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Exploring the Risks of Repeated Pregnancy Among Adolescents and Young Women in the Philippines

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Abstract

Objective Knowledge of the factors which influence repeat pregnancy can inform much needed evidence-based prevention programs. This study aims to identify correlates of repeat pregnancy in the Philippines. *Methods* We used data from five Philippine Demographic and Health Surveys (1993–2013). A total of 4757 women 15–24 years old who had experienced ≥ 1 pregnancy were included. Individual and partner-related factors were fitted into a series of logistic regression stepwise models with deformalized survey weights. Stratified analyses using two age groups (15–19, 20–24) were also conducted. Interaction terms were included to test for statistical differences between the groups. *Results* Lower wealth quintiles [odds ratio (OR) 1.71, 95% confidence interval (CI) 1.17–2.49] and partner characteristics such as age of ≥ 30 years (OR = 1.99, CI = 1.41–2.82), multiple partners (OR = 4.19, CI = 1.57–11.19) and live-in status (OR = 1.38, CI = 1.02–1.87) were found to be highly correlated with repeat pregnancy in fully adjusted analysis. Receiving prenatal care from traditional healers (OR = 1.93, CI = 1.02–3.63) during the first pregnancy and giving birth for the first time before 18 years of age (OR = 1.12, CI = 1.04–1.20) showed increased risks among 15–19 years old compared to 20–24 years old in stratified analysis. *Conclusions for practice* In general, partner characteristics were associated with repeat pregnancy among young women suggesting male involvement, especially older partners, in family planning. High risks for repeat pregnancy were observed among adolescent women who reported younger age at first birth and received prenatal care from a traditional healer which entail promotion of trained prenatal care. Further analysis is needed to validate these findings in other developing countries.

Keywords Risks · Teenage pregnancy · Repeated pregnancy · Adolescents · Correlates · Philippines

Significance

What Is Already Known on This Subject? Two existing systematic reviews have been published on this topic, one in 1997 and another from our team inclusive of meta-analysis in 2017. We reviewed and meta-analysed 26 epidemiologic articles published between 1997 and 2015, wherein we identified school discontinuation, depression, history of abortion/ miscarriage, high partner support, and non-use of long-acting as relevant predictors of repeated pregnancy among adolescent girls. Despite the breadth of our review, we found a dearth of studies from developing countries.

What This Study Adds? This is the first epidemiological study to report correlates of repeated pregnancy in the Asia-Pacific region. Our study adds to the existing evidence by highlighting the risk associated with having older partners among 15–24 year old women, as well as confirming that the use of traditional healers, as main providers of prenatal care and young age at first birth are likely factors of repeat pregnancy among teenage women.

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Introduction

Early childbearing is a major adolescent reproductive health (ARH) problem in developing countries (Chandra-Mouli et al. 2013; World Health Organization 2012). This is

particularly true for countries such as the Philippines, where a routine demographic and health survey suggests a constant trend from 1973 to 2013 in adolescent fertility rates with an increasing incidence of early pregnancies (Natividad 2013; Philippine Statistics Authority and ICF International 2014). This is in contrast with improving trends in other developing countries (UNFPA & UNESCO and WHO 2015). These concerning trends are likely to result in greater unmet needs for family planning amongst adolescents, as well as a greater risk of subsequent pregnancies amongst teenage mothers (Natividad 2013; Stevens-Simon et al. 1998).

The 2012 Philippine Vital Statistics reported that approximately 14% of the 209,274 live births from teenagers were a second birth (Philippine Statistics Authority 2012b), while an epidemiological analysis of repeated pregnancies in the Philippines showed a prevalence of 18% among non-nulliparous teenagers (Maravilla et al. 2018).

Repeated pregnancies during the teenage years may cause increased burdens on physiological and psychosocial health, ranging from pregnancy complications, psychological distress as well as financial dependency due to the inability to complete school education (Farber 2009; Gavin et al. 2013; Ownbey et al. 2011). Repeated adolescent pregnancy is commonly defined as a subsequent pregnancy occurred between 10 and 19 years ending in abortion, miscarriage, stillbirth or livebirth livebirth (Association of Maternal & Child Health Programs 2014; Damle et al. 2015). Repeated pregnancy has several implications for adolescents including unequal access to reproductive, limited employment opportunities and poverty, and increased welfare cost (Association of Maternal & Child Health Programs 2014; Penman-Aguilar et al. 2013; Schuyler Center for Analysis and Advocacy 2008).

