The Australian Prevention Partnership Centre

Improving care in pregnancy to address chronic disease risk factors

Final report

April 2023

Improving care in pregnancy to address chronic disease risk factors: Final report

Prepared by: The University of Newcastle

Contributing authors: Sophie Dilworth, Emma Doherty, Luke Wolfenden, John Wiggers, Katherine Lofting, Belinda Tully, Melanie Kingsland

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Summary

This report presents a series of interconnected projects undertaken between January 2020 and April 2023 to understand and inform improvements to antenatal care around preventive health risks including smoking, alcohol consumption and gestational weight gain. The projects were undertaken in maternity services in New South Wales, South Australia and Tasmania. This report presents each project chronologically, from exploration and description of guideline recommendations and current prevalence, through to development and pilot testing of tailored implementation strategies to improve care.

Project 1: Develop localised models of care that address preventive health risks in pregnancy

A desktop review of national, state and local clinical guidelines and policies that outline recommended antenatal care which addresses smoking, alcohol consumption and weight gain in pregnancy. This review informed the development of local models of care that included assessment, advice and referral elements. The models of care differed between sites due to differences in state and local policies and guidelines. These recommended models of preventive care were used to frame subsequent projects 2 to 5.

Project 2: Determine prevalence of preventive health risks in pregnancy and care addressing these risks

Surveys were conducted with 1064 antenatal clients to determine the prevalence of preventive health risks in pregnancy and receipt of care consistent with recommended models of care. The prevalence of preventive health risk factors for pregnant participants varied across the three sites, 7.8% – 18.0% of pregnant participants reported current/recent smoking, 3.9% – 4.8% reported alcohol consumption, and 65.0% – 70.1% reported gestational weight gain below or above recommendations. Differences by site in participant receipt of recommended care were identified. For instance, 65.6% – 92.0% of participants reported assessment of smoking status, 19.7% – 63.8% reported receipt of advice on alcohol consumption, and 13.1% – 43.8% reported referral to a service to support healthy weight gain, physical activity or nutrition.

Project 3: Understand barriers and facilitators to antenatal care addressing preventive health risks

This study aimed to identify system and provider level barriers and facilitators (determinants) to the provision of antenatal care for preventive health risks. The study included surveys of 153 clinical staff providing antenatal care; in depth interviews with seven maternity managers; and a systematic review of 48 studies.

Numerous barriers and facilitators to care were reported by antenatal staff and managers, with predominant determinants for all risks including: 'Beliefs about consequences'; 'Environmental context and resources'; and 'Memory', 'Attention and decision processes'. Maternity managers identified a broader range of determinants, including 'Social influences'. From the systematic review, the leading barriers and facilitators to care across all health risks were 'Environmental context and resources' and 'Beliefs about consequences' 'Optimism' was also a key determinant in providing care for smoking and gestational weight gain/nutrition/physical activity as were 'Skills' in providing care for alcohol use in pregnancy.

Project 4: Develop strategies to improve antenatal care addressing preventive health risks

A co-design process was conducted to identify a priority risk factor for each site to target and to develop implementation strategies designed to address identified barriers to care. This process demonstrated the ability to replicate across the three sites a method of implementation strategy development that combined co-design, local data on practice determinants and the use of theoretical frameworks.

Project 5: Pilot test strategies to improve referral to the Get Healthy in Pregnancy service

A pilot study was undertaken with one of the sites to assess the effectiveness of implementation strategies to improve the number of pregnant clients referred to the Get Healthy in Pregnancy service. The site-based co-design process identified 'Environmental context and resources', 'Knowledge' and 'Memory, attention and decision making' as key determinants for referral. To address these, implementation strategies were developed and delivered that included changes to the environment, educational meetings and resources and reminders for clinicians. Referrals to the service increased from an average of <1 per month pre-pilot to100 per month post-pilot.

Background

The World Health Organization[1] and Australian Government policies[2,3] recommend addressing preventable health risks during pregnancy as one of the most important actions to optimise health outcomes of pregnant people and babies. Smoking, alcohol consumption and excess gestational weight gain during pregnancy all increase the risk of pregnancy and birth complications, and poor health outcomes – from infancy to adulthood.[4–8] For instance, babies born to pregnant people who smoke are twice as likely to have low birthweight,[8] babies born to pregnant people who consume alcohol are 4.5 times more likely to have birth defects,[7] and babies born to pregnant people with excess gestational weight gain are twice as likely to be large for gestational age.[5] In Australia, 10% of pregnant people smoke,[8] 15% consume alcohol,[9] and 60% gain weight outside of recommended levels.[6] The impact of these preventable health risks is even greater for some pregnant people, including Aboriginal and Torres Strait Islander people, who experience systemic racism, socioeconomic disadvantage and other barriers to accessing antenatal care.[10,11]

Maternity services are a critical setting for addressing such risk as they have contact with most people during pregnancy, including those at the highest risk.[12] Behavioural interventions delivered by antenatal care providers are reported by systematic reviews to be effective in reducing preventable risks for pregnant people, and in improving pregnancy outcomes.[13–15] On this basis, the Australian national antenatal clinical guidelines[16] recommend routine provision of care for smoking, alcohol and gestational weight gain that broadly incorporates the following elements: (1) Assessment of risk (using validated tools); (2) Brief Advice on the harms associated with risk and how to reduce risk; and, (3) Referral to preventive services (e.g. dietitian; Quitline). Surveys have found that almost all pregnant people (92%–99%) find such care acceptable.[17] The extent to which these national recommendations are reflected in the policies and clinical guidelines at state and local levels is largely unknown, as is pregnant people's acceptability of local care models.

Studies have reported that many pregnant people do not receive such guideline recommended care for their preventive health risks. For example, an Australian study of 223 pregnant people found that the majority were asked about smoking (97%) and alcohol (92%) during their antenatal care, but less than half (48%) had their weight gain assessed.[18] Of those who reported requiring further support to manage their risks, 62% were offered assistance for smoking, 10% for alcohol consumption and 36% for weight management. The extent to which guideline recommended care is provided in local maternity services is unknown, as is prevalence of preventive health risks in pregnancy.

Antenatal providers report a range of barriers to providing recommended preventive care to pregnant clients. Common barriers are: lack of knowledge of guidelines; forgetting to provide care; lack of supporting systems and resources; and a belief that addressing such risks may negatively impact the client-clinician relationship.[19–21] A 2022 systematic review found that implementation strategies are probably effective in increasing some elements of antenatal care for preventive risks, but there is limited evidence regarding the types of strategies that maximise effectiveness in this setting.[22] It is therefore recommended that strategy development be guided by an implementation framework and tailored to local contexts and barriers.[23]

Across three maternity sites in New South Wales, South Australia and Tasmania, this project aimed to:

- Identify and develop recommended local models of antenatal care for addressing preventive risks
- Determine prevalence of preventive risks in pregnancy, receipt of recommended preventive health care, and pregnant people's acceptability of such care
- Identify barriers and facilitators to providing recommended antenatal care addressing preventive risks
- Co-design local context specific implementation strategies that could support increases in antenatal care addressing preventive risks
- Undertake a pilot in one of the maternity service sites to test the effectiveness of implementation strategies in improving antenatal care.

Project 1: Identification of recommended preventive care practices (models of care) for smoking, alcohol consumption and weight gain in pregnancy

A review of clinical guidelines and policies from the national, state and local hospital level was undertaken to identify recommended preventive care practices addressing smoking, alcohol consumption and weight gain in pregnancy. This review informed the development of recommended local site-based models of antenatal care to address these preventive health risks.

Methods

During 2021, a desktop review of clinical guidelines and policies from the national, state and local hospital level was undertaken to identify recommended models of antenatal care addressing smoking, alcohol consumption and weight gain in pregnancy. A search of grey literature was undertaken using strategies including searches of key websites (e.g., Commonwealth, state and local government health departments and hospitals, professional societies and colleges); contact with representatives from each state's health policy unit and each site's maternity service; and key word searches in Google. For each of the three health topics, information was extracted from each document on recommended guidelines and policies for screening and assessment, advice, and referral or other support for pregnant clients as part of routine antenatal care.

Results

The review of Australian **national** clinical guideline documents identified recommendations for antenatal care addressing smoking, alcohol consumption and weight gain in pregnancy, outlined in Table 1.

