women. Evidence of the effectiveness of these initiatives is lacking as neither has been formally evaluated.

*Smoke free homes:* Given the evidence of the impact of social norms and family influence on smoking behaviour (Gould et al., 2015; Thomas & Stevens, 2014), initiatives that advocate for smoke free homes have the potential to benefit the developing fetus, newborn babies and children in Aboriginal communities. For example, second hand smoke accounts for 27% of the population attributable risk of otitis media among Aboriginal children (Thomas & Stevens, 2014). Policies and interventions that support smoke-free homes have the potential to reduce smoking prevalence and the negative health outcomes for babies born in these environments.

## Nutrition, Physical Activity and Obesity

Maternal nutrition impacts children's health, cognitive and behavioural outcomes, and sub optimal nutrition in the prenatal period can have an adverse effect on the infant's long-term cognitive development and physical health (Doyle et al., 2009). Globally, maternal obesity has become one of the most widespread risk factors in obstetric practice, highlighting the need for education around healthy eating before and during pregnancy (Lim & Mahmood, 2015).

US data indicate that more than half of overweight pregnant women gain in excess of the American Institute of Medicine (IOM) guidelines for weight gain in pregnancy (Davis et al., 2012; Shub, Huning, Campbell, & McCarthy, 2013). In the absence of Australian guidelines for recommended weight gain in pregnancy, the IOM guideline is applied, with weight gain above recommended levels defined as excessive gestational weight gain (GWG) (Rasmussen et al., 2010).

### National trends

It is well recognised that obesity is now a widespread problem in Australia. Trend data indicates unprecedented weight gain amongst Australian women aged 25-34 years (Centre for Public Health Nutrition, 2005; National Preventative Health Taskforce, 2009a), with the prevalence of overweight and obesity among this segment estimated to be approximately 35% (Knight, 2014). Prevalence estimates encapsulating the whole cohort of women of reproductive age suggest that overweight/obesity is exceeding 50% (ABS, 2012). Excessive gestational weight gain (GWG) is another factor contributing to the obesity epidemic with prevalence estimates ranging from 40-68% among Australian women, with those who are overweight or obese when they become pregnant most at risk of GWG (Skouteris et al., 2015).

In the preconception period, obesity is associated with subfertility resulting from polycystic ovary syndrome (Skouteris et al., 2015). For those who do conceive, there is increased risk of adverse maternal and infant outcomes including pre-eclampsia, gestational diabetes, miscarriage (Skouteris et al., 2015), increased risk of stillbirth, congenital malformations, macrosomia, birth complications, as well as childhood obesity in the offspring (Davis et al., 2012; Skouteris et al., 2015; Villamor & Cnattingius, 2006). Maternal obesity has been found to be associated with adverse neonatal outcomes such as patent ductus arteriosus, necrotising enterocolitis and sepsis (Rastogi, Rojas, Rastogi, & Haberman, 2015). One systematic review looking at all modifiable maternal risk factors for stillbirth identified maternal overweight and obesity as having possibly the greatest population attributable risk (Lamont, Scott, Jones, & Bhattachaya, 2015).

Evidence of higher rates of perinatal morbidity and long-term health problems in offspring born to obese mothers is now well accepted (Lim & Mahmood, 2015; Rastogi et al., 2015). As one study shows, the relative risk increases according to the level of obesity with increased maternal BMI resulting in increased incidence of all morbidities, and among morbidly obese mothers, the incidence is twice as high (Rastogi et al., 2015). There is growing evidence of the additional burden on the health system resulting from the costs associated with caring for obese women who are giving birth, for example, equipment requirements (Heslehurst, Lang, Rankin, Wilkinson, & Summerbella, 2007). The cost burden on the system combined with the population health risk of adverse outcomes for

pregnancy, birth and the development of the fetus highlights the need for interventions targeting overweight and obesity.

### Barriers to behaviour change

A recent Australian study found that overweight and obese women are less likely to accurately report their pregnancy BMI, reflecting a level of denial and/or a shift in community perception as to what is 'normal' (Shub et al., 2013). This is a growing problem as some young women are brought up in obesogenic environments. A divergence between women's own beliefs about "...appropriate approaches to diet to achieve safe and effective management of weight gain during pregnancy..." and expert opinion has also been noted (Shub et al., 2013). Other barriers include low awareness of perinatal complications associated with excessive weight (Shub et al., 2013), which could be overcome through health promotion messages, and improved health practitioner self-efficacy in the provision of appropriate support to women with weight management issues (Davis et al., 2012).

### Interventions

Interventions at a population level to support obese women of child-bearing age to reduce their weight prior to becoming pregnant and maintain their weight within recommended guidelines during pregnancy would minimise risk and prevent adverse neonatal outcomes (Cnattingius & Lambe, 2002). In the general community, various interventions have been successful in achieving widespread acceptance of the need for a healthy diet combined with regular physical activity, however there is a gap in the evidence for best practice approaches to the reduction of overweight at the population level (Cnattingius & Lambe, 2002; Davis et al., 2012).

There is debate in the literature around the value of weight loss interventions targeting women in early pregnancy (Davis et al., 2012). In the US, guidelines clearly state that pregnant women should adhere to a standard weight gain between 7 and 11.5 kg, and obese pregnant women between 5 and 9 kg (Davis et al., 2012; Rasmussen et al., 2010). The US guidelines recognise the need for services to continue into the postpartum period to give women the maximum support to return to their pre-pregnant weight within the first year and, thus, to have a better chance of returning to a normal BMI value at the time of a subsequent conception. Best practice in the US has clinicians using weight gain grids to plot weight gain in combination with motivational counselling at each prenatal visit (Rasmussen et al., 2010).

In Australia, group-based models of antenatal care, antenatal assessment and parenting education, with a focus on healthy eating and physical activity in pregnancy in combination with the setting of weight management goals have had some traction. However, the effectiveness of such models rely on regular contact (weekly sessions), peer support, encouragement and motivational interviewing to assist with sensitivities in raising issues about weight (Davis et al., 2012).

Interventions that include changes in walking and cycling infrastructure are likely to result in reduced car use and shifts toward active transport: "... Infrastructure interventions can have an impact, although the impact will be mediated by other psychological and social factors. Community-based intervention targeting a specific population can achieve positive changes in physical activity, and local government has the capacity to be involved in and sustain physical activity interventions (Centre for Public Health Nutrition, 2005).

A Smoking, Nutrition, Alcohol and Physical activity (SNAP) Framework has been developed by a Joint Advisory Group on General Practice and Population in conjunction with Chairs of National Population Health Strategies, to guide the implementation of integrated approaches to behavioural risk factor modification (Centre for Public Health Nutrition, 2005). Evaluations of interventions targeting people who are overweight or obese has focussed on interventions targeting individuals rather than populations (Centre for Public Health Nutrition, 2005). A combination of psychological interventions (stimulus control, reinforcement, self-monitoring and goal setting) and diet and physical activity changes is optimal in producing weight loss. Evidence also highlights the potential for nutrition strategies including nutrition signposting, pricing policies and nutrition information panels (Centre for Public Health Nutrition, 2005).

