



Gestational age at first antenatal visit in Namibia

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Abstract

Objectives To examine the relationship between pregnancy intention and gestational age at first antenatal visit in Namibia.

Methods This study uses secondary data from the 2013 Namibia Demographic and Health Survey (NDHS). Log-normal survival models are used to examine the independent effect of pregnancy intention on gestational age at first antenatal visit while controlling for relevant sociodemographic and socioeconomic covariates.

Results This study finds that those who indicated unwanted pregnancies were significantly more likely to delay initiating antenatal care (ANC). Other variables also associated with gestational age at first antenatal visit include contact with a health worker, health insurance, media exposure to safe motherhood messages, birth order, relationship with

head of household, maternal education, and urban residence.

Conclusions Timely ANC is necessary to identify and mitigate risk factors in pregnancy but many mothers in Namibia do not receive such care. Reducing unwanted pregnancies through family planning may limit ANC delays. After unwanted pregnancies occur, women may benefit from further education and resources that empower them to pursue ANC promptly.

Keywords Antenatal care · Pregnancy intention · Maternal health · Namibia · Focused antenatal care · Timely care

Introduction

Timely antenatal care (ANC) is critical to maternal and newborn health. Timely ANC facilitates early identification of syphilis, anaemia, malaria, and HIV among other conditions which is key to their management or treatment during pregnancy. The timing of a pregnant female's first antenatal visit also marks the window of opportunity to develop a birth plan, emergency protocol, and healthy habits with the support of a health worker.

The timing of ANC in Namibia is question begging; while 70.4 % of pregnant females made at least 4 antenatal visits in 2009, only 33.9 % of said females made their first visit in their first trimester (Wang et al. 2011). Despite near universal ANC in Namibia, the country's maternal mortality ratio continues to increase (WHO 2010) illustrating the significance of problems like delayed ANC. With the exception of Ghana, delayed ANC is also observed in numerous other countries in Sub-Saharan Africa (SSA) such as Zimbabwe and Zambia (Wang et al. 2011).

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Research suggests multiple reasons for ANC delays in SSA which the Three Delays framework broadly categorizes as delays in seeking, reaching, and receiving ANC. Single or divorced status, lack of education, and youth are associated with lower likelihood of seeking ANC (Magadi et al. 2004). Rural residence is generally associated with delays in reaching ANC (Obermeyer and Potter 1991). One important barrier to receiving ANC is financial cost. Despite policies assuring free ANC in Ghana, Kenya and Malawi, females report user fees for certain antenatal procedures and significant expenses such as transportation to clinics (Birungi and Ouma 2006; Pell et al. 2013). These costs coupled with strained health resources further delays in receiving ANC.

At present, the World Health Organization (WHO) recommends a Focused Antenatal Care (FANC) model in areas with limited health resources and where females experience challenges accessing ANC (Carroli et al. 2001). This model compresses essential maternal health interventions for healthy pregnant females into four goal-oriented visits, ideally around 8–12 weeks, 24–26 weeks, 32 weeks and 36–38 weeks (The Partnership for Maternal, Newborn and Child Health 2006). Namibia is one of many SSA countries that have adopted a FANC model. Theoretically, the FANC model attempts to adjust for two of three aforementioned types of delays: reaching and receiving ANC. The model requires fewer visits per females and thus by reducing transportation and money required by pregnant females for ANC and demand on health resources, the FANC model improves access to ANC. However, delays in seeking ANC due to sociocultural barriers remain largely unaddressed. This study seeks to deepen our understanding of such delays by examining the role of unintended pregnancy on the timing of ANC among pregnant females. Unintended pregnancies are defined as pregnancies that, at the time of conception, are either mistimed, i.e. the mother intended the pregnancy to occur but at a later time or unintended, i.e. the mother did not want the pregnancy to occur at that time or any time in the future (Santelli et al. 2003).