The extensive impact of repeat pregnancy on adolescents' wellbeing therefore may require urgent planning and implementation of pregnancy prevention programs targeting key factors associated with repeat pregnancy. A meta-analytic review undertaken by our team (2017) identified a number of individual, interpersonal and social predictors from 26 epidemiological studies from 1997 to 2015. We found that lack of use of contraceptives, school discontinuation, depression, low educational attainment and partner support increased risks for repeat pregnancy by almost twofold. Despite the review's comprehensive and statistically robust results, we were unable to include evidence from developing countries, especially from the Asia-Pacific region, which means that our review recommendations are only relevant to developed countries, where repeat pregnancy prevention programs have been in place for a number of years.

A recent study in a metropolitan area of the Philippines addressing repeat pregnancy among young women reported different sexual, familial and social predictors of number of living children in a cohort of women aged 25 (Gipson and Hicks 2017). This longitudinal analysis found that poor communication between young women and their mothers, as well as mothers' conservative attitude towards sex during the teenage years strongly predicted having at least two children. While this study investigated a broad range of exposure variables, the outcome of interest (number of living children) was not measured during the teenage years.

Occurrence of repeat pregnancy in teenagers may be associated with a different set of factors because of biological, psychosocial and familial characteristics of teenage mothers. For example, women in their mid-twenties may transition from wanting to prevent pregnancy to wanting pregnancy (Gipson and Hicks 2017; Miller 1986) resulting in higher fertility. Moreover, being underage presents additional challenges as parental consent may be required before underage women are allowed to use contraception. Finally, measuring number of pregnancies instead of number of children can provide a clearer picture of repeat conceptions since the former would measure miscarriages and abortions, which are more prevalent amongst teenagers.

Hence, an investigation of developing country-level estimates is necessary to address gaps in the available evidence and provide evidence-based recommendations for ARH policy and programs focused at adolescent mothers other than nulliparous adolescents. Using nationally representative surveys spanning two decades, this study aims to identify correlates of repeated pregnancy in the Philippines at individual, dyadic and societal levels. Also, we compared identified risk factors among teenagers and young adults to address differences amongst these two groups. Our results may be used to develop individualised preventive approaches for adolescent mothers. These will not only contribute to a greater understanding of repeat adolescent pregnancy in the Philippines but also provide knowledge for other developing countries with similar adolescent demographics and cultural dynamics, into the relevant factors that influence repeat pregnancy.

Methods

Sample and Population

We used five datasets (i.e. 1993, 1998, 2003, 2008, and 2013) from the Philippine Demographic and Health Survey (DHS). The Philippine DHS is a routine cross-sectional survey conducted every 5 years and designed to assess a range of millennium development goal indicators. All the surveys were designed with multi-stage sampling down to the household level, stratified by 17 regions, and rural and urban areas. All women and their children in the selected households were interviewed. A total of 65,261 households were included from the 1993 to 2013 surveys consisting of

72,394 women aged 15–49 years with 14,716 adolescents aged 15–19 years and 26,809 women aged 15–24 years. Less than 2% non-response rates were obtained in all surveys (National Statistics Office-Philippines 1993, 2003, 2008; National Statistics Office-Philippines & and Department of Health-Philippines 1999; Philippine Statistics Authority & and ICF International 2014).

We selected respondents aged 15–24 years who reported experiencing at least one pregnancy. Currently pregnant primigravid respondents were excluded since they were not yet at risk of having repeat pregnancy. In total, 4757 (7.29% of the original sample) 15–24 years old women experiencing at least one pregnancy were included consisting of 912 (19.17%) 15–19 years old and 3845 (80.83%) 20–24 years old. Eligible women were interviewed by trained interviewers using a pre-tested and expert-validated questionnaire to determine their socio-demographic characteristics, reproductive health, marital status and child health status.

