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Demand-Side Causes and Covariates of Late Antenatal Care Access in Cape Town, South Africa

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Abstract
Objectives The objective of this study was to investigate the causes and covariates of late antenatal care access in South Africa. *Methods* A cross-sectional study was conducted, interviewing 221 women at four public-sector labour wards in Cape Town, South Africa in 2014. A definition of late attendance as attending ≥ 5 months was used. Data were analysed using univariate, bivariate and multivariate methods. *Results* Of the women who attended antenatal care at a public-sector clinic (n = 213, 96.4%), more than half (51.2%) attended ≥ 3 months and < 5 months, and a quarter (26.3%) attended ≥ 5 months. For those attending ≥ 5 months, 51.8% cited late recognition of pregnancy as the major reason for delayed attendance. Supply-side barriers were not identified as large contributing factors to delayed attendance. Late antenatal care access was predominantly associated with demand-side factors. Women who accessed antenatal care ≥ 5 months were more likely to be in the poorest 40% of the wealth-index distribution (p = 0.034) and to not have completed high school (p = 0.006). They were also more likely to report alcohol consumption during pregnancy (p = 0.020) and be multiparous (p = 0.035). Having completed high school was protective of late antenatal care access in stepwise logistic regression analysis (OR 0.403, CI 0.210–0.773, p < 0.01). For women who attended ≥ 3 months, late access was associated with unwanted pregnancy (p = 0.030). *Conclusions for Practice* Improved access to pregnancy tests could assist in earlier pregnancy identification. Interventions to increase awareness of the importance of early antenatal care attendance among vulnerable women may help.

Keywords Antenatal care · HIV · Unintended pregnancy · Health seeking

Significance

What is already known on this subject?

A large proportion of women in South African attend antenatal care late. In a context where a third of pregnant women are HIV positive this contributes to high maternal mortality. Many studies link the causes of late attendance to health system factors such as being turned away at the clinic or poor-quality services.

What this study adds?

Ensuring an effective supply side is not sufficient to encourage timely access to antenatal care. Even in settings where the supply side is functioning well, demand-side factors may drive delayed attendance and should be addressed.

Introduction

Early access to antenatal care (ANC) is important to promote healthy pregnancies and improve maternal and child health outcomes. Accessing ANC late in pregnancy is associated with lower infant birth weight, premature birth, infants requiring care in neonatal units shortly after birth and obtaining lower APGAR scores (a scoring system used to rate the infant's health at birth) (Conway and Deb 2005; Gissler and Hemminki 1994). Late access is also associated with higher rates of mother-to-child HIV transmission (Hoffman et al. 2010). Conversely, timely and appropriate ANC has maternal health benefits including lower post-birth

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weight and shorter post-birth hospital stay (Conway and Kutinova 2006).

Although maternal mortality rates in South Africa are declining (Moodley 2014), they remain high compared to other developing countries with similar public-health expenditure levels (World Health Organization 2015).

Unlike many other developing countries, a high proportion of births (85.9%) occur in healthcare facilities in South Africa and most (90.4%) women have at least one ANC visit before giving birth (Day and Gray 2016). However, a large group of women (47.5%) access ANC late (≥ 20 weeks/5 months) in their pregnancies (Massyn et al. 2015). Based on the role of patient-avoidable factors in maternal deaths, it has been recommended that the first ANC visit take place early (> 20 weeks) for identification of HIV and other high-risk medical conditions (Pattinson 2012).

Almost a third (29.7%) of women presenting at government clinics for their first pregnancy in 2013 were HIV positive (National Department of Health 2015). 90% of women who died from non-pregnancy related infections, the largest cause (34.5%) of maternal deaths in South Africa, were HIV positive (Moodley 2014). For improved mother and child health outcomes, HIV-positive women should be initiated on antiretroviral therapy (ART) at their first ANC screening visit irrespective of their CD4 cell count (National Department of Health 2014). Given documented systemic delays in initiating ART in South Africa (Myer et al. 2012; Schnippel et al. 2015) the full benefits of ART may not be realised if women do not access care in the first trimester.

Given the importance of timing of ANC access for maternal and child health outcomes and also with regards to the negative health consequences of HIV, we explore the self-reported timing of ANC attendance and causes of late attendance among a sample of women in metropolitan Cape Town, South Africa. We also consider self-reported healthcare facility experiences and the socio-economic, demographic and behavioural characteristics of the women who attended ANC late.