Table 1: National clinical guideline-recommended practices for antenatal care addressing smoking, alcohol consumption and weight gain in pregnancy

Health topic	Assessment	Advice	Referral/Arrange support
Smoking[16, 24–26]	At first appointment and multiple times in pregnancy: • Offer all women an exhaled breath carbon monoxide assessment • Assess smoking status using a multiple-choice question to identify current smokers and recent quitters	• Benefits of quitting (or remaining a non-smoker) for client and baby • Treatment options available to assist clients to quit (or prevent relapse)	• Provide behavioural support including: – Pregnancy specific self-help materials – Assistance to identify barriers, problem solve and set goals – Offer referral to Quitline or other smoking cessation services, including at Aboriginal Community Controlled Health Services • Recommend nicotine replacement therapy (NRT) if unable to quit with behavioural support alone • Provide follow-up support to all smokers and recent quitters at all antenatal visits

Health topic	Assessment	Advice	Referral/Arrange support
Alcohol[16, 27–30]	• Assess alcohol consumption risk for all clients using a validated tool (e.g. the AUDIT-C tool) at initial antenatal visit and multiple times in pregnancy	• Abstain from alcohol during pregnancy • Risks of alcohol consumption during pregnancy (tailor discussion based on risk level)	• Based on level of risk, offer referral to telephone or face-to-face coaching, counselling, or addiction specialist services, including at Aboriginal Community Controlled Health Services
Gestational weight gain[16, 31–33]	• Determine recommended range for pregnancy weight gain based on pre-pregnancy BMI • At all antenatal appointments measure current weight and compare with recommended weight gain range • Ask about eating and physical activity behaviours	• Benefits of gaining weight within recommended range • Self-monitoring of weight • Dietary guidelines for pregnancy • Physical activity guidelines for pregnancy	• If additional support is needed, offer a referral to services, including: – Dietitian – Exercise physiologist – Culturally appropriate services (e.g. dietitian at Aboriginal Community Controlled Health Services) – Telephone based coaching services

In addition to these Australian national guidelines, Table 2 outlines **state and local contextual considerations** for antenatal care addressing smoking, alcohol consumption and weight gain in pregnancy. These considerations were based on state and local policy and clinical guideline documents and service availability.

Table 2: State and local contextual considerations for antenatal care that addresses smoking, alcohol consumption and weight gain in pregnancy, Sites 1, 2 and 3

Topic	Site 1	Site 2	Site 3
Smoking	• Carbon Monoxide (CO) monitors available • Nicotine Replacement Therapy (NRT) available free	• Smoking assessment undertaken with all clients at first visit only	• Some CO monitors available • Smoking cessation Clinical Nurse Consultant available for referral • NRT sample packs available
Alcohol	• Get Healthy in Pregnancy–free telephone coaching service (alcohol abstinence program)	• Alcohol assessment undertaken with all clients at first visit only	• Alcohol assessment undertaken at each antenatal appointment
Gestational weight gain	• Get Healthy in Pregnancy–free telephone coaching service	• Weight only taken at first appointment/weight gain not assessed • Get Healthy – free telephone coaching service	
General	• Aboriginal Community Controlled Health Service provides support for all health risks		• Aboriginal Community Controlled Health Service provides support for all health risks

Local antenatal models of care were developed for each of the sites for each of the three health topics based on the reviewed national, state and local level guidelines, the available referral services and resources, and local antenatal appointment schedules. An example of these models of care are displayed in the Appendix.

Discussion

The Australian Government Department of Health and several national professional bodies have published guidelines with recommendations for antenatal care to address alcohol consumption, smoking and weight gain in pregnancy. There are, however, state and local level policies, guidelines, services and resources that needed to be considered in the development of localised models of care for each of the sites.

Project 2: Identification of levels of health risk and implementation of recommended preventive care practices for smoking, alcohol consumption and weight gain in pregnancy

Following the identification of recommended care practices for each of the health topics, we then explored :

(i) Prevalence of preventive health risks (smoking, alcohol consumption and gestational weight gain)
(ii) Receipt of recommended preventive care practices in antenatal visits
(iii) Acceptability of such care.

The following are outputs from Project 2:

- Doherty E, Dilworth S, Wiggers J, Wolfenden L, Wilson A, Leane C, Schranz N, Parish J, Reardon M, Foster M, Tully B, Daly J, Hollis J, Kingsland M. Prevalence of preventive health risks in pregnancy: cross-section study of pregnant people attending public maternity services in three Australian states. In preparation for submission to the *Australian and New Zealand Journal of Public Health*.
- Dilworth S, Wynne O, Wiggers J, Wolfenden L, Tully B, Doherty E, Daly J, Hollis J, Wilson A, Leane C, Day T, Schranz N, Tonks J, Bullock P, Reardon M, Kingsland M. Prevalence of care for modifiable risks during pregnancy: NSW, SA, TAS. Preventive Health Conference. May 2022. Brisbane, Australia.

Methods

Cross-sectional surveys of clients who had recently attended an antenatal appointment at a participating project site were conducted between November 2021 and April 2022. Clients were eligible to participate in the surveys if they were aged 18 years or older, between 12 and 37-weeks' gestation and had not already given birth or had a negative pregnancy outcome (miscarriage or stillbirth).

The recruitment procedure differed between project sites to align with locally approved research processes. Potential participants who attended antenatal care at Site 1 in the previous week were randomly selected via electronic medical record and appointment data. Potential participants attending antenatal care at Sites 2 and 3 were approached by a research midwife in clinic waiting rooms, provided with study information and consent was sought for participation. The surveys were delivered via telephone or online.

Participants were asked to report their smoking status, current alcohol consumption (using the Alcohol Use Disorders Identification Test – Consumption (AUDIT-C)), height and pre-pregnancy and current weight. They were also asked to report on their receipt of care consistent with recommendations (assessment, advice and referral) for each of the preventive health risks and their acceptability of each of these care elements.

Results

The total number of participants who completed surveys were:

- 748 (53.7% consent rate) for Site 1
- 232 (76.2%) for Site 2
- 84 (74.3%) for Site 3.

Participant characteristics are reported in Table 3.

Table 3. Participant characteristics across the three sites

	Site 1 (N=748) % (n)	Site 2 (N=232) % (n)	Site 3 (N=84) % (n)
Weeks' gestation at time of survey (Mean (SD))	24.5 (8.7)	27.0 (8.2)	28.3 (7.2)
Age (Mean (SD))	30.6 (4.9)	32.0 (4.7)	30.2 (5.1)
Aboriginal origin			
Aboriginal, or Torres Strait Islander, or both	4.3% (32)	5.2% (12)	2.4% (2)
Not Aboriginal or Torres Strait Islander	95.7% (716)	94.8% (220)	97.6% (82)
Highest education level completed			
Completed high school or less	19.7% (147)	19.0% (44)	32.1% (27)
Completed technical certificate or diploma	33.2% (248)	29.3% (68)	34.5% (29)
Completed university or college degree or higher	47.1% (352)	51.7% (120)	33.3% (28)
Gravidity			
One pregnancy	43.0% (322)	47.0% (109)	35.7% (30)
Two or more pregnancies	57.0% (426)	53.0% (123)	64.3% (54)
Allocated model of antenatal care			
Low risk	69.4% (519)	50.2% (115)	60.7% (51)
High risk	30.2% (226)	47.2% (108)	39.3% (33)
Aboriginal service	0.4% (3)	2.6% (6)	N/A
Pre-pregnancy body mass index (BMI) category*			
Underweight	2.6% (18)	4.2% (9)	0.0% (0)
Healthy	49.1% (339)	48.4% (103)	31.0% (22)
Overweight	25.9% (179)	25.4% (54)	22.5% (16)
Obesity	22.4% (155)	22.1% (47)	46.5% (33)

*Missing data from pre-pregnancy BMI category due to participants not being able to report pre-pregnancy weight.
Sample size: Site 1 = 691, Site 2 = 213, Site 3 = 71.

Prevalence of preventive health risks in pregnancy are presented in Table 4 and reported receipt of care consistent with the recommended care practices for each of the health topics in Tables 5 to 7.

Table 4. Prevalence of preventive health risks for participants

Preventive health risk	Site 1 (N=745)	Site 2 (N=231)	Site 3 (N=83)
Smoking			
Current smoker	5.2% (39)	2.2% (5)	8.4% (7)
Recent quitter (quit during pregnancy)	5.2% (39)	5.6% (13)	9.6% (8)
Ex-smoker (quit before pregnancy)	13.4% (100)	13.0% (30)	16.9% (14)
Non-smoker	76.1% (567)	79.2% (183)	65.1% (54)
Alcohol use*			
No risk (AUDIT-C score: 0)	95.2% (711)	96.1% (223)	95.2% (79)
Low Risk (AUDIT-C score: 1–2)	4.3% (32)	3.9% (9)	3.6% (3)
Medium Risk (AUDIT-C score: 3–4)	0.5% (4)	0.0% (0)	1.2% (1)
High Risk (AUDIT-C score: 5+)	0.0% (0)	0.0% (0)	0.0% (0)
Gestational weight gain**			
Lower than recommendations	24.0% (117)	30.9% (43)	36.8% (21)
Within recommendations	35.0% (170)	31.7% (44)	29.8% (17)
Higher than recommendations	41.0% (199)	37.4% (52)	33.3% (19)

*Alcohol categories are based on the Australian Government guidelines for determining alcohol risk in pregnancy.[27]
**Recommendations are based on the Institute of Medicine's gestational weight gain guidelines that recommend all pregnant people gain between 0.5 and 2 kilograms in first trimester and then a weekly range based on pre-pregnancy BMI (underweight: 0.44 – 0.58 kilograms/ week, healthy weight: 0.35 – 0.50 kilograms/week, overweight: 0.23 to 0.33 kilograms / week, obesity: 0.17 to 0.27 kilograms / week).[34]

