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Pregnancy intention, preconception health, health behaviours, and information and health advice seeking among expectant male partners

Tristan Carter[1,5*], Danielle Schoenaker[2,3,4], Jon Adams[1] and Amie Steel[1]

Abstract

Background Attempting pregnancy as a conscious decision (pregnancy intention) can impact the likelihood that a future parent receives or seeks preconception health information, initiates discussions with health professionals, and ultimately optimises their health and behaviours in preparation for healthy pregnancy and child. Knowledge about the relationship between men's preconception health behaviours and their pregnancy intention is only emerging.

Methods This study aimed to describe the preconception health status, behaviours, information- and advice-seeking of male expectant partners, and to explore differences in these preconception factors based on pregnancy intention. An online retrospective cross-sectional survey was completed by male reproductive partners of pregnant females. Their pregnancy intention was assessed using the London Measure of Unplanned Pregnancy (LMUP). Participants were recruited via social media and all variables were self-reported by expectant partners. Chi-square tests examined differences by LMUP categories (planned or ambivalent/unplanned).

Results Of 156 expectant partners who consented to survey participation, 138 completed all LMUP questions and were included in analysis. Most expectant partners reported their partner's current pregnancy as planned ($n=90$;65.2%), less than half reported looking for and finding information about becoming pregnant (40.0%). Expectant partners with planned pregnancy more often reported physical exercise three months before pregnancy compared with partners with unplanned/ambivalent pregnancy ($p=0.001$). Expectant partners with ambivalent/unplanned pregnancy more often experienced longstanding illness, disability, or infirmity ($p=0.002$) or disregarded contraception ($p<0.001$). Despite perceiving good or excellent health, and undertaking physical exercise, numerous expectant partners with planned pregnancy had overweight. Further research exploring the reproductive life plan process for males with longstanding chronic illness or disability may help promote pregnancy planning and preconception health amongst this sub-population.

*Correspondence:
Tristan Carter
Tristan.c.carter@student.uts.edu.au

Full list of author information is available at the end of the article

Conclusions Further large-scale studies are needed to enable clinicians to better understand pregnancy intentions and preconception health of males and for policy makers to formulate health policies aimed at supporting male preconception health and awareness.

Keywords Preconception, Male, Pregnancy intention, Health behaviours

Introduction

Preconception is the period prior to conception when individuals and couples can seek or be provided with support to optimise their health status as well as reduce behaviours and environmental exposures that may contribute to adverse pregnancy and offspring outcomes [1]. However, an individual's ability to capitalise on the opportunities afforded by the preconception period and seek care to promote health is affected by the degree to which becoming pregnant is a conscious decision, a complex multidimensional construct [2, 3] referred to as 'pregnancy intention'. Intending pregnancy is an important public health measure [4], and a principal preconception concept for couples and individuals alike, which may result in pregnancy planning and preparation. However, unplanned pregnancies, including pregnancies that are either mistimed [5] or occur when parents are ambivalent to becoming pregnant, are also common [3, 6]. Healthful preconception behaviours such as physical activity [7] or taking folate [8] and personal attributes such as relationship stability [9], and health seeking information in preparation for pregnancy [10] have been associated with intended pregnancies among females.

Public awareness must rebalance the gaze and consider males too provide genetic contributions toward their offspring and therefore healthy male sperm is a vital consideration before pregnancy to ensure healthy pregnancy and offspring outcomes. However, circumstances such as being overweight or obese can negatively impact sperm quality [11] and adversely influence pregnancy and offspring outcomes and fertilisation rates [12]. Opportunities for males to receive or seek preconception health information, initiate discussions with health professionals, and optimise health and behaviours in preparation for a healthy pregnancy and child are important aspects of preconception health and care which are interrelated with pregnancy intention. Preconception awareness for males is considered by a public health and health promotion agency in Australia which has developed a male preconception checklist that outlines the importance of men managing their weight, restricting smoking, and exercising regularly as well as booking a preconception health check with a general practitioner (GP) [13]. Males with pregnant partners (referred to here as 'expectant partners') are role models for their future children so may have considered altering their health behaviours before pregnancy, to minimise adverse pregnancy and offspring outcomes [14], in turn providing a foundation for positive contributions toward family health, a stable family environment, and an active role in a child's life [15, 16],

Research from the United Kingdom has reported that up to 20% of expectant partners draw upon sources of preconception diet and lifestyle information from peers, family, and friends and via books and online resources to optimise their preconception health and wellbeing for the sake of their expectant children [17]. Health services can play a key role among males during preconception by assisting to source information and to provide advice on paternal preconception matters [18, 19].