A recent RCT in NSW was conducted among young women 18-35 years deemed at risk of excess weight gain. The aim of the research was to evaluate the efficacy a 12-week intervention program *TXT2BFit* involving 8 weekly motivational text messages based on the trans-theoretical model of behaviour change; 5 personalised coaching calls; weekly emails; and password protected access to purpose designed mobile phone apps that provided education and allowed self-monitoring as well as a website containing a blog and access to other written resources. An online screener survey screened out those who were pregnant or planning to fall pregnant. This intervention among young adults with unhealthy lifestyle behaviours at increased risk of developing obesity, had a positive impact and reduced the likelihood of weight gain in women of child bearing age (Partridge et al., 2015).

## Obesity among Aboriginal women

### *National trends*

In 2012-2013, after adjusting for age, 66% of Aboriginal and Torres Strait Islander adults were classified as overweight or obese; a rate 1.2 times higher than non-Indigenous Australians (Healthinfonet, 2016). NSW trend data indicate that Indigenous women living in rural/remote areas are at greater risk of overweight (27%) or obesity (20.4%) when compared with their urban counterparts (15.2% and 16.9% respectively) (Centre for Public Health Nutrition, 2005). The escalation of the rates of obesity among Aboriginal and Torres Strait Islander women is a direct result of a shift over time from “traditional carbohydrate based diets to energy dense high fat diets, combined with lower levels of physical activity” (S. Campbell, Lynch, Esterman, & McDermott, 2012). Obesity is impacting on young Aboriginal women of childbearing age with evidence highlighting Australian indigenous women have 66% greater risk of pregnancy induced hypertension and are at comparatively higher risk of developing chronic hypertension and cardiovascular disease (S. Campbell et al., 2012).

### *Barriers to behaviour change*

The same barriers to behaviour change exist for Aboriginal and non-Aboriginal women but they are exacerbated for Aboriginal women by additional lifestyle stressors that are the result of social disadvantage. Aboriginal women are more likely than non-Aboriginal women to give birth in an obesogenic environment with all the associated lifestyle and behavioural barriers to achieving healthy periconception weight. Barriers to a healthy diet include: food supply, income, availability of storage and cooking facilities as well as cultural barriers. Geographical factors also impact on access to healthy food and the cost of food. Social factors such as consumption of alcohol, tobacco and

other drugs have a direct impact on nutrient intake, and the use and abuse of other substances direct substantial amounts of money away from food (NSW Centre for overweight and obesity, University of Sydney, 2005).

### *Interventions*

Opportunities exist to leverage general population health messages that encourage healthy body weight among Aboriginal and Torres Strait Islander women of childbearing age. Implementing programs that raise awareness and change behaviour have the potential to reduce the risk of elevated pre-pregnancy BMI (S. Campbell et al., 2012).

The following factors were found to influence the success of an intervention with Aboriginal people:

- responsiveness to the expressed needs of the community rather than a response to health agency's agenda
- community involvement from the beginning
- flexible and relaxed approach
- community relevance, acceptance and accessibility (taking into account Aboriginal people's ideas about food, diet and physical activity – 'diet' and exercise are seen as western health messages)
- community ownership and management of the programs local Aboriginal trained facilitator (NSW Centre for overweight and obesity, University of Sydney, 2005).

Intervention programs among Indigenous populations which utilise pre-existing cultural structures have the potential for improving the uptake of preventative health services among indigenous populations (Centre for Public Health Nutrition, 2005).

Whilst the focus of this paper is women in preconception, targeting Aboriginal families and shifting attitudes in the home environment is bound to impact young women. Intervention programs among Indigenous populations which utilise pre-existing cultural structures have the potential for improving the uptake of preventive health services among Indigenous populations. Conversely, strategies that have limited potential for prevention at a population level include many targeted at individuals such as counselling and advice, home and facility-based exercise sessions, ongoing professional support, and self-directed efforts among people who are overweight or obese (Centre for Public Health Nutrition, 2005).

In Aboriginal communities in rural or remote Australia, nutrition education including practical messages and demonstrations relating to food preparation and consumption have been shown to be effective, as are culturally specific resources. Another intervention that has proven effective is a nutritional policy for the local community store, that specifically includes in-store promotions such as shelf 'talkers', posters, and prominent displays, and cross-subsidising the price of fresh fruit and vegetables with cigarettes. Such interventions have achieved changes in eating habits toward healthier choices (NSW Centre for Overweight and Obesity, University of Sydney, 2005).

In terms of physical activity interventions, those that involved cultural or group/team based activities such as sport, hunting, and walking groups were favoured over activities centred on the individual. Innovative ways of combining approaches to promoting physical activity have led to

improvements in cultural pride, cultural identity and self-esteem (NSW Centre for overweight and obesity, University of Sydney, 2005). In rural and remote communities gender-specific programs are often deemed more appropriate.

## Alcohol Consumption

Alcohol is a teratogenic substance, and when it crosses the placenta it can cause irreparable damage to the brain and other organs of the developing fetus, potentially resulting in fetal alcohol spectrum disorder (FASD) (Elliott, 2015a). The effects of antenatal alcohol exposure on fetal brain structure and function, including memory, cognition, executive function, gross and fine motor control, sensory processing, language and behaviour is now well established (Fitzpatrick et al., 2012). Behavioural symptoms include increased hyperactivity and chronic aggression (Doyle et al., 2009; Elliott, 2015a; O'Keeffe et al., 2015). Longer term effects include negative educational outcomes, substance abuse, mental health issues, unemployment, criminal offences and issues of dependency (Elliott, 2015a). Attributing alcohol use in pregnancy to problems of learning, speech, social skills and behaviour in children can be complex resulting in alcohol use in pregnancy being termed the 'hidden' problem (Elliott, 2015b).

While dose, frequency and timing of alcohol consumption have all been identified as factors influencing risk of FASD, socio-behavioural factors including maternal age, duration of drinking, socio-economic status, race, genetic factors and polydrug use also have an impact (NHMRC, 2009). There is an association between harmful levels of alcohol use and overcrowded housing, and restricted access to education, training, employment and health services (Elliott, 2015a). A lack of evidence around what represents a safe threshold for daily intake of alcohol in pregnancy has resulted in a lack of clarity in the guidelines for alcohol consumption in pregnancy (NHMRC, 2009).

### National trends

Pre-pregnancy alcohol consumption is one of the strongest predictors for alcohol consumption during pregnancy (Skagerström, Chang, & Nilsen, 2011). The numbers of Australians reported to drink at risky and high risk levels has risen from 8% in 1995, to 13% in 2004. This increase has been more pronounced in women, where the numbers have doubled from 6% to 12%, with the highest rates of alcohol consumption in adolescents and young adults (Aboriginal and Torres Strait Islander Social Justice Commissioner, 2011). Among women aged 18-24 years, 11% drink at harmful levels on a weekly basis (Bower, 2012; Fitzpatrick et al., 2012). Australian young women have some of the highest levels of substance use in the world (Elliott, 2015a; Skagerström et al., 2011). Moreover, trend data show no decline in the proportion of women drinking alcohol at high-risk levels between 2007 and 2011 (Cameron, Davey, Kendall, Wilson, & McClure, 2013).