Table 5. Proportion of participants reporting receipt of recommended care for smoking

	Initial antenatal appointment						Subsequent antenatal appointments					
	Assessment of current smoking	Assessment of recent quitting	Advice to current smokers	Advice to recent quitters	Offer of referral	Offer of NRT	Assessment of current smoking status	Assessment of recent quitting	Advice to current smokers	Advice to recent quitters	Offer of referral	Offer of NRT
Site 1	92.0% (300)	55.5% (181)	89.5% (17)	40.0% (10)	63.2% (12)	66.7% (10)	32.9% (159)	14.5% (70)	72.7% (16)	13.5% (5)	9.1% (2)	69.2% (9)
Site 2	65.6% (40)	26.2% (16)	0% (0)	40.0% (2)	12.5% (1)	N/A	12.9%* (22)	7.7%* (13)	0%* (0)	0%* (0)	0%* (0)	N/A
Site 3	75.0% (12)	31.3% (5)	0% (0)	0% (0)	0% (0)	0% (0)	55.2% (37)	20.9% (14)	40.0% (2)	22.2% (2)	21.4% (3)	66.7% (2)

* These elements were not recommended in the developed local models of care for this site.

Table 6. Proportion of participants reporting receipt of recommended care for alcohol consumption

	Initial antenatal appointment				Subsequent antenatal appointments			
	Assessment of current alcohol consumption	Advice not to consume alcohol	Advice on potential risks	Offer of referral (medium and high risk)	Assessment of current alcohol consumption	Advice not to consume alcohol	Advice on potential risks	Offer of referral (medium and high risk)
Site 1	77.3% (252)	63.8% (208)	35.9% (117)	50.0% (2)	30.0% (145)	27.7% (134)	28.7% (139)	75.0% (3)
Site 2	1.6% (1)	19.7% (12)	8.2% (5)	0.0% (0)	0.6%* (1)	7.7%* (13)	15.9%* (27)	0.0%* (0)
Site 3	50.0% (8)	50.0% (8)	25.0% (4)	0.0% (0)	34.3% (23)	29.9% (20)	22.4% (15)	0.0% (0)

* These elements were not recommended in the developed local models of care for this site.

Table 7. Proportion of participants reporting receipt of recommended care for gestational weight gain

	Initial antenatal appointments					Subsequent antenatal appointments				
	Assessment of weight	Advice on weight gain target	Advice on healthy eating	Advice on physical activity	Offer of referral	Assessment of weight gain	Advice on weight gain tracking	Advice on healthy eating	Advice on physical activity	Offer of referral
Site 1	89.0% (290)	16.9% (55)	22.4% (73)	28.5% (93)	16.9% (55)	52.5% (254)	30.8% (149)	30.2% (146)	28.7% (139)	8.1% (39)
Site 2	63.9% (39)	8.2% (5)	9.8% (6)	13.1% (8)	1.6% (1)	21.2%* (36)	10.6%* (11)	20.6% (35)	24.7% (42)	14.1% (24)
Site 3	43.8% (7)	12.5% (2)	43.8% (7)	43.8% (7)	0% (0)	55.2% (37)	19.4% (13)	29.9% (20)	32.8% (22)	6.0% (4)

* These elements were not recommended in the developed local models of care for this site.

There was high acceptability amongst participants at all project sites for receipt of recommended care in antenatal visits for each of the health topics, including smoking (assessment: 95%–100%; advice: 98%–100%; referral: 93%–100%), alcohol consumption (assessment: 99%–100%; advice: 99%–100%; referral: 93%–100%) and gestational weight gain (assessment: 92%–94%; advice: 96%–97%; referral: 91%–100%).

Discussion

This study found that about one in ten participants smoked during pregnancy at Sites 1 and 2, with higher rates reported by participants attending antenatal care at Site 3 (18%). Across all project sites, approximately 5% of participants were current consumers of alcohol and two-thirds were not gaining weight within recommended ranges. Such data demonstrated a need for guideline recommended antenatal care to support people in reducing preventive health risks during their pregnancy.

Despite identifying this need, the receipt of preventive care consistent with recommended models of care presented in Project 1 varied across health topics and elements of care. Whilst most participants reported that their smoking status was assessed at the initial antenatal visit, half or less were assessed for recent quitting and re-assessed at subsequent antenatal visits. There were varying levels of advice and support offered, with lower levels reported by participants attending antenatal care at Sites 2 and 3.

Half or more of the participants received an assessment of their alcohol consumption and at least one component of advice at initial visits in Sites 1 and 3, with about one-third at subsequent visits. Site 2 had lower levels of care provision for alcohol consumption.

Assessment of weight at initial visits varied across sites (43.8% – 89.0%) as did assessment of gestational weight gain against recommended ranges at subsequent antenatal visits (21.2% – 55.2%). There were low levels of reported receipt of advice and referral for gestational weight gain, healthy eating, and physical activity across all project sites at both the initial and subsequent antenatal visits.

Such care receipt data showed that despite high levels of acceptability, the recommended models of care were not currently routinely implemented in each of the project sites. A comprehensive understanding of the barriers and facilitators to such care provision is needed to inform the development of strategies to support guideline implementation. The data collected as part of this study can assist with assessing local need and prioritisation of support for guideline implementation to ensure the greatest benefit for each project site is achieved.

Project 3: Identification of system level barriers and facilitators to the provision of recommended preventive care practices for smoking, alcohol consumption and weight gain in pregnancy

Project 3 included two sub-components: (a) A mixed methods study describing staff perspectives on the barriers and facilitators to the provision of recommended antenatal care for smoking, alcohol consumption and weight gain in pregnancy; and (b) A systematic review of health professionals reported barriers and facilitators to the delivery of care for smoking, alcohol consumption, gestational weight gain, nutrition and physical activity in pregnancy as part of routine antenatal care.

3a: Maternity staff and manager barriers to the provision of recommended preventive antenatal care

Methods

A parallel mixed methods design was used to elicit staff and system level barriers and facilitators to the provision of recommended antenatal care for smoking, alcohol consumption, gestational weight gain, nutrition, and physical activity in pregnancy. Surveys of staff providing antenatal care at participating maternity services were undertaken. The surveys was based on validated tools used to explore barriers and facilitators that exist at the level of Capability (Physical and Psychological), Opportunity (Physical and Social) and Motivation (Reflective and Automatic)[35] and are described further in the Theoretical Domains Framework (TDF).[36] Qualitative interviews were also undertaken with managers at Site 2 and 3. The interviews were guided by questions framed by the COM-B. This project reports the integrated data sets.

Antenatal clinician surveys were conducted with clinical staff members at Site 1 between October and November 2021 and Site 2 and Site 3 between March and June 2022. Survey data were collected and managed using REDCap[37] electronic data capture tools. Due to differences in local care pathways and previous work conducted at Site 1, different versions of the survey were used at each site.

At Site 2 and Site 3, survey questions asked for frequency of behaviour and were assessed using a 7-point Likert scale [Never (0%), Almost never (<10%), Rarely (10–29%), Sometimes (30–49%), Often (50–70%), Almost always (80–99%), Every time (100%)]. Any answer below "Almost always" then directed the participant to a list of barriers of which they were instructed to select all options that applied. The survey was reviewed for cultural appropriateness and tested prior to use.

At Site 1, surveys of antenatal staff were undertaken using a best-worse scaling method. For each of nine scenarios based on elements of preventive care, staff were asked to rank possible barriers as 'most likely' and 'least likely'. Potential barriers were arranged in different combinations. This best-worse format enabled barriers to be ranked to determine those that were most important to address if care was to be improved. This method was only possible at Site 1 as formative work had previously been undertaken with this site to determine possible barriers.

Semi-structured managers' interviews were conducted with maternity service managers at Site 3 and Site 2 between March and June 2022. Interview duration went for 30–60 minutes via Microsoft Teams and was

recorded if the interviewee consented. Interviews were guided by a semi-structured question guide and informed by the COM-B model of behaviour change[35].

Results

Staff survey participation: The response rate at Site 1 was 52% (62 completions from 120 eligible staff), which included 11 medical staff and 51 midwives. The response rate at Site 2 was 60% (60 completions from 100 eligible staff), which included 46 midwives 12 medical staff. The response rate at Site 3 was 55% (32 completions from 58 eligible staff), which included 22 midwives 10 medical staff.

Manager interview participation: At Site 2, five Maternity Service Managers participated in an individual semi-structured interview. At Site 3, two Maternity Service Manager participated in interviews.