Pivoting from intended to unintended pregnancies, approximately 40% of pregnancies globally are estimated to be unintended [20], which has been associated with unhealthy behaviours among women such as preconception substance use [21], smoking and alcohol consumption [22], and adverse maternal and infant outcomes [23]. For males, unintended pregnancies are often reported with insecure financial circumstances, less stable relationships, and false assumptions about contraception use [24]. Unintended pregnancies, alongside the problematic approach to motivate men to attend primary health-services [25] and GPs' limited knowledge about factors which affect male fertility [26], hinder progress towards paternal preconception care. Several barriers to discussing fertility and preconception health with males are reported among GP's [26] and unwavering challenges endure for primary health services generally especially due to a lack of male preconception primary health-care initiatives [25]. As such, preconception care discussions are not always initiated with males who consult with health care services or who attend primary health care [26] and exposure to a range of preconception services and information, including immunization checking, dietary advice, and smoking cessation assistance is also sometimes absent. Consequently, males may not always consider the impact of their lifestyle behaviours and modifiable risk factors on either their own health or that of their offspring [17].

To provide further evidence on how to guide and support males during preconception and when planning a pregnancy, this study aimed to describe the preconception health status, behaviours, information, and advice-seeking of male expectant partners, and to explore differences in these preconception factors based on pregnancy intention.

Materials and methods

Study design

An observational retrospective cross-sectional study utilizing data from an online survey was conducted between December 2020 and September 2021. The survey involved a convenience sample of pregnant women and their expectant partners. Informed written consent was obtained from all participants and the study was performed in accordance with the Declaration of Helsinki [27]. Ethics approval was obtained by University of Technology Sydney (UTS) Human Research Ethics Committee (HREC) (ETH20-4726).

Participants and survey administration

Eligible survey participants included those who self-identified as a female, aged 18 to 49 years, and at any stage of pregnancy living in Australia. Expectant partners of eligible participants were also eligible to participate. Targeted advertising was utilized on social media platforms (i.e. Instagram, Facebook, Twitter) to recruit participants and an incentive was provided. A screening instrument was utilized to ensure that participants met the eligibility criteria and to collect their name and email address. Any individual who met the study eligibility criteria and consented to participate was able to complete the survey via the online survey platform Qualtrics™. Eligible females received a hyperlink whereby they were instructed to complete their own survey and forward the second survey onto their partners. Eligible male expectant partners were also directly targeted for recruitment and, following consent, received a hyperlink being instructed to complete their own survey and forward the second survey onto their pregnant partners.

Analysis provided in this paper includes only the male expectant partners of eligible study participants i.e. not female partners.

Survey instrument and data

A paper-based survey was developed and tested by three individuals, feedback was provided which resulted in the survey being built into Qualtrics™ and retested before finalising (Supplementary Material 1). This survey of partners of pregnant women was developed in tandem with the survey instrument designed for pregnant women. The *Expectant partner's pre-pregnancy health information survey* consists of 80-items across five sections including preliminary survey consent, date, and post survey comments (4-items), [1] "About you" (sociodemographic characteristics, height and weight) (15-items); [2] "Your current pregnancy" (retrospective assessment of the degree and timing of pregnancy planning incorporating the version of the London Measure of Unplanned Pregnancy [LMUP] for partners [28] (12-items); [3] "Your health behaviours" (history of and changes in preconception health and health behaviours) (31-items); [4] "Prepregnancy health information and advice" (knowledge on the importance of preconception health, the content of preconception care, and the source(s) of this information) (10-items); and [5] "Your health history" (health history, general health status, and pregnancy history) (8-items).

Sociodemographic characteristics

The survey obtained participant gender, age, residential postcode, private health insurance cover, highest qualification completed, employment status, relationship status, financial management status, identity as Aboriginal or Torres Strait Islander, first language spoken, country of birth, and health care card access.

Health status and health history

Expectant partners rated their current general health status (excellent-poor), responded to questions about any longstanding illness and health conditions diagnosed (3 months before partner's pregnancy) and reported their body weight and height. The survey also asked about participant's contraception use (6 months before pregnancy) and if they had have ever smoked and/or ever consumed alcohol.

Health behaviours

Survey questions identified participant's actions in preparing for pregnancy overall (Stop/cut back smoking and alcohol, eat healthier, seek medical advice, use vitamin supplements). Health behaviours were then identified based upon three preconception time periods: three, six and twelve months prior to pregnancy. Behaviours identified three months prior to pregnancy included alcohol consumption, smoking, and physical activity levels plus the consulting with health professionals for ongoing assistance. Health behaviours in the six months prior to pregnancy that were identified included following a weight loss diet, testing for sexually transmitted infections (STIs), and use of contraception methods. Health behaviours in the 12 months prior to pregnancy that were identified included any actions before partner became pregnant (visit a dentist, check immunizations) and consulting with a health professional about their partner becoming pregnant.