Numerous studies confirm that females with unintended pregnancies are associated with negative maternal behaviours such as smoking and drinking during pregnancy (Eggleston et al. 2001; Joyce and Grossman 1990; Weller et al. 1987). However, most investigation of the link between pregnancy intention and maternal behaviour is concentrated in developed countries. Few studies have examined this relationship in developing regions. This paper seeks to contribute to our understanding of how pregnancy intention is related to maternal behaviour by examining the relationship between pregnancy intention and gestational age at first antenatal visit among pregnant females in Namibia.

Methods

This study is set in Namibia, a country in southwest Africa, bordered by Angola, Zambia, Zimbabwe, Botswana, and South Africa. Namibia covers an area of 824,292 km² and has a population of 2,198,406 people (CIA 2015). Approximately, 46.7 % of Namibians reside in urban areas (CIA 2015). Across the thirteen Namibian regions studied, ANC is most prevalent among pregnant females in Oshana, with 99 % of pregnant females in this region receiving care in 2013 (MoHaSS et al. 2014). ANC is least prevalent among pregnant females in Omaheke, with 89 % of pregnant females in this region receiving care in 2013 (MoHaSS et al. 2014). Overall, most pregnant females in Namibia have received ANC from a skilled health provider in 2013 in Namibia and this degree of uptake varies little geographically.

This study uses secondary data from the 2013 Namibia Demographic and Health Survey (NDHS), a nationally representative cross-sectional dataset collected at the household level through a stratified random sampling procedure by Namibia's Ministry of Health and Social Services. A detailed description of the NDHS sampling procedure is reported elsewhere (MoHaSS 2014). NDHS surveyed 9176 females within 9849 households in Namibia using face-to-face interviews. All females aged between 18 and 49 years who were usual residents of the sampled households or who slept in the sampled households the night before the survey were eligible for the survey and 89 % of females responded. To assess the relationship between pregnancy intention and time to first antenatal visit, the present analysis focuses on 3812 females who reported having a live birth in the 5 years preceding the survey. The retrospective period of the survey—5 years—implies that it is possible that the data include information from women who were pregnant at even younger teenage years.

The dependent variable for this analysis is time to first ANC visit. In the 2013 NDHS, females between the ages of 18 and 49 years who reported having a live birth in the 5 years preceding the survey were asked whether they had received ANC (coded no = 0 and yes = 1) and, if so, the time in months from conception to their first ANC visit. In the case of females with two or more live births during the 5 years preceding the survey, this question pertained to their most recent pregnancy. The focal independent variable, pregnancy intention, was constructed from responses to a retrospective question posed to females, 'Did you want to get pregnant when you conceived your current pregnancy?' Females were able to describe their pregnancies as wanted, mistimed, or unwanted. The first of these three responses were interpreted as intended pregnancies at the time of conception and the latter two were interpreted as

unintended pregnancies at the time of conception (coded intended = 0, unintended = 1). Theoretically, responses may imply the pregnancy intention of both the mother and her partner. However, practically, surveys generally consider mothers' reports as a standard measure of pregnancy intention (Logan et al. 2007). We also controlled for theoretically relevant covariates shown in Table 1. These include health literacy, health insurance, birth order, marital status, education, household wealth and area of residence as shown in Table 1. To determine household wealth, the NDHS collects data about household asset including consumer items like cars and dwelling characteristics and constructs a wealth index using Principal Component Analysis.

Log-normal survival models were used to examine the independent effect of pregnancy intention on the time to first antenatal visit while controlling for theoretically relevant covariates. The log-normal model was chosen over other parametric models because of the shape of the hazard function as shown in Fig. 1. The log-normal model parameterizes in accelerated failure time metric and estimates directly time to first ANC visit (Lawless 1982). Using Stata 13 SE (StataCorp LP), we obtained time ratios that show how early or late pregnant women who reported having an unintended pregnancy have their first antenatal visit relative to those with an intended pregnancy. A time ratio of magnitude of less than one signifies faster timing or initiating ANC earlier and a time ratio of magnitude greater than one indicates slower timing or initiating ANC later, compared to the reference category. Frailty was also introduced into all the models to account for unobserved heterogeneity between individuals in the sample, and to obtain more robust parameter estimates.