Rates of drinking during pregnancy among Australian women are also high, with national surveys reporting rates of 47% (Wallace, Burns, Gilmour, & al, 2007) and a Western Australian study 59% (Colvin, Payne, Parsons, Kurinczuk, & Bower, 2007). Among respondents in the Western Australian survey, 15% drank above NHMRC guidelines during the first trimester (Colvin et al., 2007). A more recent Australian study of women 18-45 years, found more than one third of all women consumed alcohol during pregnancy (34%) (Elliott, 2015a). Other estimates suggest that between 50-59% of



women consume alcohol at some stage whilst pregnant. In one study, 20% of women indicated that they had participated in binge drinking at least once when pregnant (Aboriginal and Torres Strait Islander Social Justice Commissioner, 2011).

Experts argue that high rates of alcohol consumption by women of childbearing age are a cause for concern, particularly given the evidence that approximately half of all pregnancies are unplanned (Aboriginal and Torres Strait Islander Social Justice Commissioner, 2011). A recent study incorporating population data from Ireland, the UK, Australia and New Zealand found low adherence with alcohol guidelines recommending 1-2 units once or twice per week during pregnancy (O'Keeffe et al., 2015).

Smoking has been found to be associated with alcohol consumption, with one systematic review showing smokers were 17-50% more likely to be at heightened risk of drinking alcohol during pregnancy (O'Keeffe et al., 2015). A recent NSW study found a similar association between smoking and alcohol intake (Gould et al., 2015).

### Barriers to behaviour change

A recent Australian study found low levels of awareness of guidelines for alcohol consumption among the general population and a tendency "...among younger, heavier drinkers to estimate substantially higher low-risk thresholds..." (Livingstone, 2012). Self-reporting of alcohol use results in underestimates of consumption by women, and this, combined with clinician's subjective judgement or "professionally perceived risk of exposure", have been highlighted as barriers to accurate reporting and measuring of alcohol intake (O'Keeffe et al., 2015).

Other barriers to changing alcohol consumption behaviour include cultural acceptance of alcohol as well as perceptions about what both patient and health practitioner deem acceptable consumption during pregnancy (O'Keeffe et al., 2015). Whilst women rely on 'expert' advice from health professionals as to what is a safe level of consumption of alcohol in pregnancy, research has shown that this advice is often not forthcoming with only 45% of doctors routinely asking women about their drinking (Elliott, 2015a). Health professionals have expressed concerns about the stigma associated with drinking at unsafe levels in pregnancy and are unclear themselves as to what is safe, and lack the skills and resources to support pregnant women to reduce alcohol intake (Fox et al., 2015).

### Interventions

Recent literature has highlighted the need for public awareness of the harms associated with alcohol consumption in pregnancy, mandatory labelling of alcohol products, and education and training of health professionals in the management of alcohol use in pregnancy (Elliott, 2015a). In alignment with best practice clinical care guidelines, healthcare professionals are advised to minimise the risk of contaminating the message by advocating abstinence from drinking alcohol during pregnancy (O'Keeffe et al., 2015).

A recent meta-analysis shows that motivational interviewing by health professionals involving a combination of empathic listening and patient empowerment is effective for decreasing alcohol and

drug use in adults and adolescents (Hall, Gibbie, & Lubman, 2012). Preliminary trials of computer-based approaches to routine screening that include health professionals asking questions about alcohol consumption have shown promise, allowing researchers to move beyond relying on self-report data (Paul et al., 2014).

There is limited evidence about effective interventions to raise awareness of harms and/or reduce alcohol consumption during pregnancy especially among high risk women (Crawford-Williams, Fielder, Mikocka-Walus, & Esterman, 2015; Fox et al., 2015). In Australia, there is no national register capturing standardised data on FASD and therefore no data to monitor the effectiveness of prevention programs (Elliott, 2015a). However, the literature highlights the need for messages about harms associated with alcohol consumption to be delivered in the context of a shift in cultural norms around alcohol consumption, mirroring approaches used in the National Tobacco Campaign, tackling alcohol advertising and promotions, restricting opening hours and addressing issues of pricing and taxation (Elliott, 2015a). Addressing issues of harmful consumption of alcohol in pregnancy requires effective prevention and early intervention targeting midwives, obstetricians and other health professionals in primary and acute care by including appropriate training in routine screening for alcohol use (Burns, Breen, & Dunlop, 2014).

Given evidence of an association between smoking and alcohol consumption, targeting both behaviours opportunistically upon presentation at an antenatal visit could deliver higher value returns (O'Keefe et al., 2015).

A recent review of a US intervention aimed at reducing alcohol consumption in pregnancy found a scarcity of evaluation research, lack of consistent measures and a tendency to neglect to include alcohol consumption as an outcome variable (Crawford-Williams et al., 2015).

## Alcohol consumption among Aboriginal women

### *National trends*

Whilst Indigenous women are less likely to drink alcohol than non-Indigenous women, those that drink are more likely to consume at harmful levels. Between 19 and 44% of Aboriginal women drink alcohol in pregnancy and between 10 and 19 % drink at harmful levels (Hayes, 2001; S. R. Zubrick et al., 2006; S.R. Zubrick et al., 2005). The estimated prevalence of harmful drinking in Indigenous populations is twice as high as that in non-Indigenous populations (Fitzpatrick et al., 2012; Wilson, Stearne, Gray, & Sherry, 2010). There is a paucity of quality population data on substance use among Aboriginal Australians (Fitzpatrick et al., 2012), however there are known differences in usage patterns across urban, regional and remote Aboriginal communities (Teasdale et al., 2008), with evidence of high rates of alcohol consumption in pregnancy among some communities (Hutchinson, Moore, Breen, Burns, & Mattick, 2013). There is also evidence of higher rates of FASD in some remote Aboriginal communities where consumption of alcohol at harmful levels is the norm (Elliott, E., Public Health Practice Journal, 2015). In these communities significant numbers of children under the age of five are exhibiting symptoms associated with FASD (Aboriginal and Torres Strait Islander Social Justice Commissioner, 2011).

### *Barriers to behaviour change*

Barriers to changing high-risk drinking behaviours among Aboriginal women include cultural trauma, dispossession, disconnection from country, geographical isolation and psychosocial environments where children and adolescents are exposed to harmful consumption of alcohol as a norm (Elliott, 2015a; Elliott, Latimer, Fitzpatrick, Oscar, & Carter, 2012; Teasdale et al., 2008). However, lack of sustainable funding for Indigenous-specific services prohibits the effective engagement with local communities that is needed to establish trust and credibility. Interventions for minimising the harms associated with alcohol consumption among young Aboriginal women are often left to Aboriginal clinicians who are not trained in health promotion and who are overburdened and focussed on those suffering from serious addiction (Conigrave et al., 2012).