Measures

Repeated Pregnancy

Using the self-reported pregnancy history, we created a binary outcome variable defined as an experience of at least two pregnancies regardless of the outcome of the previous pregnancy. The absence of the outcome means an experience of only one pregnancy and not being nulligravid.

First Pregnancy Experience

These included prenatal visits, intention and outcome of the first pregnancy. We defined prenatal visits using two indicator variables: the provider of the prenatal check-up and the number of antenatal visits. Provider of the prenatal check-up could be either a health professional (i.e. midwife, nurse, and physician) or a traditional birth attendant/healer. Number of antenatal visits was categorized into less than four or more than four. Intention and outcome of the first pregnancy were also dichotomized into intended or unintended, and livebirth or abortion/miscarriage respectively.

Socio-economic Status (SES)

SES comprised of education, household characteristics and religious affiliation. Educational attainment was categorized as completion/non-completion of secondary education. We collapsed wealth quintiles into three categories (i.e. income class): lower, middle and upper. Household size was also categorical by identifying if the household has the average household size in the Philippines or not (Philippine Statistics Authority 2012a). Religion was categorized as Catholic, Muslim or neither.

Demographic Characteristics

The current age of the respondents was centered at 18 years and squared, as was the age at first birth, in the final analysis.

The geographical characteristics included region and the type of residence. Instead of the main 17 regions, we used the three main island groups: Luzon, Visayas and Mindanao. The type of residence was categorized as rural or urban. The survey year was used as a continuous variable because of the equal interval between two consecutive surveys.

Use of Contraception

This referred to current use of modern contraception. It excluded folkloric and traditional family planning methods. Modern type of contraception included contraceptive pills, condoms, subdermal implants, IUDs, lactational amenorrhea method, sterilization, standard-days method, basal body temperature method and sympothermal method. We were unable to conduct separate analyses for each contraceptive method, because of the small sample size and lack of statistical power. Further disaggregation (long acting reversible, hormonal, barrier, permanent) would have given rise to analytical errors due to insufficient statistical power.

Partner Characteristics

Partner-related variables included age, education, living status and number of intimate partners. Age was categorized into five groups: "15–19", "20–24", "25–29", and "≥ 30". Educational attainment of the most recent partner was categorized as completion/ not completion of secondary education. Living status measured whether the respondent currently lived with her partner/husband in the same household. Number of intimate partners was also measured.

Data Analysis

We used the deformalized survey weights which were derived from the sample weights and the recent census of 15–19 and 20–24 years old. Initially, we conducted Chi square analysis and ANOVA to test bivariate associations while using the weighted proportion in each of the measures.

Univariate and multivariate logistic regression models were fitted using a stepwise modelling approach with a 0.20 p-value cut-off. We progressively added into the model SES (Step 1), first pregnancy characteristics (Step 2), and partner-related (Step 3/Final Model) characteristics, while adjusting all the models for use of contraception, geographical characteristics, survey year and religion. Finally we stratified the final model by age to observe any modifications in effect estimates. Age categories were divided into two groups (15–19 and 20–24); the 15–19 year old group included mother who

had their first and second pregnancy during teenage years while the 20–24 year old group included women who had their first two pregnancies either during teenage or young adult years. Interaction test between age and each correlate was conducted to empirically test age differences in effect size. Akaike's and Schwarz's Bayesian information criteria were used to determine the goodness of fit of the final model by comparing the final model with the previous models. We conducted a sensitivity analysis using three age categories, 15–18, 19–21 and 22–24, to explore difference with women who were below the legal age of consent (i.e. 18 years old).

Results

Sample Characteristics

Most of the respondents were from the Luzon region (n = 2388; 50.20%) and were living in households with lower income class (2386; 50.15%), as shown in Table 1. The highest proportion of repeat pregnancy was found in Mindanao and rural communities in terms of demographics. Respondents with poor SES (i.e. lower income class and didn't finish secondary education) showed a weighted prevalence of at least 50%. First pregnancy variables showed ~ 30% prevalence among those who had their prenatal examination performed by a traditional healer and reported higher number of antenatal visits. High prevalence of repeat pregnancy was also found among those who did not live with their husband (46.77%), had more than one intimate relationships (71.59%), whose partners were ≥ 30 years old (55.2%), and had the lowest educational attainment (54.67%).