Methods

Study Context and Population

In the Western Cape ANC services for low-risk pregnancies are provided at maternity obstetric units (MOUs) or clinics in urban areas (Western Cape Government: Health 2015b). If a pregnancy has been categorised as high risk these women receive services from outpatient clinics at hospitals (Western Cape Government: Health 2015b). Women are encouraged to have their first screening (booking) visit before 20-week' gestation and a subsequent visit every 6 weeks, up to 28-week' gestation. Thereafter visits are scheduled for 34-week' gestation and subsequently according to their individual pregnancy profiles (Western Cape Government: Health 2015b). ANC attendance is more frequent for HIV-infected pregnant women to ensure appropriate ART management.

Metropolitan Cape Town was the worst-performing district in the Western Cape province for ANC attendance > 20 weeks' gestation as shown by the province's health information system, with a late ANC care attendance rate of 45.5% for 2013/2014, the year preceding this study (Western Cape Government: Health 2015a).

Within this poorly performing district, two sub-districts were selected for this cross-sectional study. Within these sub-districts, the study focused on the two main labour wards to which women are referred for delivery by their local clinics: one district hospital and one MOU based in a community health centre. Women with uncomplicated pregnancies are referred to MOUs for vaginal delivery while women with complicated pregnancies are referred to district hospitals for either vaginal deliveries or Caesarean sections.

Study Approach

For the purpose of questionnaire design late ANC access was defined as a first visit to the clinic at or after 20-week' (5-month') gestation in accordance with the definition used by the Department of Health for attending ANC in terms of ART optimisation (Day and Gray 2016).

A group of all-female enumerators interviewed women at facilities shortly after delivery. This was preferred over interviews at ANC facilities because not all pregnant women attend ANC sessions regularly. Also, respondents are likely to be less honest about negative aspects of care when interviewed at the site of care delivery. The interviews took place at the bedside of women in the post-labour ward during the work week (Monday–Friday). A structured questionnaire was used.

The interviews were conducted by five enumerators in English, isiXhosa and Afrikaans, the three main languages in the Western Cape. The questionnaire was available in all three languages and women were interviewed in their language of choice.

Interviews were conducted between 20 October and 20 November 2014 following pilot testing at one facility. An amended version of a questionnaire which had been field-tested in a different context in a previous study (Solarin and Black 2013) was used.[1]

[1] All collected data were captured in Epidata 3.1 and analysed using Stata 13.1.

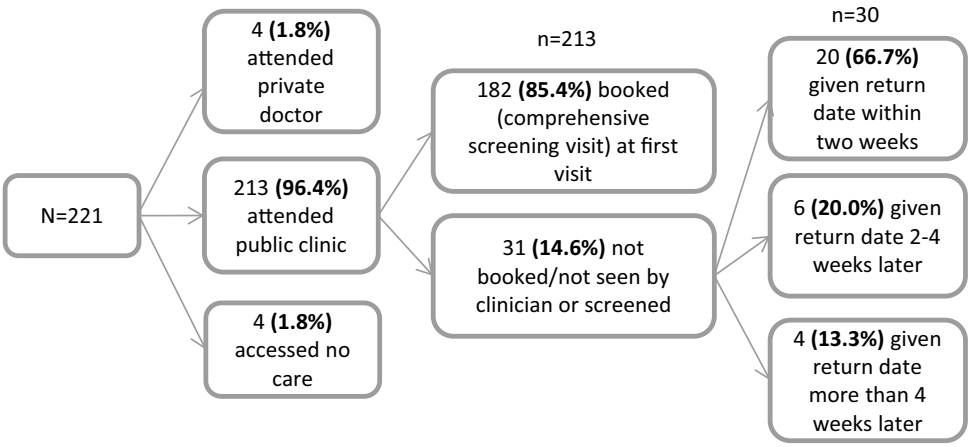

Fig. 1 Antenatal care-seeking cascade for all respondents

Survey Instrument and Index Variables

The questionnaire contained sections on socio-demographics, pregnancy discovery, ANC attendance (including reasons for late attendance), the nature of the pregnancy and ANC experiences, including a specific question on the screening tests and services provided at the first full screening visit.

Gestational age at first clinic attendance was self-reported and we distinguish between the timing of the first clinic visit and women's first screening visit (Solarin and Black 2013). Although self-reported reasons were only collected for women who attended ≥ 5 months, socio-economic correlates of late attendance for women who attended ≥ 3 months were also analyses as these data were collected for all women interviewed.[2]

We constructed an additional measure of socio-economic status (SES), a wealth index, to maximise the number of SES observations. This was done using data on the ownership of 14 durable assets by the household collected through the questionnaire. A further two variables that capture access to municipal services were also included. These were whether the respondent reported living in formal housing and whether there is access to running water in the home.