One NSW study reported, anecdotally, that it is rare for Aboriginal clients to present to Area Health Services' out-patient treatment programs for assistance with alcohol problems and that they were more likely to present to detoxification units or Hospital Emergency Departments as a result of complications resulting from harmful drinking. Feedback from community members reinforces the normalisation of harmful consumption of alcohol in these communities and this remains a key barrier to early intervention (Teasdale et al., 2008).

### *Interventions*

Given the differing attitudes and behaviours of diverse Indigenous populations, it is important that interventions targeting alcohol consumption in the preconception period are culturally appropriate, community controlled and based on self-determined goals of the local community (O'Donoghue et al., 2014).

Interactive community based education combined with culturally appropriate printed resources was found, in one NSW evaluation, to be effective in reaching and engaging groups at risk of harmful consumption of alcohol (Conigrave et al., 2012).

## **Mental Health**

It is estimated that 10-15% of women in high income countries are affected by perinatal depression (Paton et al., 2015). In order to achieve progress toward several of WHO's Millennium Development Goals, such as promotion of gender equality and empowerment of women, reduction of child mortality and improvement of maternal health, recognition of the significance of the impact of mental health is imperative (Prince et al., 2007). Despite this, it remains a neglected global health priority (Paton et al., 2015). Perinatal anxiety has also been found to negatively impact both the attainment of parenting skills and secure infant attachment (Somerville et al., 2015). Maternal age is associated with maternal mental health, with adolescent mothers three times more likely to experience postnatal depression (Ferguson-Hill, 2010). In Australia, *Beyondblue's* national depression initiative highlights that psychological distress and disorder are accentuated in the perinatal period not only for the mother, but also for her infant, partner and family (Ferguson-Hill, 2010). Perinatal anxiety and stressful life events during pregnancy have adverse impacts on the child including impaired cognitive, emotional and behavioural development (O'Neill et al., 2014; Paton et al., 2015; Pearson et al., 2012; Somerville et al., 2015). It has been estimated that among children of

women suffering antenatal depression, there is a five-fold increase in the risk of developing depression by the time they reach adolescence (O'Neill et al., 2014).

Given the strong association between a history of mental illness and perinatal depressive symptoms, women who have suffered mental health problems in adolescence or young adulthood prior to becoming pregnant have been identified as a high risk group (Paton et al., 2015). Multiple factors interact to compound the risks for highly vulnerable women in pregnancy (Ferguson-Hill, 2010)

For example, living near or below poverty levels, food deprivation, an unsafe living environment, and racial/ethnic or economic discrimination are likely to trigger acute or chronic stress in pregnant women. These external circumstances are risk factors for inability to cope, anxiety and/or depression in women of childbearing age (Grote et al., 2010). Predictably, there is evidence that “depression during pregnancy is associated with other risky but modifiable health practices” (Grote et al., 2010). Such factors include poor nutrition, lack of motivation to obtain prenatal care, and smoking and/or alcohol and substance abuse, all of which adversely affect pregnancy outcomes. Alcohol use, especially when initiated at a young age, elevates the risk of many mental health and social problems (NHMRC, 2009; Pearson et al., 2012). A recent Australian study reported that people meeting DSM-IV alcohol dependence criteria were 4.5 times more likely to meet criteria for an affective disorder than non-drinkers (Hunt, Baker, Michie, & Kay-Lambkin, 2014). Another risk factor for depression is intimate partner violence, including both physical and emotional abuse (Ferguson-Hill, 2010; Woolhouse, Garland, Hegarty, Donath, & Brown, 2012).

Partners of women experiencing postnatal depression are at increased risk of experiencing depression themselves (24%-50% compared to 1.2%-25.5%). Depression in fathers is also likely to impact on the father-infant attachment and increase the likelihood that the father is less engaged and that interaction is negative (Ferguson-Hill, 2010) .

### Barriers to behaviour change

Efforts to screen for mental illness in the perinatal period are affected by the negative impacts of mental illness, including a woman's capacity and motivation to access antenatal services, and her inability to identify her own need for help and to seek appropriate support. Generally, women and men who are vulnerable and at risk of mental illness tend to self-exclude from the health care system in the perinatal period and therefore miss opportunities for mental health screening. Barriers to accessing the healthcare system for these women and their partners include inappropriate or unaffordable services and unacceptable care options (Ferguson-Hill, 2010).

### Interventions

Identification of those at risk of perinatal psychological morbidity has been highlighted as an important first step in any intervention targeting maternal mental health (A. Campbell, Hayes, & Buckby, 2008; Sandra Campbell, Lynch, Esterman, & McDermott, 2013). The Edinburgh Postnatal Depression Scale (EPDS) is not a diagnostic tool but can identify women experiencing depressive symptoms (Ferguson-Hill, 2010). The Perinatal Anxiety Screening Scale (PASS) has also been shown to effectively screen for symptoms of acute anxiety and adjustment; general worry and specific fears; perfectionism, control, trauma; and social anxiety. Screening for perinatal anxiety and

depression both in the antenatal and postnatal periods is recommended and has the potential to pick up subtle changes in risk (Somerville et al., 2015).

However, further research is needed to identify enablers and barriers to screening among those women most at risk of mental illness, as well as formative research to investigate what works in raising awareness of the symptoms associated with perinatal anxiety/depression. In addition, parallel education strategies targeting General Practitioners, midwives and other health practitioners who are likely to interface with women in preconception are needed to highlight triggers for anxiety/depression and provide useful and appropriate techniques for diagnosis, treatment and management (Paton et al., 2015).

In 2008, the Australian Government initiated the National Perinatal Depression plan with the objective of upskilling healthcare professionals in the conduct of routine screening and treatment of those at risk of ante- and postnatal depression. Aligned with the national framework, Sustaining NSW Families (SNF) includes promoting maternal mental health during pregnancy, specifically, infant and perinatal mental health and the relationship between mother and baby. Assessment of care pathways and interventions to reduce prevalence of mental illness among young women of childbearing age includes the evaluation of psychosocial risk (eg. lack of social support), risk of harm and psychiatric history (Somerville et al., 2015). An external evaluation conducted in 2015 found a significant positive impact of the program on maternal mental health with 83% of mothers showing a decrease in their EPDS score after six to eight months in the program.

### Mental health among Aboriginal women

From the Aboriginal perspective, maternal mental health is intertwined with spirituality, and relationships with the land, family and culture (Prandl, Rooney, & Bishop, 2012). Intergenerational trauma and displacement and the fact that Aboriginal women are at increased risk of multiple factors related to disadvantage puts them at higher risk of mental illness. For example, Indigenous children are overrepresented in out-of-home care compared with non-Indigenous children (nine times higher, 35%), with some women encountering the child protection system during pregnancy, leading to the removal of their babies at birth, causing significant distress to the mother (Kildea et al., 2016).