Multivariate Analysis

Table 2 shows the stepwise logistic regression models. In the fully adjusted model, women in middle and lower income class had repeat pregnancy risks that were 53% and 71% higher compared with those in the upper quintiles. Respondents who had their first birth after 18 years old had decreased repeat pregnancy risk (OR = 0.95; CI = 0.93–0.97). Household size, employment status and number of ANC visits were dropped during modelling. Partner characteristics remained associated with increased odds of repeat pregnancy occurrence after full adjustment. Young women who reported having had more than one partner were about four times more likely to report a second pregnancy (OR = 4.19; CI = 1.57–11.19). Associations also remained for cohabitation, partner's lower levels of education and age (≥ 30 years). Results did not change substantively after adjustment for adolescent's current age (see S1).

Table 1 Participant characteristics

Characteristics	Repeated pregnancy		Total
	Yes n (wt%)	No n (wt%)	
Demographics			
Survey year*			
1993	440 (49.89)	442 (50.11)	882
1998	370 (45.45)	444 (54.55)	814
2003	417 (44.6)	518 (55.4)	935
2008	350 (37.15)	592 (62.85)	942
2013	438 (36.99)	746 (63.01)	1184
Region*			
Luzon	944 (39.53)	1444 (60.47)	2388
Visayas	333 (42.26)	455 (57.74)	788
Mindanao	738 (46.68)	843 (53.32)	1581
Type of residence*			
Urban	831 (39.14)	1292 (60.86)	2123
Rural	1184 (44.95)	1450 (55.05)	2634
Current Age*[a]	18.87 (1.91)	19.65 (2.13)	
Socio-economic status			
Educational attainment*			
No education/didn't finish HS	1079 (50.19)	1071 (49.81)	2150
Completed HS	936 (35.9)	1671 (64.1)	2607
Income class*			
Lower	1179 (49.41)	1207 (50.59)	2386
Middle	415 (41.33)	589 (58.67)	1004
Higher	421 (30.80)	946 (69.20)	1367
Employment*			
Unemployed	1517 (43.18)	1996 (56.82)	3513
Employed	490 (40.03)	734 (59.97)	1224
Religion			
Non-catholic	330 (41.67)	462 (58.33)	792
Catholic	1532 (41.95)	2120 (58.05)	3652
Islam	151 (48.71)	159 (51.29)	310
Household size*			
< 6 members	1240 (48.68)	1307 (51.32)	3042
≥ 6 members	775 (35.07)	1435 (64.93)	1715
Current use of contraception			
None/non-modern	1398 (41.93)	1936 (58.07)	3334
Modern	617 (43.36)	806 (56.64)	1423
First pregnancy			
Age of first birth*[a]	21.06 (2.16)	21.84 (1.82)	
Intention*			
Planned	1172 (39.37)	1805 (60.63)	2977
Unplanned	387 (29.25)	936 (70.75)	1323
Prenatal care provider*			
Traditional healer	183 (29.76)	432 (70.24)	615
Health professional	673 (22.74)	2287 (77.26)	2960
Number of antenatal visits*			
< 4	331 (31.83)	709 (68.17)	1040
4+	540 (21.07)	2023 (78.93)	2563

Table 1 (continued)

Characteristics	Repeated pregnancy		Total
	Yes n (wt%)	No n (wt%)	
Outcome*[b]			
Livebirth	1927 (41.27)	2742 (58.73)	4669
Abortion/miscarriage	88 (100)	0 (0)	88
Partner characteristics			
Partner's age (in years)*			
15–19	29 (20.86)	110 (79.14)	139
20–24	527 (37.48)	879 (62.52)	1406
25–29	627 (49.06)	651 (50.94)	1278
≥ 30	314 (55.18)	255 (44.82)	569
Educational attainment*			
No education/ didn't finish HS	1062 (51.48)	1001 (48.52)	2063
Completed HS	929 (39.3)	1435 (60.7)	2364
Residing with husband*			
Yes	135 (35.53)	245 (64.47)	380
No	1796 (46.77)	2044 (53.23)	3840
Number of intimate relationships*			
1	1928 (44.41)	2413 (55.59)	4341
> 1	63 (71.59)	25 (28.41)	88