Barriers/facilitators to care provision: Following the integration of the clinician survey data and the manager interview data across all sites, the identified barriers were mapped to 11 TDF domains, as presented in Table 8. Manager interview data captured four additional domains to the clinician survey data: 'Optimism', 'Goals', 'Social Influences', and 'Emotion'. Strong overlap for identified barriers by clinicians and managers existed for 'Beliefs about consequences', and 'Environmental context and resources', particularly for GWG and Smoking care pathways. 'Beliefs about consequences' was the leading domain identified. Barriers reported by staff in this domain related to other issues being of higher priority and clinical staff not seeing the benefit of preventive care elements. 'Environmental, contextual and resource' barriers was the second most prevalent domain. Barriers identified by staff in relation to the environment were a lack of time and limited access to resources. Staff reported the most barriers in relation to the GWG care pathway. Across all care pathways the referral step was commonly identified as presenting more barriers to staff. This often related to a lack of knowledge of any available services and lack of referral resources/forms. Lack of available services for culturally appropriate referral for Aboriginal people was also frequently identified by staff.

Table 8. Summary of all TDF domains reflecting barriers to guideline antenatal care addressing alcohol, smoking and GWG, as identified in clinician and manager interviews

		Know	Skill	Role	Bel Cap	Op	Bel Con	Goal	Mem	Env	Soc	Em
Alcohol	Assess	Ω		+	Ω		# × O Ω		# × Ω	# + Ω	Ω	
	Advise	Ω	O		Ω		# × +		# +	#		
	Refer*	× O + Ω	O		× O + Ω		Ω		×	× O + Ω	Ω	
Smoking	Assess	#					# × + Ω		# +	# +	Ω	
	Advise*		× O +				× O +		× O +	× + Ω		
	Refer	× O +			× +	Ω	× + Ω		× +	× O + Ω	Ω #	
GWG	Assess	Ω		+ Ω	Ω	O	# × O + Ω		# Ω	# × + Ω	Ω	O Ω
	Advise	O Ω	O Ω	O Ω	# O Ω	O	# × O + Ω	O Ω	# × +	# × + Ω	O Ω	O
	Refer	× + Ω				O	# O +	O	Ω	# × O + Ω	# Ω	O

*Barriers/facilitators for this element of care were not examined for Site 1.

Key:
#: Site 1 clinician survey
+: Site 2 clinician survey
Ω: Site 2manager interviews
×: site 3 clinician survey
O: site 3 manager interviews

Know: Knowledge; Skill: Skills; Role: Social/professional role and identity; Bel Cap: Beliefs about capabilities; Op: Optimism; Bel Con: Beliefs about consequences; Goal: Goals; Mem: Memory, attention and decision processes; Env: Environmental context and resources; Soc: Social influences; Em: Emotion.

Discussion

The TDF provided a useful structure to identify and examine determinants to the provision of antenatal care addressing preventive health risks across the three project sites. The predominant domains, related to barriers within the 'Beliefs about consequences' and 'Environmental context and resources' domains and are consistent with previous literature (see Project 3b).

The findings highlight the challenges clinical staff face in providing guideline recommended preventive care within the context of routine antenatal care. These findings suggest that several strategies could be useful including:

- Enhancing the antenatal service environment with tools, resources and reminders
- Providing persuasive education about the health consequences of smoking, alcohol use and GWG in pregnancy
- Providing training in how to discuss these risks with clients using positive and supportive approaches.

Systematic reviews suggest that such interventions have been effective in improving guideline implementation in other health settings.[38–40]

The study was conducted in relatively small samples of clinicians and managers with a moderate response rate. However, the commonality of TDF domains linked to barriers across sites along with the similarities noted with the systematic review findings presented below (Project 3b) provide confidence in the findings.

3b: Systematic review: Health professionals reported barriers and facilitators to addressing smoking, alcohol consumption, gestational weight gain, nutrition and physical activity in pregnancy as part of antenatal care

Full details of this systematic review are included in the publication:

- Sophie Dilworth, Emma Doherty, Olivia Wynne, Jenna Hollis, Luke Wolfenden, John Wiggers and Melanie Kingsland. Health professionals reported barriers and facilitators to addressing smoking, alcohol consumption, gestational weight gain, nutrition, and physical activity in pregnancy as part of antenatal care: A mixed methods systematic review (under development): Prospero registration number: CRD42022353084; 22 October 2022.

The primary aim of the study was to systematically review the literature for qualitative and quantitative evidence to describe the barriers and facilitators reported by health professionals in the delivery of antenatal care that aims to address smoking, alcohol consumption, gestational weight gain, nutrition, and physical activity, individually and/or in combination.

Methods

Electronic bibliographic databases were searched for eligible peer reviewed literature: MEDLINE (Ovid), EMBASE (Ovid), PsycINFO (Ovid), Maternity and Infant Care (Ovid), Scopus, CINAHL (EBSCOhost) and Cochrane Library (Wiley). A google search identified other grey literature sources. Searches were run November 2021 and updated December 2022. Reference lists of included studies or relevant reviews identified through the search were assessed for other potentially eligible studies. The year of study was limited to papers published in the past 20 years. The strategy aligned with PICOS inclusion criteria. Titles and abstracts, then full text articles were independently screened by two reviewers. When required, a third reviewer was consulted to resolve discrepancies. Data extraction and quality assessment using standardised forms was completed by one reviewer and independently checked by a second reviewer. Two reviewers independently coded the extracted barriers and facilitators to the Theoretical Domains Framework.[36] The three reviewers met to discuss and agree on the coding.

Results

Characteristics of included studies

The search strategy identified 3549 papers. Following title and abstract screening, 172 full text articles were assessed for eligibility, and 48 papers included in the review. Included studies were published between 2001 and 2022 and were conducted across 13 countries, predominately in the United States (13), Australia (12), and the United Kingdom (7). There were 25 studies that used qualitative designs, 21 studies that used a cross sectional survey, two mixed method designs. The study samples were midwives (21), multidisciplinary groups (12), Obstetrician/Gynaecologists (5), General Practitioners (GPs) (5), mixed/unspecified medical practitioners (5). There were 22 studies that reported barriers/facilitators to antenatal care addressing smoking, eight alcohol consumption and 18 gestational weight gain/physical activity/healthy eating.

Barriers/facilitators to care addressing preventive health risks

As shown in Figure 1, barriers/facilitators to care addressing preventive health risks were coded across 13 of the 14 domains of the TDF. The predominant domain identified for all health risks was 'Environmental context and resources', with time and structural restrictions on antenatal appointments being a major contributor. 'Belief about consequences' was the second most predominant domain coded, with many studies reporting

clinician concerns about the negative impact addressing these health risks would have on their clients as well as their belief that these health risks were not as important to address compared to other antenatal care priorities. Optimism (including pessimism) was also a key domain for studies that focused on care related to smoking in pregnancy, with a number reporting that clinicians believed their clients were unlikely to modify their smoking behaviours. Skills and knowledge were also domains that were more likely to be linked to studies of care addressing alcohol consumption in pregnancy, this was often in reference to a lack of understanding and training in how to support people consuming alcohol or where to refer them for support.