Preconception health information and advice

Questions further established if expectant partners had searched for information about becoming pregnant, and if so, asked about the source of this information and who (which partner) did this information related to. Also, questions explored whether expectant partners were provided with information about diet and lifestyle options for example eating a healthy diet, smoking,

consuming alcohol, or taking vitamin C supplements before pregnancy.

Pregnancy intention

Pregnancy intention was assessed using the London Measure of Unplanned Pregnancy (LMUP) for women's partners; a measure developed in the UK which identifies the degree of planning for a current/recent pregnancy [28].

Data analysis

Survey data were imported into Stata 17.1 and prepared for analysis by the research team. Survey participants comprise those who consented to participate in the survey, reported their sex as male, and completed all the survey questions directly related to the LMUP. The LMUP was scored as per the instrument's guide; participants response to each item score a minimum 0 and maximum 2 which then combine to a total score [29]. Technical issues with the online survey did not allow the last question of the LMUP to select multiple items but only one item. As a result, the maximum score awarded for this question is 1 instead of the standard maximum of 2. The LMUP scoring guide was followed for analysis. Two participants had a single missing value in one LMUP variable and were excluded from the analysis; imputation was not considered.

Based on the LMUP scoring, new categorical variables were generated as 'Planned' (LMUP score 10 or 11), 'Ambivalent' (between 4 and 9), or `Unplanned' pregnancy (3 or less) [28]. A binary variable was then generated to combine the 'Ambivalent' and `Unplanned' categories (ambivalent/unplanned) as only one participant had a score of 3 or less [30]. Data was tabulated into categories describing participant demographics, health status and history, health behaviours and health information. Variables of interest were then analysed according to planned and ambivalent/unplanned pregnancies.

Binary variables were created from categorial variables to determine descriptive statistics for health status and health history, participant health behaviours, and health information and advice. Body mass index (BMI) was calculated using the participants height and weight and then categorized according to the World Health Organization classifications [31]. Participants with missing data were not included in the analysis. Chi-square tests were utilized to examine differences by LMUP categories (planned or ambivalent/unplanned). If a cell count was less than 5, a Fisher's exact test was conducted. ANOVA tests were employed to compare differences in medians according to LMUP category for continuous variables. An alpha value below 0.05 was considered statistically significant and effect size was determined using Cramer's V [32]. Results for Cramer's V range between 0 and 1, greater values indicate stronger associations between variables; > 0.25 equals a very strong association, > 0.15 equals a strong association, > 0.10 equals a moderate association, > 0.05 equals a weak association and >0 equals a very weak association [33].

Results

A total of 156 expectant partners were eligible and provided consent to participate in the survey. The LMUP for partners includes six questions and has a maximum total score of 12 with higher scores indicating a greater degree of pregnancy planning [30] (Supplementary Material 2). Most expectant partners ($n = 138$) completed all the LMUP questions and were included in the analysis. The majority of expectant partners had a planned pregnancy ($n = 90$;65.2%).

Demographics

Overall, the most common age range of expectant partners was 30–39 years (61.7%) and most were employed full-time (89.1%) and married (70.2%) (Table 1). A small percentage of expectant partners identified as Aboriginal or Torres Strait Islander (3.6%). When comparing expectant partners with planned pregnancy and expectant partners with ambivalent/unplanned pregnancy, a very strong association was identified between the LMUP categories and relationship status ($V = 0.26$;$p = 0.006$) indicating that expectant partners with planned pregnancy were more often married. A moderate association was identified for expectant partners with an ambivalent/unplanned pregnancy who more often spoke a primary language other than English ($V = 0.16$;$p = 0.05$).

Health status and health history

Most expectant partners reported their general health status as "good" (60.4%) and approximately half (49.2%) reported no contraception use in the 6 months before their partners pregnancy as they were trying to conceive (Table 2). According to the BMI classifications, expectant partners with planned pregnancy were most often overweight (42.0%). A comparison of the LMUP categories provided evidence to support very strong associations; expectant partners with ambivalent/ unplanned pregnancy more often had a longstanding illness, disability, or infirmity ($V = 0.31$;$p = 0.005$) and more often did not use contraception ($V = 0.37$;$p < 0.001$).