n-sample; wt%-weighted proportion

HS high school

*Significant at < 0.001

[a]Mean and standard deviation was used instead of n and wt%

[b]Used Fisher exact test

Stratified Analysis

There were no apparent associations between repeat pregnancy and individual factors in stratified analysis (see Table 3), except for age of first birth and type of prenatal care provider. Estimates for respondents who had their first birth before 18 years old were elevated when compared to respondents who had their first birth when they were older than 18. Prenatal examination provided by a traditional healer, increased the repeat pregnancy risk by 93% (OR = 1.86; CI = 1.02–3.63) among women aged 15–19 years. Interaction tests confirmed these differences for age of first birth ($\beta = -0.19$; CI = -0.23 to 0.11; p < 0.001) and type of prenatal care provider ($\beta = -0.79$; CI = -1.58 to 0.01; p = 0.049).

Other factors displayed substantial effect sizes but failed to have significant interaction coefficients. Women in the lower income category showed an increased odds of repeat pregnancy among 20–24 year olds. In this age group, having an older partner and cohabitation remained to show increased repeat pregnancy risk with an OR of at least 1.43. A higher number of intimate relationships (OR = 7.23;

CI = 2.47–21.16) led to increased odds bordering on statistical significance (p-value = 0.08) in age interaction tests. We conducted a sensitivity analysis using three age categories, 15–18, 19–21 and 22–24. Although the small numbers in each cells did not allow some associations to reach agreed standards of statistical significance because of lack of statistical power, repeat pregnancy risk estimates for age of first birth, use of traditional healer and partner's age were remarkably similar to those reported in the main analysis (see S2). There was also a fourfold increased repeat pregnancy risk amongst those who reported a planned first pregnancy.

Discussion

Main Findings

In this paper we investigated factors influencing repeat pregnancy among adolescent and young mothers in the Philippines. In the overall sample, low SES, relationship characteristics such as older partners, cohabitation and partners' lower levels of education were linked to increased risk of repeat pregnancy. In stratified analysis, we found that prenatal examination performed by a traditional healer during the first pregnancy put adolescent mothers at higher risk of having another pregnancy.

Interpretation

Male involvement can play an important role in decisions about family planning and contraceptive use. (Bankole and Malarcher 2010; World Health Organization 2013). Our analysis identified cohabitation and large age differences between young women and their partners as strongly correlated with greater likelihood of repeat pregnancy, which confirms findings from other longitudinal research (Black et al. 2006; Raneri and Wiemann 2007). More frequent sexual contact can be expected among women living with their partners (Black et al. 2006) and this can lead to higher risk of subsequent conceptions particularly when the couple or either partners have limited or no knowledge on family planning (de Fátima et al. 2012). Wide age differences may reflect adolescents' reduced autonomy, greater financial dependency on male partners, and/or relative inexperience in handling relationships. There is also evidence that older partners express their support to young mothers by reassuring them they want the pregnancy (Bull and Hogue 1998). However this may have the unintended result of encouraging plans for a subsequent pregnancy (Boardman et al. 2006).

Compared to trained health professionals, traditional healers tend to provide inaccurate or no advice on family planning (Kabagenyi et al. 2016). It has been suggested

Table 2 Correlates of repeated pregnancy among adolescents and young adults: stepwise modelling expressed in odds ratio (95% confidence interval)