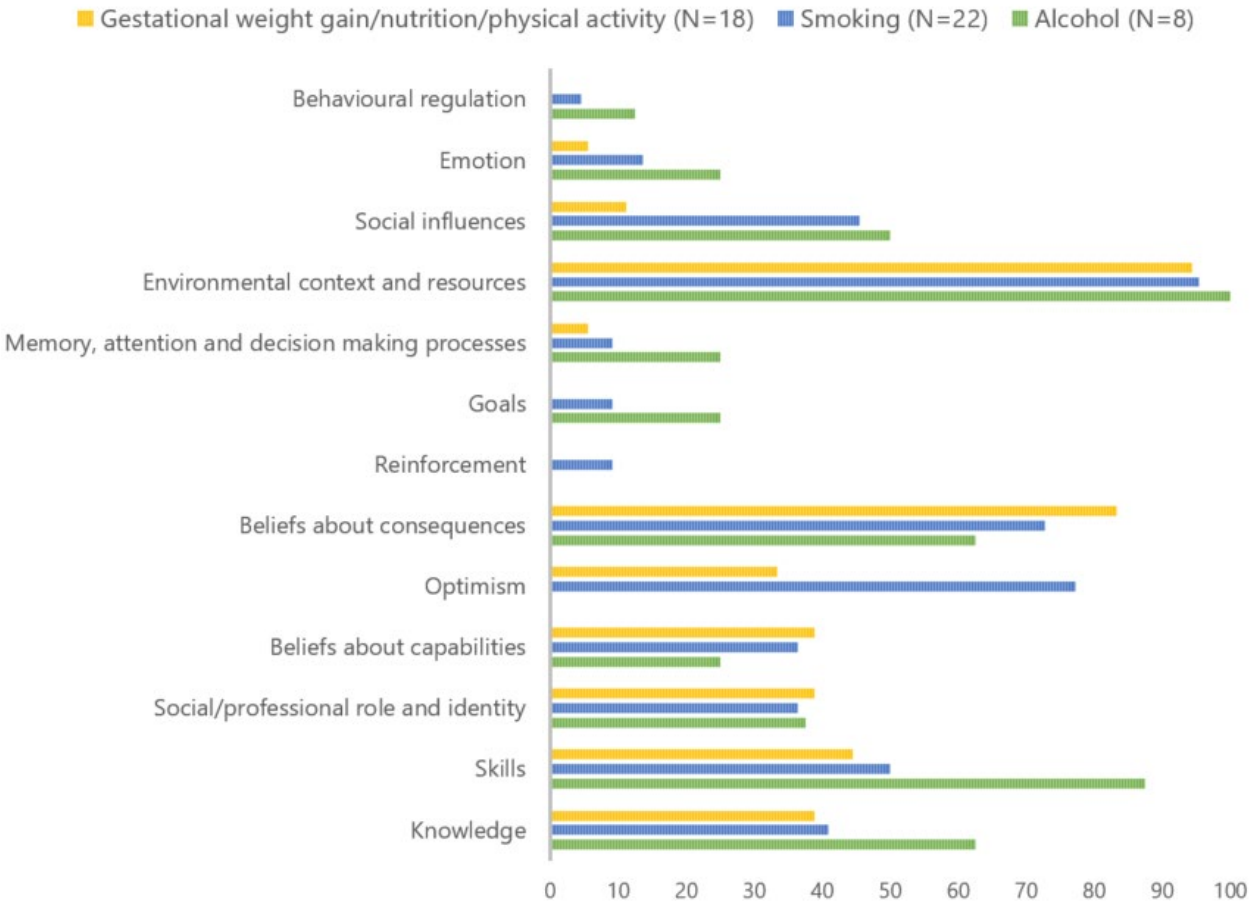


Figure 1. Barriers/facilitators to care addressing preventive health risks (% of studies reporting TDF domain)

Discussion

The findings of this review highlight several predominant barriers and facilitators to the provision of antenatal care regarding preventive health risks that need to be addressed if care is to be improved. There was some consistency in key barriers/facilitators to care reported for smoking, alcohol consumption and gestational weight gain/nutrition/physical activity, as well as some notable differences.

'Environmental context and resources' was identified as a barrier/facilitator in over 90% of studies across each of the three health risks, indicating that key system, structural and organisational determinants will need to be addressed for preventive care to be implemented routinely in antenatal care. 'Beliefs about consequences', notable a lack of belief in the importance of addressing preventive health risks and the belief that addressing such risks may negatively impact relationships with clients and make them feel uncomfortable was also consistently reported. Addressing these concerns through persuasive education and training in how to undertake effective discussions about preventive health risks will be essential if improvements to care are to be made.

The development of implementation strategies to address these and other identified barriers to care should be undertaken using theoretical frameworks and in collaboration with clinicians so that strategy content is appropriately tailored to service context and resources.

Project 4: Development of local implementation strategies

The primary aim of this project was to map the priority barriers identified through the surveys of antenatal staff to *evidence-based implementation strategies* and *techniques for behaviour change*. An *environmental scan* of local systems was also undertaken in each of the project sites to identify how the identified practice change strategies to support the provision of recommended preventive care practices for smoking, alcohol consumption and weight gain in pregnancy could be operationalised at the local level.

Methods

Following identification of current receipt of preventive health care (Project 2) and barriers to care provision (Project 3), each site was presented with findings for their site. The presentations were undertaken with working group and executive leaders at the sites and highlighted areas where recommended care was reported to be low and where the staff reported barriers. Each site selected an element of preventive health care for improvement.

A mapping process was then conducted to link the identified practice barriers to implementation strategies that would support practice improvement. The first step in this mapping process was to classify the barriers reported by clinicians using the TDF.[36] Behaviour Change Techniques that were linked to Mechanisms of Action that would address these barriers were then selected.[41] Finally, implementation strategies were chosen based on definitions provided in the ERIC Taxonomy [42] and the site-based projects teams and research team co-developed strategy content that aligned with the identified Behaviour Change Techniques and fit within local service context and resources.

Results

Table 9. Priority barriers mapped to implementation strategy (ECRI taxonomy) and description of implementation activities

Site	Element of preventive care selected for improvement	Priority barrier/s to undertaking element of care (TDF Domain)	Behaviour change technique/s	Implementation strategy (ERIC taxonomy) and description of content
Site 1	Alcohol assessment (at subsequent visits) and advice not to consume alcohol and of the potential risks (at all visits)	Forgetting to provide the care elements (TDF: Memory, attention and decision making)	• Restructuring the physical environment • Prompts/cues	Remind clinicians • Point of care prompts in medical records.
			• Action planning	Facilitation • Peer-to-peer active problem solving to identify behavioural cues for providing care elements within clinical workflow. • Action plans document cues in clinical workflow.
		Not believing that the care elements need to be delivered to all pregnant people (TDF: Beliefs about consequences)	• Information about health consequences • Credible sources • Framing/reframing	Conduct educational meetings • Education session on harms of alcohol consumption in pregnancy delivered by an expert in Fetal Alcohol Spectrum Disorder. • Guided discussion on reframing the purpose of providing care elements.
Site 2	Referral for GWG, Healthy eating and physical activity to Get Healthy in Pregnancy telephone coaching service	I don't have the referral resources (TDF: Environmental context and resources)	• Adding objects to the environment • Restructuring the physical environment	Change physical structure and equipment • Have pre-filled referral forms available in all clinics • Include pre-filled forms in information packs for clients • Save pre-filled forms to service computers
		I don't know what to do/ I don't know of any available referral services (TDF: Knowledge)	• Instruction on how to perform the behaviour	Conduct educational meetings • Provide information on the Get Healthy in Pregnancy telephone coaching service, including what the service provides, benefits and client acceptability. • Provide instruction on how to offer a referral to the Get Healthy in Pregnancy service and how to submit the referral form. • Including demonstration and rehearsal of the offer and referral process. Develop educational materials • Provide resources to clinicians outlining instructions on how to offer and undertake a referral to Get Health in Pregnancy.

Site	Element of preventive care selected for improvement	Priority barrier/s to undertaking element of care (TDF Domain)	Behaviour change technique/s	Implementation strategy (ERIC taxonomy) and description of content
		I forget to do it (TDF: Memory, attention and decision making)	• Prompts/cues.	Remind clinicians • Add a sticker on the maternity service booking-in form in the client's medical record to remind clinicians to refer women to the Get Health in Pregnancy service. • Include a pre-filled referral form for Get Healthy in Pregnancy included in the client's information pack.
Site 3	Offer of nicotine replacement therapy (NRT) to smokers and recent quitters	I don't have the resources (TDF: Environmental context and resources)	• Adding objects to the environment • Restructuring the physical environment	Change physical structure and equipment • Have NRT available in maternity services for dispensing to smokers and recent quitters. • Signpost NRT sample packs within clinic areas.
		I don't have the skills to do this well (TDF: Skills)	• Instruction on how to perform the behaviour • Behavioural practice/rehearsal	Conduct educational meetings • Training in how to offer and provide NRT to smokers and recent quitters within antenatal appointments, including demonstration and role play/rehearsal.
		I believe my client does not want NRT assistance with smoking cessation (TDF: Beliefs about consequences; Optimism; Social influences)	• Feedback on outcomes of the behaviour • Credible source • Information about others' approval	Conduct educational meetings • Provide information on the acceptability of NRT to pregnant people and the rate of uptake of NRT by pregnant people Audit and provide feedback; Obtain and use patients' feedback • Provide data on the uptake and acceptability of NRT by clients of the specific maternity service following implementation.
		I don't think doing this is part of my role (TDF: Social/ professional role and identity)	• Credible source • Social comparison • Social support	Revise professional roles • Add NRT provision into the role of antenatal clinical staff. Mandate change • Organisational requirement and expectation to provide NRT communicated by manager/professional leads

Discussion

This project described a replicable, theory-based process that used site-specific data as part of a co-design approach to develop implementation strategies to support maternity services provide recommended preventive care. The use of established theoretically informed methods for mapping the local barriers provided a process model that was feasible and replicable across the three sites. The co-designed process ensured that the localised implementation plans were tailored and practical for local implementation while remaining evidence based.

Project 5: Feasibility pilot of implementation strategies to support the provision of Get Healthy in Pregnancy referrals

The aim of this pilot project was to assess the potential effectiveness of implementation strategies (developed in Project 4) in improving the number of pregnant people from Site 2 referred to the Get Healthy in Pregnancy service. The nature of the pilot was negotiated and co-developed with the site.