Preconception health behaviours

Numerous expectant partners reported physical exercise in the three months before their partner's pregnancy (69.5%); generally, expectant partners reported an average number of five hours of physical activity per week (SD 3.0–7.5) (Table 3). The majority of expectant partners had ever consumed alcohol (84.7%) and approximately

Table 1 Sociodemographic characteristics of expectant male partners

	LMUP category			
	All (*n* = 138)	**Planned (*n* = 90)**	**Ambivalent/ Unplanned (*n* = 48)**	**P (Cramer's V)**
	n (%)	***n (%)***	***n (%)***	
Age (n = 128)				
*Less than 29 years^*	39 (30.4)	22 (25.5)	17 (40.4)	0.06
30–39 years	79 (61.7)	59 (68.6)	20 (47.6)	
40 years +	10 (7.8)	5 (5.8)	5 (11.9)	
State of residence (n = 138)				
New South Wales	45 (32.6)	28 (31.1)	17 (35.4)	0.11
Victoria	41 (29.7)	22 (24.4)	19 (39.5)	
Queensland	23 (16.6)	17 (18.8)	6 (12.5)	
*Other**	29 (21.0)	23 (25.5)	6 (12.5)	
Private health insurance (n = 138)	85 (61.5)	59 (65.5)	26 (54.1)	0.19
Highest educational qualification (n = 138)				
*Up to year 12 or equivalent***	15 (10.8)	9 (10.0)	6 (12.5)	0.52
Vocational education (e.g. Apprenticeship/Diploma)	45 (32.6)	27 (30.0)	18 (37.5)	
University degree or Higher	78 (56.5)	54 (60.0)	24 (50.0)	
Employment status (n = 138)				
Full-time work (≥ 35 h/week)	123 (89.1)	82 (91.1)	41 (85.4)	0.58
Part time or casual temp work	11 (7.9)	6 (6.6)	5 (10.4)	
Not currently working	4 (2.9)	2 (2.2)	2 (4.1)	
Relationship status (n = 138)				
Married	97 (70.2)	71 (78.8)	26 (54.1)	0.006 (0.26)
De facto	38 (27.5)	18 (20.0)	20 (41.6)	
In a relationship but not living with my partner	3 (2.1)	1 (1.1)	2 (4.1)	
Financial manageability (n = 138)				
*It is impossible/It is difficult****	34 (24.6)	19 (21.1)	15 (31.2)	0.36
It is not too bad	73 (52.9)	51 (56.6)	22 (45.8)	
It is easy	31 (22.4)	20 (22.2)	11 (22.9)	
Identify as Aboriginal or Torres Strait Islander (n = 138)	5 (3.6)	2 (2.2)	3 (6.1)	0.15
First language other than English (n = 138)	16 (11.5)	7 (7.7)	9 (18.7)	0.05 (0.16)
Born outside Australia (n = 138)	32 (23.1)	20 (22.2)	12 (25.0)	0.71
Health care card (n = 138)	42 (30.4)	25 (27.7)	17 (35.4)	0.35

^ One participant was identified under 20 years of age

*Other includes South Australia/ACT/Tasmania/Western Australia/Northern Territory

** Includes no formal qualifications, year 10 or equivalent, and year 12 or equivalent

*** Combined it is impossible; is difficult all the time; it is difficult some of the time

one third of expectant partners had ever smoked (36.3%). Almost one third of expectant partners reported seeing any health professional 12 months before their partner's pregnancy (32.2%). A small number of expectant partners reported using folic acid before their partner's pregnancy (5.0%).

A very strong association was observed for physical activity three months before the partner's pregnancy with LMUP category (V = 0.27;p = 0.001) indicating that a greater proportion of expectant partners with planned pregnancy reported physical exercise. A very strong association was identified between checking immunizations 12 months before partner's pregnancy and planned pregnancy (V = 0.26;p = 0.26) while a strong association was identified between having ever smoked and reporting an ambivalent/unplanned pregnancy (V = 0.24;p = 0.005).

Preconception health information and advice

Almost one third of all expectant partners reported looking for and finding information about becoming pregnant (31.8%) (Table 4). A large proportion of expectant partners sourced preconception information from the internet (92.0%) and in many instances the preconception information related to both males and females (76.0%). When preparing for pregnancy, many expectant partners received information regarding immunizations (21.1%), smoking (20.0%), and alcohol (20.0%), yet fewer received information about maintaining a healthy weight (11.5%) or sexually transmitted diseases (11.5%). Upon comparing LMUP categories, a strong association was identified between planned pregnancy and looking for and finding information about becoming pregnant (V = 0.23;p = 0.005).