Results

Descriptive statistics

As seen in Table 2, the majority of Namibian women (53.1 %) reported their pregnancies as unintended, and slightly less than half (46.9 %) classified their pregnancies as intended. With respect to contact with health worker, about half of females in this study had contact with a health worker in the year preceding the survey (52.7 %). An overwhelming majority of the sample lack health insurance (80.1 %). Regarding birth order, 28 % of the sample reported their most recent pregnancy as their first pregnancy and 26 % categorized their pregnancy as their second pregnancy. More than half reported a third (19 %) or fourth or higher (27 %) birth order. Over half (53.2 %) of females are unmarried. Most other females are married or living with a partner (37.9 %) with few, separated,

Table 1 Univariate and bivariate analysis of time to first antenatal care visit in Namibia based on 2013 Namibia Demographic Health Survey Data

Variables	Number (%)	Time ratio (CI)
Pregnancy intention		
Wanted pregnancy		
Yes (ref)	1754 (46.9)	1.00
No	2158 (53.1)	1.06 (1.03–1.09)***
Contact with health worker		
No (ref)	1801 (47.3)	1.00
Yes	2011 (52.7)	0.93 (0.90–0.95)***
Media exposure to safe motherhood messages (factor score)	3812	0.98 (0.96–0.99)*
Health insurance coverage		
No	3049 (80.1)	1.00
Yes	762 (19.9)	0.75 (0.71–0.79)***
Birth résumé and personal history		
Birth order		
First order (ref)	1067 (28.0)	1.00
Second order	991 (26.0)	0.95 (0.92–0.99)*
Third order	724 (19.0)	0.96 (0.92–1.01)
Fourth or higher	1029 (27.0)	1.00 (0.97–1.04)
Marital status		
Never married (ref)	2029 (53.2)	1.00
Married/living together	1410 (37.9)	0.96 (0.94–0.99)*
Separated/widowed/Div.	335 (0.08)	0.98 (0.92–1.05)
R/ship with h/hold head		
Head themselves	1022 (26.8)	1.00
Wife	895 (23.5)	1.00 (0.96–1.04)
Daughter	770 (20.2)	1.06 (1.02–1.11)**
Daughter-in-law/ grand daughter	480 (12.6)	1.09 (1.04–1.14)***
Fostered/non-relation	643 (16.8)	1.05 (1.00–1.10)*
Socioeconomic and demographics		
Wealth quintiles		
Poorest (ref)	624 (16.4)	1.00
Poorer	692 (18.2)	0.99 (0.96–1.04)
Middle	780 (20.4)	1.01 (0.96–1.04)
Richer	895 (23.9)	0.96 (0.91–0.99)*
Richest	820 (21.5)	0.83 (0.78–0.87)***
Education		
No formal education (ref)	276 (7.24)	1.00
Primary	875 (22.9)	0.93 (0.86–0.98)*
Secondary	2374 (62.3)	0.89 (0.84–0.95)***
Higher	286 (7.5)	0.69 (0.63–0.76)***
Primary place of residence		
Urban (ref)	1965 (51.5)	1.00
Rural	1847 (48.5)	0.96 (0.91–0.99)*

Statistical significance: * $p < 0.05$, ** $p < 0.005$, *** $p < 0.001$

widowed, or divorced (8.9 %). From most to least frequently, Namibian females are heads of their households (26.8 %) or wives (23.5 %), daughters (20.2 %),

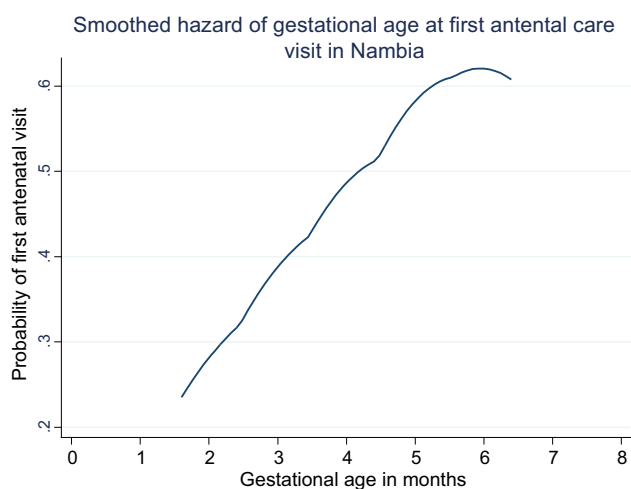


Fig. 1 Smoothed hazard curve showing probability of a pregnant woman initiating antenatal care within the first trimester of her pregnancy based on 2013 Namibia Demographic Health Survey Data