Instruments used to identify stress or psychological distress in pregnant women, such as the PASS, have not been validated among Aboriginal women. Also, the language of such measures can be easily misinterpreted (Prandl et al., 2012). There is currently no culturally sensitive measure that assesses stress or psychological distress in pregnant Aboriginal women and the focus to date has been on modifiable risk behaviours without any investigation of the underlying causes (Prandl et al., 2012). A Victorian study found that Aboriginal and Torres Strait Islander women scored no differently on a language-specific version of the EPDS than on the mainstream EPDS (Ferguson-Hill, 2010).

Twenty four per cent of Indigenous women who give birth each year live in remote and very remote Australia (versus 2% of non-Indigenous women), and many are transferred to distant health services for maternity care. Risk factors for maternal mental health among these Indigenous women in the

antenatal period include cultural risk (eg., the belief that not being born on their land threatens claims to land rights) and emotional risks (having to spend weeks removed from family and other children while awaiting birth). Such scenarios are very common particularly for women in rural and remote parts of NSW and cause distress to women and families. This distress can lead to medical and clinical risks as women do not attend antenatal care and present late in labour to avoid being transferred out of their community (Kildea et al., 2016).

#### *Barriers to behaviour change*

Historically, assessing risk of depression among pregnant Aboriginal women has been limited by the use of parameters identified for non-Aboriginal women. Recent literature has argued that the definition of risk among Indigenous women needs to be broader than clinical and medical, and incorporate social (cultural, emotional and spiritual) risks (Kildea et al., 2016).

Aboriginal women present later in their pregnancy for midwifery/obstetric care, attend fewer antenatal appointments and are less likely to receive health screening during pregnancy (Prandl et al., 2012). Cultural issues such as the tendency for Aboriginal women to view pregnancy as a normal life event and therefore to be less likely to engage with health services, and the lack of culturally appropriate and safe services, act as barriers to identifying and preventing mental illness (Prandl et al., 2012).

#### *Interventions*

Programs that incorporate traditional and cultural approaches to parenting and lifestyle, and provide support to women and their babies throughout the perinatal period, such as 'Strong Women, Strong Babies, Strong Culture' are more likely to have an impact (Ferguson-Hill, 2010). Important factors contributing to the success of such programs include that they are community based; include continuity of care, outreach and home visiting; involve Aboriginal workers; and are integrated with other services (Kildea, Kruske, Barclay, & Tracy, 2010).

Evidence highlights that culturally appropriate treatment modalities include narrative and demonstration therapies, personal stories and anecdotes, open-ended discussion, yarning, and grief and loss therapies (Bond, 2009). An example of a culturally sensitive intervention is one which minimises the impact of disconnectedness when birth occurs away from homelands, for example, by offering women the chance to take the placenta (or part thereof) home for burial, enabling the creation of physical and symbolic links between mother, baby and the homeland.

Whilst the Sustaining NSW Families program includes Aboriginal families, evaluation results highlight the need to increase participation by building better connections with local communities and Aboriginal controlled health services. The success of such programs would be enhanced by a culturally competent workforce who understand the ongoing impact of intergenerational trauma resulting from historical injustices, colonisation, and removal from and dispossession of land, and continuing racism (Kildea et al., 2016).

## Summary and Conclusions

Dovetailing with broader population health interventions and targeting women in preconception with new policies and interventions could have greater impact on high risk groups (O'Keeffe et al., 2015). The broader population health campaigns have an agenda setting role in shifting overall attitudes and behaviours with regard to issues such as smoking and obesity among young women. Specific programs and interventions targeting women in childbearing years as well as health practitioners providing antenatal care, and the tailoring of messages emphasising the harm to the unborn child, would reinforce the impact of the mainstream campaigns.

### Smoking

Modifying smoking behaviour in pregnancy has been identified as a priority given the impact of reductions on maternal and child health outcomes. Decades of tobacco control efforts have been successful, however women in all age groups are now more likely to be smokers than men. Given that smoking is a coping mechanism for the most vulnerable pregnant women, offering alternative stress management strategies and support structures could increase the likelihood of quit attempts.

The gap between prevalence of smoking among Aboriginal women smokers compared to non-Aboriginal women smokers remains substantial, making this one of the top priorities at local, State and National levels. Initiatives involving Aboriginal community-controlled health organisations are needed to provide leadership, program implementation and evaluation. Increases in smoke-free homes will contribute to reductions in Indigenous smoking prevalence by both increasing cessation and reducing initiation. Trends showing increases in the numbers of smoke-free homes among Aboriginal people (often triggered by the arrival of a new baby) are particularly encouraging.

### Nutrition, physical activity and obesity

Obesity is a widespread problem that is now having an impact on significant numbers of women of childbearing age. The greatest impact in interventions to reduce obesity is achieved if implemented early in life including the preconception and peri conception period. Dovetailing with population health initiatives, targeted communication strategies directed at women of child-bearing age, could be developed to increase awareness of risks associated with obesity, highlighting health outcomes for baby whilst also dispelling myths about what is normal.

### Alcohol misuse

The majority of young women in Australia consume alcohol, with a significant minority reporting harmful levels of consumption, including young Indigenous women. Whilst the proportion of women engaged in heavy drinking in pregnancy is low, the adverse outcomes (including FASD) of heavy gestational alcohol consumption and the lack of evidence around safe levels of consumption highlight the issue as high public health priority. Developing public health campaigns to increase awareness of national guidelines as well as longer term tracking of the impact of guidelines on alcohol consumption in pregnancy would add to the evidence base around what works (Hutchinson et al., 2013). Shifting the focus from treatment of advanced alcohol dependence to prevention and early detection will likely improve longer term outcomes and be more cost-effective (Conigrave et al., 2012).

## Mental health

Antenatal services can play a key role in the identification of vulnerability and risk and in establishing appropriate care pathways. Effective screening for identification of perinatal anxiety and depression can help direct women into programs such as Supporting Families Early which offer ongoing support.

## Targeting disadvantage

Vulnerable groups, including Aboriginal peoples, are at greater risk of exposure to high rates of smoking, obesity, alcohol abuse and mental illness. These are known risk factors for adverse birth outcomes that impact on early childhood development. Therefore, these vulnerable groups are a key target audience for interventions to reduce modifiable risk factors in preconception.

In targeting these groups, a first step is to gain a better understanding of the barriers to reducing harmful behaviours. Many of the barriers to change are cultural and environmental and include structural issues of socioeconomic disparities (Sidebotham & Fraser, 2014a). Pregnancy has the potential to compound already challenging circumstances, and evidence supports prevention and early intervention targeting modifiable risk factors prior to conception. Primary healthcare networks (PHC) are well positioned to target disadvantaged groups, monitor and evaluate health promotion activities and interface with other sectors. (O'Donoghue et al., 2014). The impact of socioeconomic factors on the prevalence of these risk factors highlights the need for inter-sectoral collaboration targeting the most vulnerable groups in our community.