Table 2 The health status and health history of expectant male partners

	LMUP category			
	All (n = 138)	**Planned (n = 90)**	**Ambivalent/ Unplanned (n = 48)**	**P (Cramer's V)**
	n (%)	***n (%)***	***n (%)***	
General Health Status (n = 96)				
Excellent	22 (22.9)	14 (21.5)	8 (25.8)	0.74
Good	58 (60.4)	41 (63.0)	17 (54.8)	
Fair/Poor	16 (16.6)	10 (15.3)	6 (19.3)	
Longstanding illness, disability, or infirmity (n = 96)	15 (15.6)	5 (7.6)	10 (32.2)	0.005 (0.31)
Diagnosed or taking medications for any conditions [3 months before partner's pregnancy]	31 (22.4)	21 (23.3)	10 (20.8)	0.73
***Contraception use*[6 months before partner's pregnancy] (n = 128)**				
Yes	43 (33.5)	30 (35.7)	13 (29.5)	< 0.001 (0.37)
No – Was trying to conceive	63 (49.2)	48 (57.1)	15 (34.0)	
No – Was not trying to conceive	22 (17.1)	6 (7.1)	16 (36.3)	
	Median (Q1, Q3)	***Median (Q1, Q3)***	***Median (Q1, Q3)***	
***Body Mass Index [BMI]*(n = 136)**	27.4 (23.6, 30.9)	27.7 (24.8, 31.0)	26.6 (23.4, 30.7)	0.56
***BMI Classification*(n = 136)**	***n (%)***	***n (%)***	***n (%)***	
*Normal weight [BMI 18.5–24.9] **	46 (33.8)	26 (39.5)	20 (41.6)	0.30
Overweight [BMI 25.0–29.9)	50 (36.7)	37 (42.0)	13 (27.0)	
Obesity class I [BMI 30.0–34.9]	26 (19.1)	17 (19.3)	9 (18.7)	
Obesity class II [BMI 35.0–39.9] & class III [BMI > 40]	14 (10.2)	8 (9.0)	6 (12.5)	

* Zero participants were underweight [BMI < 18.5]

Discussion

This study on paternal pregnancy intention and planning identified several key findings of importance for public health and reproductive health broadly and more specifically for expectant partners preconception health and care, and their efforts to seek, source, identify, and consult for preconception information and advice. According to the LMUP for Women's Partners [28], the proportion of expectant partners with a planned pregnancy in our study (69%) was lower than in other studies exploring males' pregnancy intention (81–95%) [24, 34]. Our study also reported a proportion of expectant partners with planned pregnancy less than the planned pregnancy rate generally reported for women (83%) [35] and similar to the estimated global planned pregnancy rate (60%) [20]. The public health implications of this research rebalance the social gaze to consider the impact of male health during preconception and to prompt males to take opportunities to sustain health during preconception. Noteworthy findings within our study are discussed below.

When comparing the sociodemographic characteristics of expectant partners in our study according to pregnancy intention, some findings align with existing evidence describing the target population. For example, male expectant partners with intended pregnancy were most commonly aged 30–39 age [36], were often in committed relationships [37], and generally did not report issues with financial manageability [38]. Other findings in our study present potential areas for exploration and future research; a significant proportion of expectant partners who had a first language other than English or who had ever smoked reported ambivalent pregnancies.

A large proportion of expectant partners in our study with a planned pregnancy undertook physical activity in the three months prior to their partner's pregnancy (69.5%), averaging five physical activity hours per week. Regular exercise plays an important role in regulating body weight and BMI [39], and with general physical function and health related well-being; [40] a lack of exercise is considered a major cause of chronic disease [41]. However, the health benefits of preconception interventions including regular exercise is only emerging for reproductive males [13]. Our finding of expectant partners undertaking physical activity during preconception is promising and may even substantiate why many expectant partners in our study report their health status as good or excellent. Despite perceiving their health as good or excellent, and undertaking physical activity, numerous expectant partners who planned pregnancy in our study had overweight status with a BMI between 25.0 and 29.9 (42%). The literature exploring males having overweight or obese suggests that their offspring are more likely to also have overweight or obesity [42, 43] and asthma [44]. Expectant partners having overweight and intending pregnancy should feel supported to optimise their body weight and reduce their risks, given that a sustained and increased BMI can signpost numerous