daughters-in-law or granddaughters (12.6 %), or fostered or unrelated (16.8 %) to the heads of their households. When it comes to socioeconomic status, the wealth category with the largest proportion of respondents is ‘richer’ (23.9 %) followed by ‘richest’ (21.5 %). Still, a majority of females cumulatively compose the lower three wealth quintiles: middle (20.4 %), poorer (18.2 %), and poorest (16.4 %). In terms of education status, most females report attaining secondary education (62.3 %). Females with no formal education or primary education account for 7.24 and 22.9 % of the sample, respectively. A small proportion of females (7.5 %) reports attaining higher education. Similar numbers of pregnant females reside in urban (51.5 %) and rural (48.5 %) areas.

Hazard analysis

In this study, the hazard represents the probability of whether and, if so, when a pregnant woman in Namibia initiates ANC. Inspection of Fig. 1 shows that the probability of a pregnant woman initiating ANC within the first trimester of her pregnancy as recommended by WHO is only 0.4. In other words, only 40 % of women initiate ANC prior to gestational age of 12 weeks as recommended by the WHO’s FANC model. The median lifetime—the gestational age at which 50 % of mothers are expected to make their first antenatal visit is 16 weeks. The median lifetime of 16 weeks represents mid-point gestational age, such that there is an equal probability for the typical Namibian pregnant woman to fall above or below it in terms of having first ANC visit. The hazard function distinctively peaks once around 24 weeks where the probability of initiating ANC is highest, and declines thereafter. When the hazard is stratified by pregnancy intention as shown in Fig. 2, gestational age at first

ANC visit significantly varies between women with intended pregnancies and women with unintended pregnancies. Females with intended pregnancies are consistently more likely to initiate ANC than females with unintended pregnancies.

Bivariate analysis

Table 2 presents time ratios from the hazard models built with each independent variable. The bivariate analysis suggests that women with unintended pregnancies delayed initiation of ANC relative to women with intended pregnancies (TR = 6.3 %, $Z = 4.14$, $p < 0.00$). The same was true of women who were daughters (TR = 6.2 %, $Z = 3.04$, $p < 0.05$), daughters in-law or granddaughters (TR = 9.3 %, $Z = 3.63$, $p < 0.000$), fostered or unrelated to the head of their household (TR = 5.2 %, $Z = 2.16$, $p < 0.05$) compared to women who were heads of their households.

On the other hand, the bivariate analysis suggests that women who had contact with a health worker initiated ANC earlier (TR = 9.3 %, $Z = -4.79$, $p < 0.000$). Similarly women who reported high level of exposure to safe motherhood media (TR = 2.1 %, $Z = -2.61$, $p < 0.0001$) or had health insurance (TR = 1.60 %, $Z = -2.34$, $p < 0.05$) initiated ANC earlier than women who reported low level of exposure to media messages and were without health insurance coverage, respectively. With regards to personal history, having birthed exactly one child only was associated with early initiation of ANC (TR = 4.6 %, $Z = -2.30$, $p < 0.05$). Being married or living with a partner (TR = 2.6 %, $Z = -1.59$, $p < 0.05$) was also associated with reduced time to first ANC visit. Wealth is associated with early initiation of ANC. Women from households in richest quintile (TR = 17.4 %, $Z = -6.68$, $p < 0.000$) and richer (TR = 4.1 %, $Z = -2.87$, $p < 0.05$) initiated ANC earlier than women from households in the poorest wealth quintile. Mothers with higher than secondary (TR = 20.3 %, $Z = -7.35$, $p = 0.000$), secondary (TR = 10.1 %, $Z = -3.51$, $p < 0.000$) or primary (TR = 7.4 %, $Z = -2.29$, $p < 0.05$) education initiated ANC earlier than those without formal education. Remarkably, education shows a steady gradient, with increases in schooling progressively associated with decreases in time to first ANC visit. Surprisingly, rural residence is associated with earlier start (TR = 21.67 %, $Z = -2.64$, $p < 0.001$) of ANC compared to urban residence.