## Implications for policy

To date perinatal care has been based on the assumption that eliminating a risk factor will reduce the risk of “adverse perinatal outcomes” (Temel et al., 2014). However, increasingly policy makers recognise the complex interplay of psychosocial and environmental factors. “High quality antenatal care could identify and address many risk factors especially given that more than half of pregnant women are estimated to attend at least four antenatal care visits. However, optimisation of timing and quality of visits and attention to the marginalised, including those with mental health conditions is essential” (Lawn et al., 2016).

Greater consistency and standardisation of policy and program evaluation measures will generate an evidence base about efficacy, cost-effectiveness and acceptability as well as the feasibility of integrating programs in specific contexts (Sidebotham & Fraser, 2014a). Measuring the impact of programs requires greater sophistication, including the provision of specific information regarding the content of interventions and as well as the context to inform the implementation of future interventions (Temel et al., 2014).



## References

- Aboriginal and Torres Strait Islander Social Justice Commissioner. (2011). *Social Justice Report*. Australian Human Rights Commission.
- Abroms, L., Johnson, P., Heminger, C., et al. (2015). Quit4baby: Results from a pilot test of a mobile smoking cessation program for pregnant women. *JMIR mHealth uHealth*, 3(1), e10. doi:DOI: 10.2196/mhealth.3846
- ABS. (2012). *Australian Health Survey - First Results 2011-12*. Canberra: Australian Bureau of Statistics.
- ABS. (2013). *Australian Health Survey - Biomedical Results for Nutrients, 2011-2012*. Canberra: Australian Bureau of Statistics.
- Australian Health Ministers' Advisory Council AHMAC. (2012). *Clinical Practice Guidelines: Antenatal Care - Module 1*. Canberra: Australian Government.
- Bond, C. (2009). Starting at strengths... an Indigenous early years intervention. *Medical Journal of Australia*, 191(3), 175-177.
- Bower, C. (2012). *Submission to House Standing Committee on Social Policy and Legal Affairs Inquiry into Foetal Alcohol Spectrum Disorder*. Perth: Telethon Institute for Child Health Research.
- Burns, L., Breen, C., & Dunlop, A. J. (2014). Prevention of fetal alcohol spectrum disorders must include maternal treatment. *Medical Journal of Australia*, 200(7), 392-392.
- Cameron, C. M., Davey, T. M., Kendall, E., et al. (2013). Changes in alcohol consumption in pregnant Australian women between 2007 and 2011. *Medical Journal of Australia*, 199(5), 355-357.
- Campbell, A., Hayes, B., & Buckby, B. (2008). Aboriginal and Torres Strait Islander women's experience when interacting with the Edinburgh Postnatal Depression Scale: A brief note. *Australian Journal of Rural Health*, 16(3), 124-131.
- Campbell, S., Lynch, J., Esterman, A., & McDermott, R. (2012). Pre-pregnancy predictors of diabetes in pregnancy among Aboriginal and Torres Strait Islander women in North Queensland, Australia. *Matern Child Health Journal*, 16(6), 1284-1292.
- Campbell, S., Lynch, J., Esterman, A., & McDermott, R. (2013). Pre-pregnancy predictors of hypertension in pregnancy among Aboriginal and Torres Strait Islander women in north Queensland, Australia; a prospective cohort study. *BMC Public Health*, 13(1), 138.
- Centers for Disease Control CDC. (2006). *Recommendations to improve preconception health and health care - United States: A report of the CDC/ATSDR Preconception care work group and the select panel on preconception care*. <https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5506a1.htm>
- Centre for Epidemiology and Evidence. (2016). *New South Wales Mothers and Babies 2015*. NSW: NSW Ministry of Health.
- Centre for Public Health Nutrition. (2005). *Best Options for Promoting Healthy Weight and Preventing Weight Gain in NSW* Sydney: NSW Health.
- Cnattingius, S., & Lambe, M. (2002). Trends in smoking and overweight during pregnancy: prevalence, risks of pregnancy complications, and adverse pregnancy outcomes. *Perinatology*, 26, 286-295.
- Colvin, L., Payne, J., Parsons, D., et al. (2007). Alcohol consumption during pregnancy in nonindigenous west Australian women. *Alcoholism: Clinical and Experimental Research*, 31(2), 276-284.

- Conigrave, K., Freeman, B., Carroll, T., et al. (2012). The Alcohol Awareness Project: Community education and brief intervention in an urban Aboriginal setting. *Health Promotion Journal of Australia*, 23(3), 219-225.
- Crawford-Williams, F., Fielder, A., Mikocka-Walus, A., & Esterman, A. (2015). A critical review of public health interventions aimed at reducing alcohol consumption and/or increasing knowledge among pregnant women. *Drug and Alcohol Review*, 34(2), 154-161.
- Davis, D., Raymond, J., Clements, V., et al. (2012). Addressing obesity in pregnancy: The design and feasibility of an innovative intervention in NSW, Australia. *Women and Birth*, 25, 174-180.
- Doyle, O., Harmon, C., Heckman, J., & Tremblay, R. (2009). Investing in early human development: Timing and economic efficiency. *Economics & Human Biology*, 7(1), 1-6.
- Eades, S., Sanson-Fisher, R., Wanitong, M., et al. (2012). An intensive smoking intervention for pregnant Aboriginal and Torres Strait Islander women: a randomised controlled trial. *Medical Journal of Australia*, 197(1), 42-46.
- Elliott, E. (2015a). Fetal alcohol spectrum disorders in Australia - the future is prevention. *Public Health Research & Practice*, 25(2). doi:doi:http://dx.doi.org/10.17061/phrp2521516
- Elliott, E. (2015b). Fetal alcohol spectrum disorders: Hidden problem is more pervasive than we thought. *Sydney Morning Herald*, 3 November 2015.
- Elliott, E., Latimer, J., Fitzpatrick, J., Oscar, J., & Carter, M. (2012). There's hope in the valley. *Journal of Paediatrics and Child Health*, 48(3), 190-192.
- Ferguson-Hill, S. (2010). Promoting perinatal mental health wellness in Aboriginal and Torres Strait Islander communities. In P. Dudgeon, H. Milroy, & R. Walker (Eds.), *Working Together: Aboriginal and Torres Strait Islander Mental Health and Wellbeing Principles and Practice* (pp. 223-242). Canberra: Department of Health and Ageing.
- Fitzpatrick, J. P., Elliott, E. J., Latimer, J., et al. (2012). The Lililwan Project: study protocol for a population-based active case ascertainment study of the prevalence of fetal alcohol spectrum disorders (FASD) in remote Australian Aboriginal communities. *BMJ Open*, 2(3), e000968.
- Fox, S., Southwell, A., Stafford, N., et al. (2015). *Better Systems, Better Chances: A Review of Research and Practice for Prevention and Early Intervention*. Canberra: Australian Research Alliance for Children and Youth (ARACY).
- Freeman, B., Gartner, C., Hall, W., & Chapman, S. (2010). Forecasting future tobacco control policy: where to next? *Australian and New Zealand Journal of Public Health*, 34(5), 447-450.
- Giglia, R., Binns, C., & Alfonso, H. (2006). Which women stop smoking during pregnancy and the effect on breastfeeding duration. *BMC Public Health*, 6(195). doi:10.1186/1471-2458-6-195
- Gould, G., Watt, K., McEwen, A., et al. (2015). Predictors of intentions to quit smoking in Aboriginal tobacco smokers of reproductive age in regional NSW, Australia: quantitative and qualitative findings of a cross-sectional survey. *BMJ Open*. doi:10.1136/bmjopen-2014-007020
- Grote, N., Bridge, J., Gavin, A., et al. (2010). A meta-analysis of depression during pregnancy and the risk of preterm birth, low birthweight, and intrauterine growth restriction. *Archives of General Psychiatry*, 67(10), 1012-1024.
- Hall, K., Gibbie, T., & Lubman, D. I. (2012). Motivational interviewing techniques: Facilitating behaviour change in the general practice setting. *Australian Family Physician*, 41(9), 660.
- Hayes, L. (2001). Grog babies: where do they fit in this alcohol life cycle? *Aboriginal and Islander Health Worker Journal*, 25(2), 14-17.