Table 3 The health behaviours of expectant male partners

Participant health behaviours	**LMUP category**			
	All (n = 138)	**Planned (n = 90)**	**Ambivalent/ Unplanned (n = 48)**	***P*** **(Cramer's V)**
	n **(%)**	***n*** **(%)**	***n*** **(%)**	
Vitamins/supplements before partner's pregnancy				
Folic acid (n = 80)	4 (5.0)	3 (5.6)	1 (3.7)	0.58
Ordinary multivitamin (n = 86)	16 (11.5)	12 (13.3)	4 (8.3)	0.28
Vitamin C (n = 82)	9 (6.5)	6 (6.6)	3 (6.2)	1.00
Zinc (n = 81)	7 (5.0)	6 (6.6)	1 (2.0)	0.23
Omega 3 (n = 84)	7 (5.0)	3 (3.3)	4 (8.3)	0.19
Antioxidants (n = 79)	2 (1.4)	2 (2.2)	0 (0.0)	0.42
Herbal medicines (n = 80)	3 (2.1)	2 (2.2)	1 (2.0)	1.0
Other (n = 80)	8 (5.8)	6 (6.6)	2 (4.1)	0.71
Any folic acid[#]	18 (13.0)	14 (15.5)	4 (8.3)	0.29
Any natural health product[##]	30 (21.7)	22 (24.4)	8 (16.6)	0.29
Physical activity [3 months before partner's pregnancy] (n = 134)	96 (69.5)	71 (78.8)	25 (52.0)	0.001 (0.27)
	Median (Q1, Q3)	**Median (Q1, Q3)**	**Median (Q1, Q3)**	
Number of physical activity hours per week (n = 95)	5 (3, 7.5)	5 (3, 7.5)	5 (3, 6)	0.10
	n (%)	***n (%)***	***n (%)***	
Ever smoked (n = 134)	50 (36.3)	25 (27.7)	25 (52.0)	0.005 (0.24)
Cigarettes	42 (84.0)	19 (76.0)	23 (92.0)	0.20
E-cigarettes	4 (8.0)	4 (16.0)	0 (0.0)	
Other	4 (8.0)	2 (8.0)	2 (8.0)	
Smoking [3 months before partner's pregnancy] (n = 50)**	22 (44.0)	9 (36.0)	13 (52.0)	0.25
	Median (Q1, Q3)	**Median (Q1, Q3)**	**Median (Q1, Q3)**	
Number of cigarettes or equivalents per day (n = 20)	8 (2,18.5)	8 (2, 16)	8 (3, 20)	0.61
	n (%)	***n (%)***	***n (%)***	
Ever consumed alcohol (n = 132)	117 (84.7)	78 (86.6)	39 (81.2)	0.39
Alcohol consumption [3 months before partner's pregnancy]***				
	Median (Q1, Q3)	**Median (Q1, Q3)**	**Median (Q1, Q3)**	
Units during the week (Monday to Thursday) (n = 113)	2 (0, 4)	2 (0, 4)	1 (0,3)	0.11
Units during the weekend (Friday to Sunday) (n = 114)	4 (1, 6)	4 (1, 6)	4 (1, 8)	0.76
Any action before partner became pregnant [6 months before partner's pregnancy]				
Followed a weight loss diet	15 (19.7)	10 (18.1)	5 (23.8)	0.74
Get tested for a sexually transmitted disease	10 (13.1)	9 (16.3)	1 (4.7)	0.26
Contraception methods [6 months before partner's pregnancy] ******				
Condoms (n = 39)	27 (69.2)	19 (70.3)	8 (66.6)	0.81
Other^ (n = 116)	18 (15.5)	12 (16.2)	6 (14.2)	0.78
Any action before partner became pregnant [12 months before partner's pregnancy]				
Visit a dentist	59 (42.7)	42 (46.6)	17 (35.4)	0.20
Check immunizations	22 (15.9)	20 (22.2)	2 (4.1)	0.02 (0.26)
Seeing any health professional about becoming pregnant [12 months before partner's pregnancy] (n = 96)	31 (32.2)	21 (32.3)	10 (32.2)	0.99

[#] Folic acid or multivitamin

[##] Use of any vitamin/supplement including folic acid, multivitamin, vitamin c, zinc, omega 3, antioxidants, herbal medicines, other

** only asked of those participants who reported having `ever smoked'. *** only asked of those participants who reported having `ever consumed alcohol'