Multivariate analysis

Three multivariate models are fitted as shown in Table 2. In the first model, we examine the effects of pregnancy

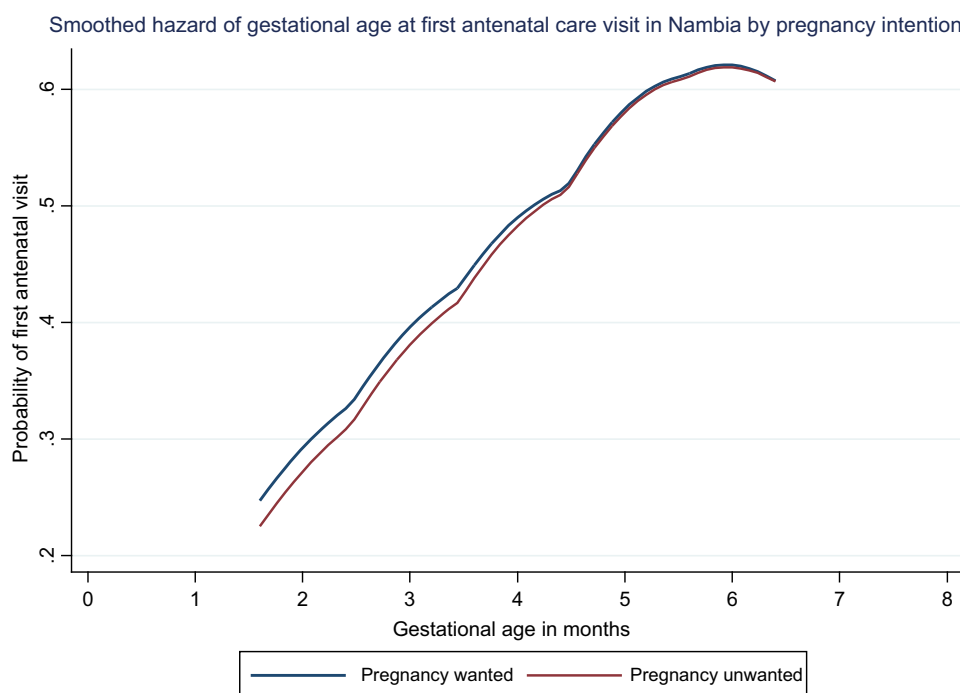
Table 2 Multivariate hazard analysis of time to first antenatal care visit in Namibia based on 2013 Namibia Demographic Health Survey Data

Variables	Model 1 Time ratios (CI)	Model 2 Time ratios (CI)	Model 3 Time ratios (CI)
Pregnancy intention			
Wanted pregnancy			
Yes (ref)	1.00	1.00	1.00
No	1.03 (1.00–1.07)*	1.03 (1.00–1.06)*	1.03 (1.00–1.06)*
HW contact			
No (ref)	1.00	1.00	1.00
Yes	0.95 (0.91–0.96)***	0.93 (0.91–0.97)***	0.94 (0.91–0.96)*
Media exposure to safe motherhood messages (factor score)	1.00 (0.98–0.96)	1.00(0.99–1.02)	0.95 (0.92–0.99)*
Health insurance coverage			
No	1.00	1.00	1.00
Yes	0.76 (0.71–0.79)***	0.76 (0.72–0.80)***	0.80 (0.76–0.84)***
Birth résumé and personal history			
Birth order			
First order (ref)		1.00	1.00
Second order		1.01 (0.96–1.04)	0.96 (0.92–0.99)*
Third order		1.08 (1.02–1.12)**	0.98 (0.94–1.05)
Fourth or higher		1.15 (1.09–1.22)***	0.99 (0.95–1.03)
Marital status			
Never married (ref)		1.00	1.00
Married/living together		1.03 (0.99–1.07)	1.03 (0.99–1.07)
Separated/widowed/div.		1.02 (0.94–1.07)	0.98 (0.92–1.05)
R/ship with household head			
Head themselves		1.00	1.00
Wife		0.97 (0.93–1.02)	0.99 (0.95–1.03)
Daughter		1.01 (0.97– 1.07)	1.04 (1.00–1.09)*
Daughter-in-law/grand daughter		1.02 (0.97–1.07)	1.05 (1.00–1.11)*
Fostered/non-relation		0.99 (0.94–1.03)	1.06 (1.01–1.15)*
Socioeconomic and demographics			
Wealth quintiles			
Poorest (ref)			1.00
Poorer			1.00 (0.95–1.04)
Middle			1.01 (0.97–1.06)
Richer			1.01 (0.98–1.04)
Richest			0.92 (0.86–0.98)
Education			
No formal education (ref)			1.00
Primary			0.93 (0.87–0.99)*
Secondary			0.93 (0.87–0.99)**
Higher			0.86 (0.77–0.95)***
Primary place of residence			
Urban (ref)			1.00
Rural			1.06 (1.00–1.15)*
Sample size	3812	3812	3812
Log pseudo likelihood	–2387.13	–2303.76	–2289.64
Model sig (Wald)	45.24	162.33	186.33