Methods

The following targeted implementation strategies were implemented by a registered midwife employed on site from 1st September 2022 to 20th December 2022:

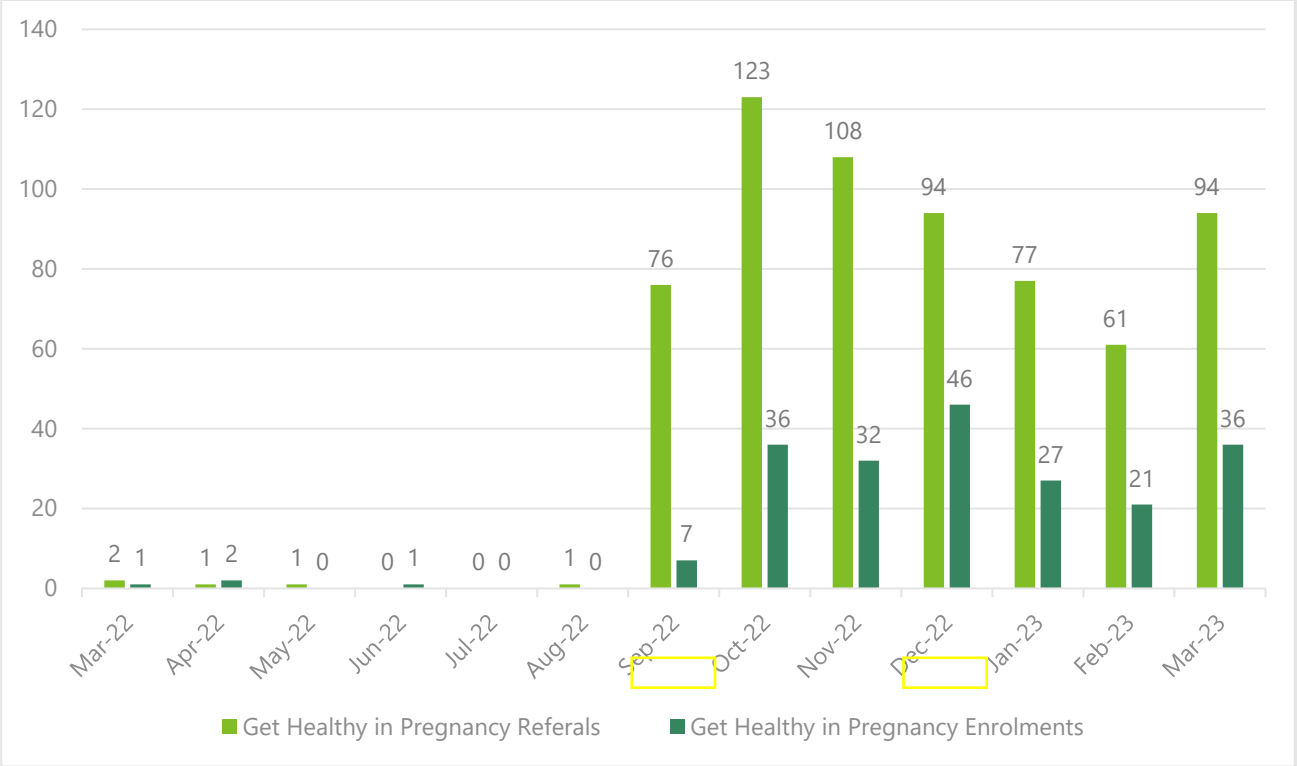
- **Change physical structure and equipment:** pre-filled referral forms available in all clinics and information packs for clients; saving pre-filled forms to service computers.
- **Conduct educational meetings**: providing information on the Get Healthy in Pregnancy telephone coaching service, including what the service provides, benefits and client acceptability; providing instruction on how to offer a referral to the Get Healthy in Pregnancy service and how to submit the referral form; including demonstration and rehearsal of the offer and referral process.
- **Develop educational materials:** resources outlining instructions on how to offer and undertake a referral to Get Health in Pregnancy.
- **Remind clinicians:** stickers on the maternity service booking-in form in the client's medical record to remind clinicians to refer people to the Get Health in Pregnancy service; a pre-filled referral form included in the client's information pack.

Service referral data was obtained from the service provider to record the number of referrals made to the service. To support the Get Healthy in Pregnancy service referral data and examine the acceptability of care, surveys were undertaken with clients attending antenatal clinics at Site 2 from October 2022 – February 2023 (see Project 2 Methods). Clients who were referred to Get Healthy in Pregnancy were asked about their experiences with the service.

Results

As show in Figure 2, during the period of intervention (1st September 2022 to 20th December 2022) referrals increased from an average of 0.5 per month pre-pilot to 100.25 per month post-pilot. The highest number of referrals during the intervention period was in second month of the intervention period, October 2022, when 123 referrals were received. After the period of active implementation (September 2022 – December 2022), the increase in referrals was sustained and has not dropped to the pre-intervention period. In addition, enrolments in the Get Healthy in Pregnancy service increased from an average of 0.25 per month in the four-month period prior to the intervention to an average of 30.25 per month during the period of intervention.

Figure 2. Get Healthy in Pregnancy service referral data (March 2022–March 2023)



Note: Referral numbers exclude self-referrals; enrolments include all referral modes.

Table 10 details the feedback provided by survey participants who were referred to Get Healthy in Pregnancy across the study period.

Table 10. Get Health in Pregnancy supporting information

Experience of care	Frequency % (n)
Mode of referral (n=15)	
Health professional referral	93.3% (14)
Self-referred	6.7% (1)
Reason for referral to Get Healthy in Pregnancy**	
Alcohol support	0.0% (0)
Pregnancy weight gain support	20.0% (3)
Healthy eating support	33.3% (5)
Physical activity support	26.7% (4)
Unsure	46.7% (7)
Had been contacted by Get Healthy in Pregnancy at time of survey	73.3% (11)
Enrolled in Get Healthy in Pregnancy (n=11)	72.7% (8)
Time to first contact (n=10)	
1–3 days	40.0% (4)
4–7 days	50.0% (5)
8–14 days	10.0% (1)

Experience of care	Frequency % (n)
Number of coaching calls from Get Healthy in Pregnancy (n=10)	
0 calls	20.0% (2)
1 call	40.0% (4)
2 calls	30.0% (3)
3–5 calls	10.0% (1)
What they liked about the service (n=8)**	
Encouraged me to change my eating and physical activity habits	12.5% (1)
Helped me to set goals	25.0% (2)
The information provided is useful	50.0% (4)
They understand	12.5% (1)
Good to have someone to talk to	12.5% (1)
Other (included: Flexibility, convenience of phone and tailored support)	50.0% (4)
What they did not like about the service (n=8)	
Nothing	50.0% (4)
Would prefer more personalised support	37.5% (3)
Other (included: admin style questions and not followed through)	25.0% (2)

** Multiple responses allowed.

Discussion

This pilot intervention demonstrates that co-designed and tailored implementation strategies can be used to improve referral to a telephone coaching service for preventive health care. Although the practice change intervention vastly improved participants reported rates of referral to the Get Healthy in Pregnancy Service, post-intervention rates of referral showed some decline. This suggests that some barriers to implementation of the model of care into routine practice may have persisted. This is in line with findings of previous work undertaken by our team at multiple sites.[43] Efforts to refine and sustain the implementation strategies are needed to ensure everyone attending the maternity service for antenatal care continue to receive the offer of referral to the health coaching service as part of their routine care. This should include reassessment of priority barriers and facilitators of care delivery and development of additional implementation strategies based on effective behaviour change techniques.[44]

The pilot implementation focused on clinical care and did not address the uptake of services beyond the point of referral. The results of both surveys and service data demonstrate that despite higher numbers of referral, enrolment in the health coaching program did not increase at the same level. People's ability to make positive life changes are mediated by social and structural determinants of their health and wellbeing, as well as social norms, stigma, trauma and other stressors.[45] Assessment of and support for these contributors, in addition to implementation of a standard model of antenatal care based on guideline recommendations, may prove more effective in supporting healthy eating, physical activity and gestational weight gain within the guideline ranges.

This study was undertaken as a pilot intervention only. It was only pre-post design, however, due to the clear demonstration of impact it is unlikely that the changes were related to confounding factors. It has demonstrated that the model used to identify areas of clinical need, understand the contextual barriers, and develop tailored intervention was feasible and showed promising results for broader implementation and evaluation.

Project outputs and impacts

Publications

- Doherty E, Dilworth S, Wiggers J, Wolfenden L, Wilson A, Leane C, Schranz N, Parish J, Reardon M, Foster M, Tully B, Daly J, Hollis J, Kingsland M. Prevalence of preventive health risks in pregnancy: cross-section study of pregnant people attending public maternity services in three Australian states. [In preparation for submission to the *Australian and New Zealand Journal of Public Health.]*
- Dilworth, S Doherty, E Wynne O, Hollis J, Tully B, Wolfenden L, Wiggers J, Kingsland M. Health professionals reported barriers and facilitators to addressing smoking, alcohol consumption, gestational weight gain, nutrition and physical activity in pregnancy as part of antenatal care: A mixed methods systematic review [under development]: Prospero registration number: CRD42022353084; 22 October 2022.
- Dilworth S, Doherty E, Wiggers J, Wolfenden L, Wilson A, Leane C, Schranz N, Muyambi Y, Parish J, Reardon M, Tully B, Daly J, Hollis J, Kingsland M. Staff identification of barriers and facilitators to the provision of recommended preventive care practices for smoking, alcohol consumption and weight gain in pregnancy within maternity services in two Australian states. [In preparation for submission].
- Dilworth S, Doherty E, Wiggers J, Wolfenden L, Wilson A, Leane C, Schranz N, Muyambi Y, Tully B, Daly J, Hollis J, Kingsland M. Feasibility pilot of implementation strategies to support referral to a telephone coaching service for support with weight gain, healthy eating and physical activity in pregnancy: A brief report. [In preparation for submission].