**** only asked of those participants who reported `using contraception in the 6 months before pregnancy'

^ Other includes abstinence, withdrawal, and timed intercourse

Table 4 Preconception health information and advice for expectant male partners

Participant preconception health information and advice	LMUP category			
	All (n = 138)	**Planned (n = 90)**	**Ambivalent/ Unplanned (n = 48)**	***P***
	n **(%)**	***n*** **(%)**	***n*** **(%)**	
Look at information about becoming pregnant [12 months prior]				
Yes – I went looking for information and found it	44 (31.8)	36 (40.0)	8 (16.6)	0.005 (0.23)
Yes- I did not go looking for information but found it anyway	6 (4.3)	4 (4.4)	2 (4.1)	1.00
No – I went looking for information but did not find any	2 (1.4)	1 (1.1)	1 (2.0)	1.00
No - I did not go looking for information and did not find any	46 (33.3)	26 (28.8)	20 (41.6)	0.12
Who did the information relate to**				
My partner only	11 (22.0)	10 (25.0)	1 (10.0)	0.42
Both me and my partner	38 (76.0)	29 (72.5)	9 (90.0)	0.24
Sources of preconception information/*****				
Books	19 (38.0)	17 (42.5)	2 (20.0)	0.27
Leaflets	14 (28.0)	11 (27.5)	3 (30.0)	1.00
Internet	46 (92.0)	37 (92.5)	9 (90.0)	0.79
Magazines	3 (6.0)	2 (5.0)	1 (10.0)	0.61
Family of friends	19 (38.0)	14 (35.0)	5 (50.0)	0.45
GP	25 (50.0)	20 (50.0)	5 (50.0)	1.00
Midwife	7 (14.0)	6 (15.0)	1 (10.0)	0.57
Obstetrician/Gynaecologist	7 (14.0)	5 (12.5)	2 (20.0)	0.61
When preparing for pregnancy, did anyone give you information about…				
Immunisation (n = 88)	23 (16.6)	19 (21.1)	4 (8.3)	0.06
Smoking (n = 88)	27 (19.5)	18 (20.0)	9 (18.7)	0.86
Alcohol (n = 88)	25 (18.1)	18 (20.0)	7 (14.5)	0.43
Physical activity (n = 88)	20 (14.4)	13 (14.4)	7 (14.5)	0.98
Stopping contraception (n = 88)	20 (14.4)	14 (15.5)	6 (12.5)	0.62
Eating a healthy diet (n = 88)	19 (13.7)	15 (16.6)	4 (8.3)	0.20
Folic acid (n = 88)	18 (13.0)	13 (14.4)	5 (10.4)	0.60
A healthy weight (n = 88)	16 (11.5)	12 (13.3)	4 (8.3)	0.57
Sexually transmitted diseases (n = 88)	16 (11.5)	12 (13.3)	4 (8.3)	0.57
Ordinary multivitamin (n = 87)	15 (10.8)	12 (13.3)	3 (6.2)	0.25
Omega 3 (n = 84)	7 (5.0)	3 (3.3)	4 (8.3)	0.23
Zinc (n = 84)	6 (4.3)	5 (5.5)	1 (2.0)	0.66
Vitamin C (n = 84)	5 (3.6)	3 (3.3)	2 (4.1)	1.00
Antioxidants (n = 84)	3 (2.1)	2 (2.2)	1 (2.0)	1.00
Herbal medicines (n = 84)	3 (2.1)	2 (2.2)	1 (2.0)	1.00

** only asked of those participants who reported 'looking at information about becoming pregnant' in the year before their partner became pregnant

*** Naturopaths, Pharmacists, and Doulas not included in final analysis due to nil results

ailments [45] and, along with waist and hip measurements, presents a health risk factor [46]. Although, according to BMI, having overweight does not always equate to being `unhealthy' and boundaries can seem blurred between BMI and health [47] due to the limitations of BMI due to its lack of distinction between fat and muscle tissue or determining body weight distribution [48]. Expectant partners having the perception of reasonable health yet living with overweight underscores the importance for males planning a pregnancy to be aware that despite undertaking physical activity, their preconception BMI may influence the health of their child later in life. Males during the preconception period and specifically the 3-month period prior to conception require further exploration to determine the influence of their regular exercise on pregnancy and offspring outcomes and to determine the efficacy of paternal preconception health and care treatment plans incorporating regular exercise.

Expectant partners with planned pregnancy in our study actively sought information and advice and often used the internet as a source of preconception information (92.0%). More broadly, previous research has shown that how males plan and prepare for pregnancy is varied; [34] one Australian study identified that males often only seek information regarding fertility when experiencing difficulties conceiving [49] while another study from England suggests that one in two males have looked at information about their partners pregnancy before conception from a variety of sources [17]. For many males, seeking

information or advice about pregnancy planning may now be a process governed online and by social media whereby familiar digitized social platforms are used to support decision making when planning a pregnancy [50]. Thus, online resources, social media platforms, and primary health care services all play a key role and have an onus to promote and provide accurate and reliable preconception information to reproductively aged males, especially those who are planning pregnancy.

Our study also shows that close to one quarter (22.2%) of expectant partners who planned a pregnancy completed immunization checks in the 12 months prior to their partners pregnancy and that approximately one fifth (21.1%) of expectant partners who planned a pregnancy received information or advice about immunization. The research exploring immunisation status during preconception is primarily focused on women [51–53] and checks for females before pregnancy are actively encouraged in the resources available for pregnancy planning [54, 55], are advocated by Governments worldwide [56, 57], and also recommend in the guidelines utilized by GPs for preventive activities in general practice [58]. As messages are directed and disseminated mainly toward the birthing parent not the couple or the male [59], and even when males check immunizations during preconception, immunization information will not always translate to immunisation currency or even immunization acceptance. Our results regarding immunisation may underscore the emphasis placed on immunization information, advice, and messages during the times of COVID-19 for both women and men [60]. Post COVID-19, preconception equality advocates that males should also reduce the risks of various infectious diseases to promote health [61] and thus preconception immunization status screening and information should be incorporated into consultations for all reproductive males intending pregnancy, including males who report any longstanding illness, disability, or infirmity.