Correlates	Univariate	Adjusted for socio-economic status	+ First pregnancy	+ Partner characteristics
Socio-economic status				
Education				
Complete HS	1	1	1	1
No education/did not finish HS	**1.81 (1.59–2.05)**	**1.40 (1.22–1.61)**	1.10 (0.89–1.36)	1.02 (0.76–1.37)
Income class				
Upper	1	1	1	1
Middle	**1.67 (1.39–2.00)**	**1.55 (1.29–1.86)**	**1.58 (1.19–2.10)**	**1.53 (1.04–2.27)**
Lower	**2.29 (1.96–2.67)**	**1.88 (1.57–2.24)**	**1.94 (1.47–2.54)**	**1.71 (1.17–2.49)**
Household size				
≤5 members	1	1	1	
>5 members	**0.57 (0.50–0.65)**	**0.69 (0.61–0.79)**	0.74 (0.60–1.04)	
Employment status				
Employed	1	1		
Unemployed	1.11 (01.96–1.29)	0.96 (0.83–1.12)		
First pregnancy				
Age of first birth (in years)[a]	**0.95 (0.94–0.95)**		**0.95 (0.93–0.96)**	**0.95 (0.93–0.97)**
Intention				
Unplanned	1		1	1
Planned	**1.56 (1.34–1.81)**		**1.40 (1.12–1.74)**	1.08 (0.81–1.44)
Prenatal care provider				
Health professional	1		1	1
Traditional healer	**1.57 (1.26–1.96)**		1.16 (0.89–1.51)	0.94 (0.66–1.35)
Number of antenatal visits				
4+	**1**		1	
<4 visits	**1.92 (1.62–2.30)**		0.92 (0.76–1.11)	
Partner characteristics				
Partner's age (in years)				
15–24	1			1
25–29	**1.72 (1.45–2.05)**			**1.52 (1.14–2.03)**
≥30	**2.37 (1.91–2.94)**			**1.99 (1.41–2.82)**
Residing with husband				
Yes	**1.53 (1.19–1.95)**			**1.55 (1.02–2.36)**
Number of intimate relationships				
1	1			1
>1	**3.38 (2.02–5.66)**			**4.17 (1.57–11.07)**
Educational attainment				
Completed HS	1			1
No education/didn't finish HS	**1.65 (1.44–1.90)**			1.29 (0.95–1.74)

Outcome of pregnancy was dropped due to collinearity. All steps were adjusted for current use of contraception, survey year, type of residence and religion

All estimates in bold are significant at 0.05 level of error

[a]Centered at 18 years

that this may cause misconceptions about the use of modern contraceptives, and/or not build the individual capital and resources much needed to postpone subsequent pregnancies. In contrast, health professionals have a mandate to encourage greater thinking around subsequent conceptions, and evidence shows that prenatal check-ups performed by trained health professionals incorporate advice on future family planning (Dean et al. 2014), hence improving access and use of postpartum contraceptives (Banke-Thomas et al. 2017).

Table 3 Correlates of repeated pregnancy by age groups (15–19 and 20–24 years old) using fully adjusted model expressed in odds ratio (95% confidence interval)

Correlates	Age groups (in years)		Interaction term (p-value)
	15–19	20–24	
Socio-economic status			
Educational attainment			
Completed HS	1	1	
No education/didn't finish HS	1.41 (0.67–3.00)	1.07 (0.76–1.45)	0.458
Income class			
Upper	1	1	
Middle	2.09 (0.78–5.62)	1.43 (0.94–2.19)	0.443
Lower	0.92 (0.35–3.57)	**1.97 (1.31–2.96)**	0.256
First pregnancy			
Age of first birth (in years)[a]	**1.12 (1.04–1.20)**	**0.93 (0.91–0.95)**	**< 0.001**
Intention			
Unplanned	1	1	
Planned	1.62 (0.79–3.34)	0.98 (0.71–1.36)	0.223
Prenatal care provider			
Health professional	1	1	
Traditional healer	**1.93 (1.02–3.63)**	0.74 (0.48–1.14)	**0.049**
Partner characteristics			
Partner's age (in years)			
15–19	1	0.53 (0.16–1.77)	
20–24	0.92 (0.36–2.35)	1	
25–29	1.12 (0.39–3.17)	**1.43 (1.02–2.00)**	0.603*
≥ 30	2.68 (0.62–11.53)	**1.61 (1.08–2.39)**	0.300*
Residing with husband			
Yes	1.17 (0.38–3.57)	**1.70 (1.07–2.69)**	0.407
Number of intimate relationships			
> 1	1.03 (0.15–7.13)	**7.23 (2.47–21.16)**	0.080
Educational attainment			
Completed HS	1	1	
No education/didn't finish HS	1.12 (0.30–2.08)	1.36 (0.96–1.92)	0.563