- Healthinfonet. (2016). *Overview of Aboriginal and Torres Strait Islander Health Status 2015*. Perth WA: [www.healthinfonet.ecu.edu.au](http://www.healthinfonet.ecu.edu.au)
- HealthStats NSW. (2015). Infant feeding at discharge by type of feeding. [http://www.healthstats.nsw.gov.au/Indicator/mab\\_feed\\_cat/mab\\_feed\\_cat\\_atsi\\_snap](http://www.healthstats.nsw.gov.au/Indicator/mab_feed_cat/mab_feed_cat_atsi_snap)
- Heslehurst, N., Lang, R., Rankin, J., et al. (2007). Obesity in pregnancy: a study of the impact of maternal obesity on NHS maternity services. *BJOG*, *114*(3), 1-9.
- Hunt, S. A., Baker, A. L., Michie, P. T., & Kay-Lambkin, F. J. (2014). Change in neurocognition in people with co-occurring alcohol misuse and depression: 12-month follow-up. *Journal of Addiction Research & Therapy*, *S10*:004. doi:10.4172/2155-6105.S10-004
- Hutchinson, D., Moore, E. A., Breen, C., et al. (2013). Alcohol use in pregnancy: Prevalence and predictors in the Longitudinal Study of Australian Children. *Drug and Alcohol Review*, *32*(5), 475-482.
- Johnston, V., Thomas, D., McDonnell, J., & Andrews, R. (2011). Maternal smoking and smoking in the household during pregnancy and postpartum: findings from an Indigenous cohort in the Northern Territory. *Medical Journal of Australia*, *194*(10), 556-559.
- Kenny, L. C., Lavender, T., McNamee, R., O'Neill, S. M., Mills, T., & Khashan, A. S. (2013). Advanced maternal age and adverse pregnancy outcome: Evidence from a large contemporary cohort. *PLoS One*, *8*(2), e56583. doi:10.1371/journal.pone.0056583
- Kildea, S., Kruske, S., Barclay, L., & Tracy, S. (2010). 'Closing the Gap': How maternity services can contribute to reducing poor maternal infant health outcomes for Aboriginal and Torres Strait Islander women. *Rural and Remote Health*, *10*, 1383. <http://www.rhrh.org.au/articles/subreview.asp?ArticleID=1383>
- Kildea, S., Tracy, S., Sherwood, J., et al. (2016). Improving maternity services for Indigenous women in Australia: Moving from policy to practice. *Medical Journal of Australia*, *205*(8), 375-379.
- Knight. (2014). The views and attitudes of health professionals providing antenatal care to women with a high BMI: A qualitative research study. *Women and Birth* *27*(2), 138-144.
- Lamont, L., Scott, N., Jones, G., & Bhattachaya, S. (2015). Risk of recurrent stillbirth: systematic review and meta-analysis. *BMJ*, *350*(h3080), 1-10.
- Lawn, J. E., Blencowe, H., Waiswa, P., et al. (2016). Stillbirths: rates, risk factors, and acceleration towards 2030. *Lancet*, *387*(10018), 587-603.
- Li, A., Zeki, R., Hilder, L., & Sullivan, E. (2013). *Australia's Mothers and Babies 2011*. Canberra:
- Lim, C. C., & Mahmood, T. (2015). Obesity in pregnancy. *Best Practice & Research Clinical Obstetrics & Gynaecology*, *29*(3), 309-319. doi:10.1016/j.bpobgyn.2014.10.008
- Livingstone, M. (2012). Perceptions of low-risk drinking levels among Australians during a period of change in the official drinking guidelines. *Drug and Alcohol Review*, *31*, 224-230.
- Marmot, M. (2010). *Fair Society, Healthy Lives: Strategic Review of Health Inequalities in England post 2010*. London: Institute of Health Equity.
- McCall, S., M Nair, M., & Knight, M. (2017). Factors associated with maternal mortality at advanced maternal age: a population-based case control study. *BJOG*. *124*(8), 1225-1233.
- National Preventative Health Taskforce. (2009a). *Australia: the Healthiest Country by 2020. Obesity in Australia: a Need for Urgent Action. Technical Report 1*. Canberra: Australian Government.
- National Preventative Health Taskforce. (2009b). *Australia: The Healthiest Country by 2020: Technical Report No 2: Tobacco Control in Australia: Making Smoking History*. Canberra: Australian Government. <http://www.health.gov.au/internet/preventativehealth/publishing.nsf/Content/tech-tobacco-toc>