Additional publications co-funded through the project:

- Reynolds R, Kingsland M, Daly J, Licata M, Tully B, Doherty E, Farragher E, Desmet C, Lecathelinais C, McKie J, Williams M, Wiggers J, Hollis J. Breastfeeding practices and associations with pregnancy, maternal and infant characteristics in Australia: a cross-sectional study. *Int Breastfeed J.* 2023 Jan 19;18(1):8. doi: 10.1186/s13006-023-00545-5. PMID: 36658629; PMCID: PMC9854140.
- Kingsland M, Hollis J, Daly J, Elliott E. Smoking, alcohol and weight: primary care in the preconception, pregnancy and postnatal periods. *Medicine Today*. 2022 Dec; 23:12.
- Doherty E, Kingsland M, Wiggers J, Wolfenden L, Hall A, McCrabb S, Tremain D, Hollis J, Licata M, Wynne O, Dilworth S, Daly JB, Tully B, Dray J, Bailey KA, Elliott EJ, Hodder RK. The effectiveness of implementation strategies in improving preconception and antenatal preventive care: a systematic review. *Implement Sci Commun*. 2022 Nov 22;3(1):121. doi: 10.1186/s43058-022-00368-1. PMID: 36419177; PMCID: PMC9682815.
- Doherty E, Wiggers J, Nathan N, Hall A, Wolfenden L, Tully B, Elliott EJ, Attia J, Dunlop AJ, Symonds I, Tsang TW, Reeves P, McFadyen T, Wynne O, Kingsland M. Iterative delivery of an implementation support package to increase and sustain the routine provision of antenatal care addressing alcohol consumption during pregnancy: study protocol for a stepped-wedge cluster trial. *BMJ Open*. 2022 Jul 26;12(7):e063486. doi: 10.1136/bmjopen-2022-063486. PMID: 35882461; PMCID: PMC9330336.

Presentations

- Dilworth S, Wolfenden L, Wiggers J, Tully B, Doherty E, Daly J, Hollis J, Wilson A, Leane C, Day T, Schranz N, Tonks J, Bullock P, Reardon M, Kingsland M. Co-designing preventive antenatal care pathways to reflect national guidelines and local contexts. Public Health Association of Australia Preventive Health Conference. May 2022. Brisbane, Australia.

- Dilworth S, Wynne O, Wiggers J, Wolfenden L, Tully B, Doherty E, Daly J, Hollis J, Wilson A, Leane C, Day T, Schranz N, Tonks J, Bullock P, Reardon M, Kingsland M. Prevalence of care for modifiable risks during pregnancy: NSW, SA, TAS. Public Health Association of Australia Preventive Health Conference. May 2022. Brisbane, Australia.
- Leane C, Bayly T, Tully B, Day T, Muyambi Y, Doherty E, Kingsland M, Dilworth S. Privileging Aboriginal Women's Voices: Learning from a focus group study. Public Health Association of Australia Preventive Health Conference. May 2023. Adelaide, Australia.
- Kingsland M and Hollis J. Improving antenatal care addressing alcohol, gestational weight gain, and smoking: lessons learnt from implementation trials. Monash University Implementation Masterclass. 2020, 2021. (Invited speaker).

Additional funding

- Tully B, Leane C, Bayly T, Day T, Muyambi Y, Doherty E, Kingsland M, Dilworth S. Aboriginal women's experiences of the antenatal care - Focus groups. Seed funding grant 2022 $5000. The Australian Prevention Partnership Centre.

Service capacity and partnership building

Midwife research capacity building: At all sites, midwives from the participating maternity service teams were seconded into research roles to help recruit participants who were attending antenatal care and staff working within the participating maternity services. The midwife at Site 2 was also responsible for implementing the pilot. The research team supported the midwives in developing local processes in line with ethical and governance approvals. Midwives recruited to these positions reported positive experiences overall with this process.

Research higher degree students: A Master of Studies student at the University of Newcastle was supervised by the project team to conduct the identification of staff barriers and facilitators (Project 3a).

Site resources: Sites 2 and 3 identified a need for increased access to carbon monoxide (CO) monitors to support smoking assessment. Sites were provided with CO monitors to allow for routine assessment. At Site 3, initial training to support the implementation of CO monitors was undertaken. At Site 2, collaborative work is being continued to support the development of processes to embed the use of CO monitors in practice.

Maternal health pathways: Visual representations of best practice models of antenatal care for clinicians called Maternal Health Pathways were developed at each of the three sites. These infographics help support preventive care practice for gestational weight gain in pregnancy, alcohol consumption, and smoking cessation. Available from: https://preventioncentre.org.au/resources/maternal-health-pathways/

Partnership and networks

Policy to practice: The policy partner at Site 2 has established a strong relationship with the clinical team through this project. At Site 3, policy partners were able to seek clinician and researcher feedback on 'low literary' resources developed for 'Eating well for Pregnancy', 'Nausea and Vomiting in Pregnancy', and 'Weight Gain in Pregnancy'.

Research to practice: Members of the research team are working with the Tasmanian Collaboration for Health Improvement to deliver workshops on communication skills that support behaviour change. The relationships established have been leveraged to engage local clinician participation. In NSW, project team members engaged in targeted consultation for the NSW Health's Policy Directive 'Reducing the effects of smoking and vaping on pregnancy and newborn outcomes' and invited to participate in a series of co-design workshops convened by NSW Ministry of Health to develop prevention services in maternity settings.

Project conclusion

A series of interconnected projects was successfully undertaken in three maternity services to understand and inform improvements in antenatal care for preventive health risks including smoking, alcohol consumption and gestational weight gain.

Project 1 developed localised models of care addressing preventive health risks in pregnancy. Due to differences in state and local level policies and guidance, the models of care differed between sites. These recommended models of care were used as a basis for all subsequent projects.

Project 2 reported the prevalence of preventive health risks in pregnancy and reported receipt of care consistent with the recommended models of care. There were some identified differences in the prevalence of preventive health risk factors for participants at the sites. There were also identified differences by site in participant receipt of recommended care across assessment, brief advice, and referral elements.

Project 3 identified system and provider level barriers and facilitators (determinants) to the provision of antenatal care for preventive health risks. Numerous determinants to care were reported by antenatal health care providers and managers at the sites including beliefs about consequences; environmental context and resources; and memory, attention and decision processes. Maternity managers reported a broader range of determinants, including social influences. Across 48 studies included in a systematic review, environmental context and resources and beliefs about consequences were also identified as key barriers/facilitators to antenatal preventive health care. Optimism was also a key determinant in providing care regarding smoking and gestational weight gain/nutrition/physical activity as were skills in providing care regarding alcohol use.

Project 4 described a co-design process that was conducted to identify a priority preventive health risk factor for each site to target and the development of implementation strategies to improve antenatal care addressing this risk factor. This demonstrated the ability to replicate a process of implementation strategy development that combined co-design, local data on practice determinants and the use of theoretical frameworks.

Project 5 reported a pilot study undertaken with one of the sites to assess the effectiveness of implementation strategies to improve the number of pregnant clients who were referred to the Get Healthy in Pregnancy service. Referrals to the service increased from an average of 0.5 per month pre-pilot to 100.25 per month post-pilot demonstrating the effectiveness of implementation strategies including changes to the environment, educational meetings and resources and reminders for clinicians.

What next?

The promising pilot results indicate that more extensive implementation, with a focus on sustainability, to maintain the Get Healthy in Pregnancy referral service at Site 2 is warranted.

Sites 2 and 3 identified a greater need for resources that support recommended preventive care, for example the implementation of carbon monoxide (CO) monitors to help assess smoking and support smoking cessation. The project supported the procurement of CO monitors and additional resources will be sought to help replicate the process undertaken in this project to implement tailored, theoretically sound implementation strategies for embedding their use in routine antenatal care.

The project highlighted differences in local care pathways that reflect differences in state and local level policies and guidance that impact local preventive care delivery. At a policy level, it would be beneficial to work collaboratively across states to better align state and local policy with national guidelines to support best practice evidence-based care. Key features of this work should consider the successful aspects of this project that were supported by the involvement of research, policy and practice stakeholders being actively engaged across all components.