Time ratios are reported for all models

Statistical significance: * $p < 0.05$, ** $p < 0.005$, *** $p < 0.001$

Fig. 2 Smoothed hazard curve showing probability of a pregnant woman initiating antenatal care within the first trimester of her pregnancy stratified by pregnancy intention and based on 2013 Namibia Demographic Health Survey Data



intention, contact with health worker, exposure to media messages and health insurance coverage on the timing of the first ANC visit. The second model adds variables capturing the effects of birth resume and personal history which include birth order, marital status and relationship with the household head. In the third model, we examine the effects of socioeconomic and demographic factors which include household wealth, education attainment and primary area of residence.

The results show that pregnancy intention is a significant predictor of increased time to first ANC visit. Mothers who indicated that their pregnancy was unintended delayed initiating their ANC (TR = 3.6 %, $Z = 2.48$, $p < 0.05$) compared to mother who indicated that their pregnancy was intended. With respect to contact with health worker, mothers who indicated having been in contact with a health worker in the 12 months prior to the survey initiated ANC earlier (TR = 6.9 %, $Z = -4.25$, $p < 0.000$) than mothers who reported no contact. Similarly, mothers who report having health insurance coverage initiated ANC earlier (TR = 24.5 %, $Z = -10.26$, $p < 0.000$) than mothers without health insurance coverage.

When variables capturing the effects of birth resume and personal history are entered in model 2, the effect of pregnancy intention on the timing of ANC is retained. Mothers who reported that the child they were pregnant with was a third-order birth (TR = 8.0 %, $Z = 2.16$, $p < 0.05$) and fourth-order birth or higher (TR = 15.1 %, $Z = 5.7$, $p < 0.000$) delayed initiating their ANC compared to mothers whose pregnancy was a first order. Unlike

in the bivariate analysis, marital status and relationship with household head lost significance when they were entered alongside birth order in model 2.

Socioeconomic and demographic variables are entered in model 3. Consistent with the bivariate analysis, education is a strong predictor of early ANC in the third multivariate model. Mothers with higher (TR = 14.0 %, $Z = -2.84$, $p < 0.05$), secondary (TR = 6.1 %, $Z = -2.23$, $p < 0.05$) and primary education (TR = 7.1 %, $Z = -2.83$, $p < 0.05$) initiated their first ANC visit earlier than mothers without formal education. Residing in a rural area was also maintained its significant association with the timing of first ANC visit but unlike in the bivariate analysis, the direction of the association reversed in the multivariate models. Rural residence is associated with delayed initiation of ANC (TR = 4.1 %, $Z = 2.10$, $p < 0.05$) compared to urban residence. The association between relationship with household head and time to first antenatal visit picked up significance in the presence of socioeconomic and demographic variables, suggesting suppressor effect. Pregnant mothers who reported media exposure to safe motherhood messages initiated ANC earlier (TR = 5 %, $Z = -2.34$, $p < 0.05$) than those who reported no exposure. Being a daughter (TR = 4.4 %, $Z = 2.01$, $p < 0.05$), daughter-in-law/granddaughter (TR = 5.8 %, $Z = 2.30$, $p < 0.05$), and fostered/non-relation (TR = 2.4, $Z = 2.11$, $p < 0.05$) was associated with delayed initiation of ANC. Similarly, the association between exposure to media messages and the timing of first ANC also gained significance in the presence