Outcome of pregnancy was removed due to collinearity. All the steps were adjusted for current use of contraception, survey year, type of residence and religion

All estimates in bold are significant at 0.05 level of error

*Reference group for interaction test is 15–24 years old

[a]Centered at 18 years

Pregnant adolescents usually consult traditional healers not only because of low cost services and long distance from health facilities but also because of perceived assurance of confidentiality (Biddlecom et al. 2007). Difference in the age effect can be explained by adolescents' low level of education and poor decision-making ability to delay another pregnancy compared to young adults (Oluwasola et al. 2017; Reynolds et al. 2006). Providing adolescent-friendly prenatal services (Chandra-Mouli et al. 2013), through positive attitude among service providers could address these concerns. Home visitations have also been found to be an effective by assisting adolescents to develop a contraceptive plan during pregnancy (Corcoran and Pillai 2007; Sheeder et al. 2009).

We found that younger age at first birth increased repeat pregnancy risk among adolescents. This finding has also been observed in a cross-sectional study based in a tertiary hospital in Brazil (de Fátima et al. 2012) and a national longitudinal youth survey in the USA (Davis 2002). Younger age at first birth allows greater amount of time of exposure to repeat pregnancy risk during teenage years, likely school drop-out with consequent higher exposure to repeat pregnancy (Maravilla et al. 2017).

Multiple partners showed null effect among teenagers compared to young adults, with age interaction term that bordered statistical significance. Despite the low prevalence of multiple partners in our sample, this finding is

supported by results from USA-based studies with high prevalence of multiple partners (Black et al. 2006; Montgomery 2010).

Strengths and Limitations

This study has several strengths. Firstly it establishes the complexity of repeat pregnancy in the context of a developing country. Our study also used a robust cross-sectional design using 20 years of data allowing us to adjust our country-level estimates for trends of repeat pregnancy and other key determinants of ARH in the past two decades. The 5-year gap between surveys enabled us to avoid inclusion of the same age group participants from one survey to the next since all teenagers in one survey would have become young adults in the subsequent survey. Lastly, the DHS has been widely and regularly conducted in over 90 developing countries worldwide which therefore permits capacity to implement future cross-country and regional comparisons.

The study has some limitations. Despite the relevance of our findings, the temporality between the factors we investigated and the occurrence of a second pregnancy could not be established. For partner-related variables, we were not able to ascertain if the adolescents had a partner with such characteristic before or after the repeat pregnancy occurred. Also, the effect of education was not well examined because of the unavailability of data regarding the education of the adolescent between the first and the second pregnancy, however this is a limitation common to other studies (Maravilla et al. 2017). Our cross-sectional data concurrently measured (current) use of contraception and occurrence of repeated pregnancy. This means that use of contraception could have been the result of repeat pregnancy, particularly if repeated pregnancy occurred before the survey. Therefore, we were unable to come up with a robust estimate for modern contraceptive use as a predictor. Longitudinal data is needed to achieve temporal assumption between repeat pregnancy and contraceptive use while reducing the potential effect of recall bias as well as testing possible mediating effects (Maravilla et al. 2018). We also had reduced statistical power due to our small sample size for some analyses. Using datasets or surveys focused on adolescents may allow increased sample size and more robust correlation and interaction estimates than this study was able to provide.

Repeated pregnancies among young mothers are more likely among those from lower SES, with older partners and cohabiting with their partner. Younger age at first birth and traditional healers as prenatal care providers during first pregnancy increased the repeat pregnancy risk among teenagers compared with older women. Further studies are necessary to confirm these findings using both longitudinal data and replications in other developing countries.

Compliance with Ethical Standards

Conflict of interest The authors have no conflicts of interest to disclose.

Ethical Approval This study underwent an expedited review and was approved by the University of Queensland—School of Public Health Ethics Committee last 11 April 2016.

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