Another key finding in this study is that expectant partners who report any longstanding illness, disability, or infirmity (15%) more often have an ambivalent or unplanned pregnancy than a planned pregnancy. Evidence suggests that approximately one in three adults live with multiple chronic conditions [62]. Males with longstanding chronic illness, including preconception paternal comorbidity such as metabolic syndrome, threaten the health of their gametes and have been associated with higher odds of pre-term birth or low birth weight than males without comorbidities [63]. Previous research also identifies that the partners of disabled fathers are at higher risk of unintended pregnancy compared with the partners non-disabled fathers [64]. Hence, for expectant partners with health-related issues which may manifest as a longstanding chronic illness, disability, or infirmity, their partner's pregnancy may not always be intended or may even result in adverse pregnancy outcomes [65]. Therefore, tailoring a reproductive life plan specifically to males with longstanding chronic illness or disability may help promote pregnancy intention and paternal preconception health amongst this sub-population. All reproductive males, including those with longstanding chronic illness or a disability, are likely to benefit from preconception care and require targeted information regarding the importance of pregnancy planning and preparation.

Strengths and limitations

Our study captures the preconception health behaviours and information seeking behaviours of expectant partners through the lens of pregnancy intention, nevertheless, it is important to acknowledge several limitations. Firstly, this study was cross-sectional in nature and therefore represents the preconception intentions, health, health behaviours, and information and health advice seeking among expectant partners in a 12-month period only. Expectant partners were recruited via social media, and completed an online survey, both processes which can be predisposed to data collection bias or sampling and selection bias [66]. Although social media does have hundreds of millions of users, and is becoming more frequently used by the general public [66], utilizing social media to recruit survey participants for this study may not have provided a true representation of males during preconception. Further, recruiting only males with pregnant partners also does not provide a true representation of males during preconception. Due to the reliance upon self-reported data in the survey, there is potential for response bias whereby participants may have provided socially desirable responses which has been mitigated by ensuring questions were articulated without an emphasis on socially acceptable answers or being right or wrong [67]. The self-reported measures identified in this study were also not considered alongside objective data which would enhance the rigour of the fundings. Further, a survey data error meant that only five of the six questions in the LMUP for women's partners survey could be allocated the maximum score. Also, the use of LMUP for Partners has only been piloted in the UK [28] and so has not been validated for Australian expectant partners as has the LMUP among pregnant Australian women [68]. Finally, due to the sample size, there was insufficient statistical power to perform multivariate analysis. Despite these limitations, this study still provides valuable insights to an understudied population on a topic that is critical to public health for multiple generations.

Conclusion

The majority of expectant partners in our study had a planned pregnancy, yet close to one third of the expectant partners in our study remain ambivalent about their current pregnancy. Key differences, including undertaking physical activity and checking immunisations, were evident in the health behaviours of expectant partners with a planned pregnancy compared with ambivalent/unplanned pregnancy. Our study establishes a foundation for further large-scale research to be conducted to build a knowledge base for clinicians to better understand preconception health for males and their information and advice seeking behaviours and also enable policy makers to formulate health policies and initiatives aimed at improving male preconception health and awareness.

Abbreviations

GP	General Practitioner
RACGP	Royal Australian College of General Practitioners
UTS	University of Technology Sydney
HREC	Human Research Ethics Committee
LMUP	London Measure of Unplanned Pregnancy
STI's	Sexually transmitted infections
BMI	Body mass index

Supplementary Information

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Supplementary Material 1

Supplementary Material 2

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Author contributions

AS initiated the survey, administered the survey process, and collected data. TC analyzed and tabulated the data and was a major contributor to the writing of the manuscript. This manuscript was overseen by faculty supervisors AS, JA, & DS. All authors read and approved the final manuscript.

Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

Study ethics approval was obtained from the Human Research Ethics Committee (HREC) at the University of Technology Sydney (UTS) (ETH20-4726), in accordance with the Declaration of Helsinki. Informed consent was obtained from each participant prior to survey commencement.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

[1]School of Public Health, Faculty of Health, University of Technology Sydney, Sydney 2006, Australia
[2]School of Human Development and Health, Faculty of Medicine, University of Southampton, Southampton, UK
[3]MRC Lifecourse Epidemiology Centre, University of Southampton, Southampton, UK
[4]NIHR Southampton Biomedical Research Centre, University of Southampton and University Hospital Southampton NHS Foundation Trust, Southampton, UK
[5]Level 8, Building 10 235-253 Jones St Ultimo, NSW 2006, Australia

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