of variables controlling for socioeconomic and demographic factors. It is noteworthy, however, that even after controlling for socioeconomic and demographic factors in model 3, the relationship between pregnancy intention and time to first ANC visit remained robust.

Discussion

The hazard function shows that less than half of women in Namibia initiate ANC within the first trimester as recommended by WHO. Only half of pregnant mothers make their first ANC visit by the gestational age of 24 weeks, the point at which mothers should begin to make their second ANC visit as recommended by the FANC. This implies that nearly half of pregnant women in Namibia are already at least than two visits behind schedule by the time they make their first ANC visit. Even this approximation is likely a conservative estimate given that in low resource settings women tend to rely on the last menstrual period method to determine conception, a method prone to underestimate gestational age (Rosenberg et al. 2009). The shape of the hazard curve in Fig. 1 has important implications for the timing of potential ANC promotion. It speaks to the need to find appropriate ways of encouraging mother to report early for ANC, especially in light of the recently introduced FANC model which recommends a limited number of ANC visits for low-risk pregnancies.

In this study, more than half of (53.1 %) females reported unintended pregnancies, suggesting substantial barriers to the uptake of family planning services. Further, our multivariate analysis suggests pregnancy intention is a significant determinant of timely ANC, highlighting the role of family planning in reducing ANC delays. The utility of family planning to maternal health via pregnancy intention is supported by numerous maternal health studies (Singh et al. 2009; Tsui et al. 2010). Our finding, however, contradicts one of few studies which have previously focussed on the links between maternal health and pregnancy intention (Gage 1998). Gage found that pregnancy intention did not significantly determine the timing of the first ANC visit among a cohort of females in Namibia. In this 1992 study, 66.5 % of females reported intended pregnancies while our 2013 study shows only 46.9 % of females reported intended pregnancies. Limited freedom to express pregnancy intention in 1992 relative to 2013 maybe have obscured the role of pregnancy intention in timing of the first ANC visit in Gage's study.

There are a number of factors which may explain why females with unintended pregnancies delayed initiation of ANC. Females with unintended pregnancies may delay ANC if they are contemplating abortion. Indeed, nearly 20 % of obstetric complications in Namibia are attributed to

unsafe abortions (WHO 2009). Pregnant teenagers are especially vulnerable to this scenario and given Namibia's remarkably high rate of teenage pregnancy, contemplating abortion may pose significant delays to ANC (WHO 2009). For instance, in the year 2013, more than a quarter (26.3 %) of females with unintended pregnancies were between the ages of 15–19 and further nearly all (94.6 %) of these females were unmarried (MoHaSS et al. 2014). Cultural norms that denounce pregnancy out of wedlock may create shame or fear of reprisal that compels unmarried women to conceal their pregnancy in the early stages which also leads to delays in ANC (Glei et al. 2003; Thogarapalli et al. 2015; Weller et al. 1987). It is paramount that the effect of pregnancy intention on maternal behaviour should be understood within context of sociocultural norms that govern sexual behaviour and child bearing.

This study also highlights the role of health insurance in enhancing access to maternal care. Even though maternal services, including ANC, are provided for free of charge in Namibia, health insurance coverage still confers several advantages to those with coverage. Insurance permits more frequent contact with health providers, provides access to better quality health care from the private sector in a context marked by poor quality of public health services, can empower clients to demand services from service providers and hence reduce time to first antenatal visit (Jütting 2004; Knaul and Frenk 2005).