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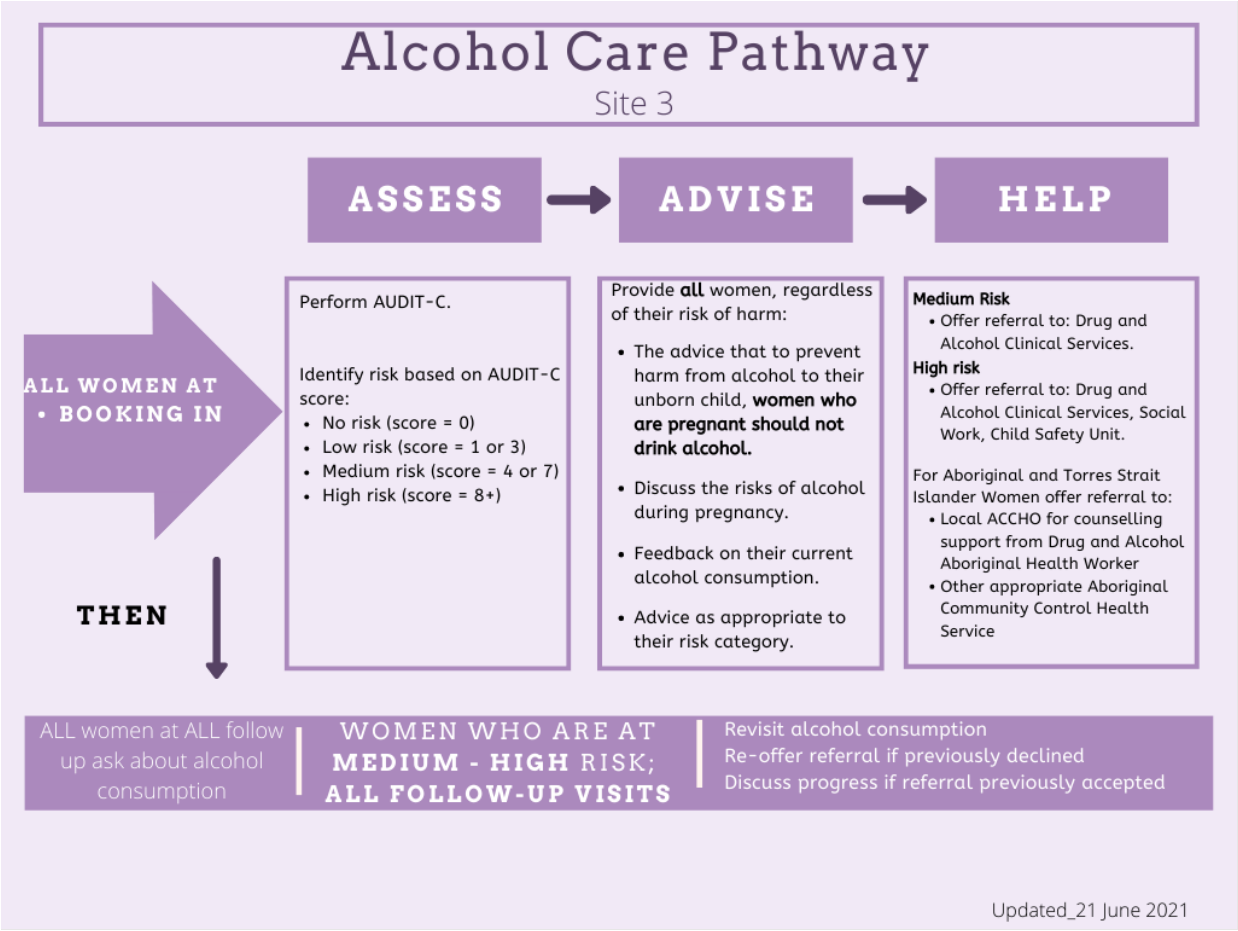
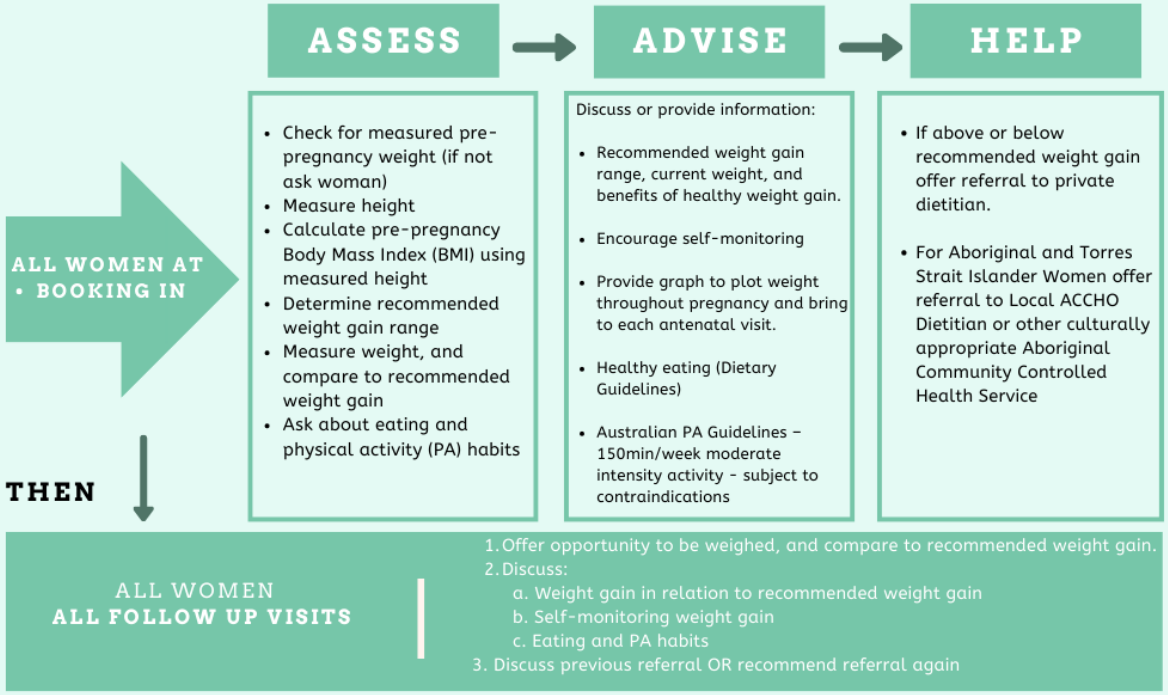
Appendix: Example of localised models of antenatal care for preventive health risks

Download PDF versions of this series of infographics from The Australian Prevention Partnership Centre's website at: https://preventioncentre.org.au/resources/maternal-health-pathways/



Gestational Weight Gain Care Pathway

Site 3



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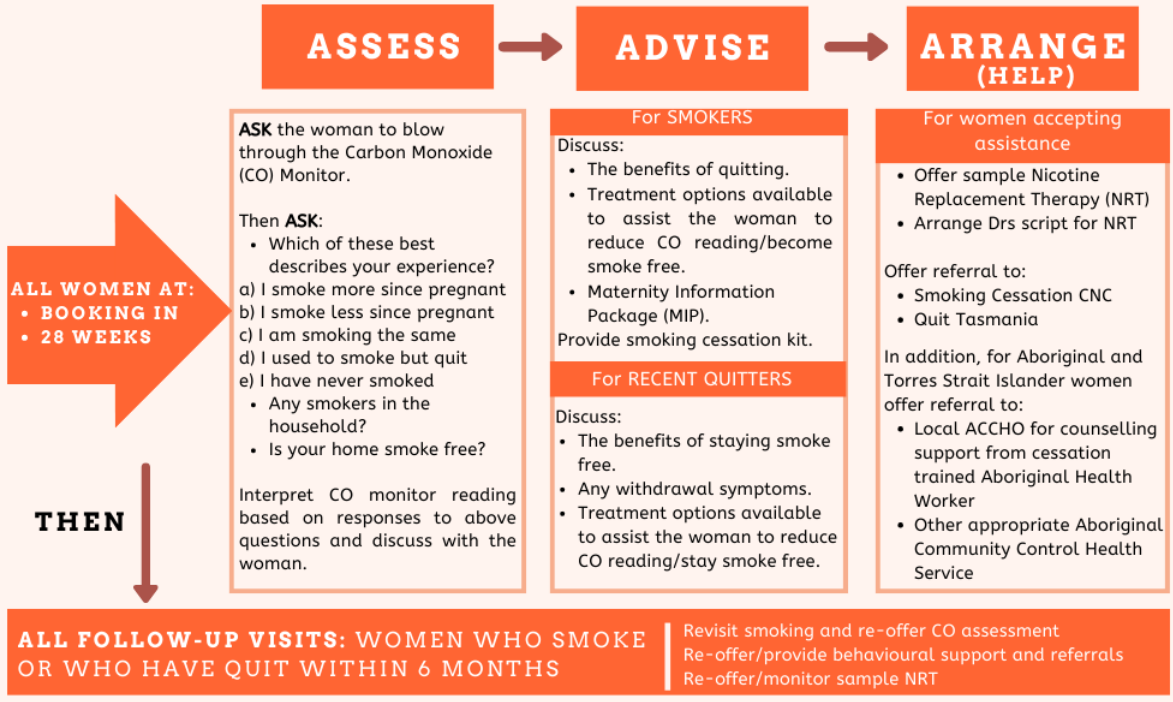
Smoking Cessation Care Pathway

Site 3



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