- NHMRC. (2009). *Australian Guidelines to Reduce Health Risks from Drinking Alcohol*. Canberra: National Health and Medical Research Council.
- NSCDC. (2010). *The Foundations of Lifelong Health Are Built in Early Childhood*: National Scientific Council on the Developing Child (NSDC). Harvard University.
- O'Donoghue, L., Percival, N., Laycock, A., et al. (2014). Evaluating Aboriginal and Torres Strait Islander health promotion activities using audit and feedback. *Australian Journal of Primary Health*, 20, 339-344.
- O'Keefe, L. M., Kearney, P. M., McCarthy, F. P., et al. (2015). Prevalence and predictors of alcohol use during pregnancy: findings from international multicentre cohort studies. *BMJ Open*, 5(7). doi:10.1136/bmjopen-2014-006323
- O'Neill, A., Itsiopoulos, C., Skouteris, H., et al. (2014). Preventing mental health problems in offspring by targeting dietary intake of pregnant women. *BMC Medicine*, 12(208). <http://www.biomedcentral.com/1741-7015/12/208>
- Partridge, S., McGeechan, K., Hebden, L., et al. (2015). Effectiveness of a mHealth Lifestyle Program with Telephone Support (TXT2BFit) to prevent unhealthy weight gain in young adults: Randomized controlled trial. *JMIR mHealth uHealth*, 3(2).
- Paton, G., Romaniuk, E., Spry, E., et al. (2015). Prediction of perinatal depression from adolescence and before conception (VIHCS): 20-year prospective cohort study. *Lancet*, 386, 875-883.
- Paul, C., Yoong, S. R., Sanson-Fisher, R., et al. (2014). Under the radar: A cross-sectional study of the challenge of identifying at-risk alcohol consumption in the general practice setting. *BMC Family Practice*, 15(74). doi:<http://www.biomedcentral.com/1471-2296/15/74>
- Pearson, R., Melotti, R., Heron, J., et al. (2012). Disruption to the development of maternal responsiveness? The impact of prenatal depression on mother-infant interactions. *Infant Behavior and Development*, 35, 613-626.
- Pierce, J., Cummins, S., White, M., et al. (2012). Quitlines and nicotine replacement for smoking cessation: Do we need to change policy? *Annual Review of Public Health*, Vol. 33, 341-356.
- Pierce, J., & Messer, K. (2011). Commentary on White et al: Smoke free policies within a comprehensive program coincident with major declines in teen smoking. *Addiction* 106, 1503-1504.
- Prandl, K., Rooney, R., & Bishop, B. (2012). Mental health of Australian Aboriginal women during pregnancy: Identifying the gaps. *Archives of Women's Mental Health*, 15, 149-154.
- Prince, M., Patel, V., Shekar, S., et al. (2007). Global mental health 1: No health without mental health. *Lancet*, 370, 859-877.
- Rasmussen, K. M., Abrams, B., Bodnar, L. M., et al. (2010). Recommendations for weight gain during pregnancy in the context of the obesity epidemic. *Obstetrics and Gynecology*, 116(5), 1191.
- Rastogi, S., Rojas, M., Rastogi, D., & Haberman, S. (2015). Neonatal morbidities among full-term infants born to obese mothers. *Journal of Maternal-Fetal & Neonatal Medicine*, 28(7), 829-835.
- Sarin, J., Hunt, J., Ivers, R., & Smyth, C. (2015). Lifting the burden: a coordinated approach to action on Aboriginal tobacco resistance and control in NSW. *Public Health Research and Practice*, 25(3), e2531528. doi:<http://dx.doi.org/10.17061/phrp2531528>
- Scollo, M. M., & Winstanley, M. H. (2016). *Tobacco in Australia: Facts and issues*. Melbourne: Cancer Council Victoria. [www.TobaccoInAustralia.org.au](http://www.TobaccoInAustralia.org.au)

- Shub, A., Huning, E., Campbell, K., & McCarthy, E. (2013). Pregnant women's knowledge of weight, weight gain, complications of obesity and weight management strategies in pregnancy. *BMC Research Notes*, 6(278). doi:doi:10.1186/1756-0500-6-278
- Sidebotham, P., & Fraser, J. (2014a). Child death in high-income countries 3: Understanding why children die in high-income countries. *Lancet*, 384, 915-927.
- Sidebotham, P., & Fraser, J. (2014b). Child death in high income countries. Comment. *Lancet*, 384, 831-833.
- Skagerström, J., Chang, G., & Nilsen, P. (2011). Predictors of drinking during pregnancy: A systematic review. *Women's Health*, 20(6), 901-913.
- Skouteris, H., Huang, T., Millar, L., et al. (2015). A systems approach to reducing maternal obesity: The Health in Preconception, Pregnancy and Postbirth (HIPPP) Collaborative. *Australian and New Zealand Journal of Obstetrics and Gynaecology*, 55(4), 397-400.
- Social Research Centre. (2015). *2015 National Tobacco Campaign Research Evaluation Final Report*. Canberra: Australian National University.  
[http://www.quitnow.gov.au/internet/quitnow/publishing.nsf/Content/2B624C441CC88083CA257E530081C8AD/\\$File/2015%20NTC%20Report.pdf](http://www.quitnow.gov.au/internet/quitnow/publishing.nsf/Content/2B624C441CC88083CA257E530081C8AD/$File/2015%20NTC%20Report.pdf)
- Somerville, S., Byrne, S. L., Dedman, K., et al. (2015). Detecting the severity of perinatal anxiety with the Perinatal Anxiety Screening Scale (PASS). *Journal of Affective Disorders*, 186, 18-25.
- South Eastern Sydney Local Health District SESLHD. (2014). *Strategic Plan for the Prevention of Smoking and Harm from Smoking 2014-2017: Working together to improve the health and wellbeing of our community*. Sydney: NSW Health.
- Stegers, E., Barker, M., Regine, P., et al. (2016). Societal valorisation of new knowledge to improve perinatal health: Time to act. *Paediatric and Perinatal Epidemiology*, 20, 201-204.
- Teasdale, K. E., Conigrave, K. M., Kiel, K. A., et al. (2008). Improving services for prevention and treatment of substance misuse for Aboriginal communities in a Sydney Area Health Service. *Drug and Alcohol Review*, 27(2), 152-159.
- Temel, S., van Voorst, S., Jack, B., et al. (2014). Evidence-based preconceptional lifestyle interventions. *Epidemiologic Reviews*, 36, 19-30.
- Thomas, D., & Stevens, M. (2014). Aboriginal and Torres Strait Islander smoke-free homes, 2002-2008. *Australian and New Zealand Journal of Public Health*, 38(2), 147-153.
- Tran, D., Roberts, C., Jorm, L., et al. (2014). Change in smoking status during two consecutive pregnancies: A population-based cohort study. *BJOG*. doi: 10.1111/1471-0528.12769
- Ussher, M., Lewis, S., Aveyard, P., et al. (2015). Physical activity for smoking cessation in pregnancy: Randomised controlled trial. *British Medical Journal*, 350(2415), 1-10.
- Villamor, E., & Cnattingius, S. (2006). Interpregnancy weight change and risk of adverse pregnancy outcomes: A population-based study. *Lancet*, 368, 1164-1170.
- Wallace, C., Burns, L., Gilmour, S., et al. (2007). Substance use, psychological distress and violence among pregnant and breastfeeding Australian women. *Australian NZ Journal of Public Health*, 31, 51-56.
- Wilson, M., Stearne, A., Gray, D., & Sherry, S. (2010). Review of the harmful use of alcohol amongst Indigenous Australians. *Australian Indigenous Health InfoNet*. [www.healthinfonet.ecu.edu.au](http://www.healthinfonet.ecu.edu.au)
- Woolhouse, H., Garland, D., Hegarty, K., et al. (2012). Depressive symptoms and intimate partner violence in the 12 months after childbirth: A prospective pregnancy cohort study. *BJOG*, 119(3), 315-23.

Zubrick, S. R., Silburn, S. R., De Maio, J. A., et al. (2006). *The Western Australian Aboriginal Child Health Survey: Improving the educational experiences of Aboriginal children and young people*. Perth: Curtin University of Technology and Telethon Institute for Child Health Research.

Zubrick, S. R., Silburn, S. R., Lawrence, D. M., et al. (2005). *The social and emotional wellbeing of Aboriginal children and young people: summary booklet*. Perth: Telethon Institute for Child Health Research and Curtin University of Technology.