The significance of media exposure to safe motherhood messages to time to first antenatal visit underscores the importance of health literacy and health promotion in enhancing access and utilization of maternal health. This is especially vital for poor-resource regions, like Namibia, which tend to have limited channels for disseminating health information and still primarily depend on mass media such as national radio or press for health literacy (Kuhlmann et al. 2008; Mkandawire 2015). Similarly, regular contact with health worker can be a critical source of health information and advice for pregnant mothers in the absence of family doctors as is sometimes the case in Namibia. In addition to being better informed, mothers who are in regular contact with health workers may be more familiar with and, therefore, comfortable using maternal health services.

The finding that second birth order is associated with early start of ANC challenges other studies that report poor ANC attendance among multigravida mothers (Magadi et al. 2000). Second-time mothers are more likely to seek ANC promptly possibly because they are more likely to have received ANC in the past and understand the benefits of ANC relative to first time mothers. More experienced mothers may not have benefitted from the recent universal rollout of ANC in Namibia during previous pregnancies, perhaps explaining why the relationship does not continue for higher order births.

Women who are daughter, daughter-in-law/granddaughter, and fostered/non-relation to their household head report significant delays in time to first ANC visit. Remarkably, a steady gradient appears between social distance from household head and delay of ANC. This may be the result of household power dynamics which reflects decreasing autonomy in decision making or access to health care resources the further away one is from the household head in terms of blood ties.

This study also shows that maternal education is an important predictor of time to first antenatal visit in Namibia. This finding is consistent with numerous studies that argue a positive relationship between education and utilization of ANC (Elo 1992; Raghupathy 1996) and calls for evaluations of education that account for its health benefits. Remarkably, the bivariate analysis and multivariate analysis to a lesser extent suggest a steady gradient across successive levels of education, adding to a body of research that argues even slight progress in schooling, such as gaining a primary education, could be advantageous in improving ANC utilization (Ahmed et al. 2010; Mkan-dawire 2015).

Rural residence is associated with delayed ANC compared to urban residence. This association is consistent with many studies which argue that because rural areas tend to be under-resourced, rural residents suffer from poor health outcomes relative to urban residents (Dolea et al. 2010; Lehmann et al. 2008). Several studies have shown that maternal health indicators such as delivery by trained health provider, delivery by caesarian section and postnatal care are vastly more favourable in urban areas (Zere et al. 2010). In Namibia, a profound urban bias in health infrastructure development coupled with a largely rural population renders a significant reduction in maternal mortality particularly difficult.

Conclusion

ANC program managers should be mindful that even with the WHO's FANC model, timely ANC is not uniformly accessed by pregnant women in Namibia. This study finds that those who indicated unintended pregnancies were significantly more likely to delay initiating ANC. This effect persists even after controlling for the influence of sociodemographic and socioeconomic variables, suggesting pregnancy intention is independently associated with maternal behaviour. This finding first highlights the benefit of reducing of unwanted pregnancies as a way of limiting ANC delays in Namibia and other SSA countries. Second, once unwanted pregnancies occur, women may benefit from further education and resources that empower them to pursue ANC promptly. This study is limited by the cross-sectional nature of the data, which

prevents us from drawing a definitive causal relationship between pregnancy intention and time to first antenatal visit. Second, the findings of the study may also be affected by social desirability bias typically associated with survey data generated from self-reports. Social desirability bias refers to a tendency of survey respondents to give answers that generally conform to the expected standards of behaviour or practice that are obtained in a particular social or cultural context. Additionally, significant factors of ANC utilization such as perceived quality of ANC institutions could not be included in this analysis because of a lack of data at the national level (Griffiths and Stephenson 2001). Future studies that comprehensively incorporate such factors may help to gauge the relative criticality of pregnancy intention to timely ANC amidst other factors. Nonetheless, this study importantly identifies the potential role of pregnancy intention in shaping maternal health service utilization within the context of SSA, a social determinant of health that has hitherto received little attention in SSA relative to developed countries.

Compliance with ethical standards

Ethical statement The authors declare that they have no conflict of interest. NDHS data are made freely available to the general public through MEASURE DHS, a USAID-funded project. To gain access to the dataset, a short proposal detailing the intended analysis was submitted to and approved by MEASURE DHS.

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