An ANC service index was constructed through use of data on 13 variables on the provision of specific screening tests and service elements at the first screening visit (Solarin and Black 2013). This index is a control measure for the quality and comprehensiveness of care provided.

Statistical Methods

The data were analysed using univariate, bivariate and multivariate methods. Differences in bivariate analysis between late and early attenders for a definition of late attendance (≥ 5 months) were identified through the Chi square test (χ^2). Logistic multivariate regressions for both a full model and a backward stepwise model were used to estimate the odds ratios of possible predictors of late ANC attendance for late attendance. P-values < 0.05 were considered statistically significant throughout, also in deciding which variables to retain in the final stepwise logistic regression model.

As recommended for the construction of index variables using only categorical variables (Booysen et al. 2008), multiple correspondence analysis (MCA) was used to estimate the wealth index and the ANC service index.

Ethics Clearance

The study was approved by the Humanities Research Ethics Committee of Stellenbosch University (HS1021/2014) which is a registered health research ethics committee. The study has therefore been conducted in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments The Western Cape Department of Health provided permission to interview respondents in the four facilities. Permission was also obtained from the facility and labour ward managers. Written informed consent in the language of choice was obtained for all study participants. Ethics approval limited interviews to women aged ≥ 18 years.

[2] Data on the ethnic (or racial) affiliation of respondents were collected. Respondents were asked to self-identify as one of four race groups: white, black, coloured or Asian/Indian. Because of the enduring legacy of apartheid, studies concerned with socio-economic factors and health behaviour continue to collect data on apartheid racial classifications. This allows for the monitoring of the degree to which race remains a source of inequity.

Table 1 Summary of ANC behaviour for women who attended ANC at a public-sector clinic

	n (%)	Mean
Timing of antenatal care attendance (n = 213/213)		
< 3 months (12 weeks)	48 (22.5)	
≥ 3 months (12 weeks) and < 5 months (20 weeks)	109 (51.2)	
≥ 5 months (20 weeks)	56 (26.3)	
Number of antenatal care visits (n = 213/213)		6.0
Gestational age (months) at first visit (n = 202/213)		3.7

Results

Health-Seeking Behaviour

Two hundred and twenty-one women were interviewed. A high proportion (n = 213, 96.4%) reported seeking care for their pregnancy at a public-sector ANC clinic (Fig. 1). The remainder either reported consulting a private doctor (1.8%) or not accessing any healthcare (1.8%) before birth.

Most women (85.4%) who attended ANC reported having their full screening visit the first time they visited the clinic (Fig. 1). Of the 14.6% of women who did not have their full screening visit at their first interaction with the ANC clinic and who provided data on whether they were asked to return later, 66.7% were given a return date within 2 weeks, 20% were given a return date 2–4 weeks later and 13.3% were given a return date for later than 4 weeks (Fig. 1).

Timing of Attendance, Antenatal Care Behaviour and Self-Reported Causes of Late ANC Access

Over a quarter (26.3%) of women reported attending ANC for the first time in their pregnancies at ≥ 5 months (Table 1). The majority (51.2%) visited the clinic for the first time after the first trimester (≥ 3 months) and before 5 months, with only 22.5% of women reporting attendance during the first trimester (< 3 months) (Table 1). For those who attended ANC at a public clinic, the mean number of visits was six (Table 1). A large proportion of women (86.4%) reported visiting the ANC clinic four or more times during the pregnancy (Table 2). The mean gestational age at the first visit was 3.7 months (Table 1).

Of the 26.3% of women who attended ANC ≥ 5 months, the main reasons for late attendance were delayed recognition of pregnancy ("I didn't know I was pregnant") (51.8%), deliberate postponement ("I kept putting off") (19.6%) and reasons related to knowledge (16.1%) (Fig. 2). Clinic-related reasons for the delay in attendance were reported by 10.7% of women ("I didn't like the clinic" and "I went earlier but was asked to return at a later time") and 17.9% provided "other" reasons for delayed attendance (Fig. 2).

Socio-demographic and Behavioural Correlates of Late ANC Access

The results of the bivariate analysis (Table 2) and multivariate logistic regression (Table 3) for late ANC attendance (≥ 5 months) are reported on.

A significantly higher percentage of multiparous women accessed ANC care ≥ 5 months compared to early attenders (76.8% vs. 61.2%, $p < 0.05$) (Table 2).There was no difference in timing of ANC attendance between the different self-reported ethnic groups.

No significant differences for late compared to early ANC attendance were found according to different interview languages (Table 2). There were also no significant differences in the distribution of age categories of late compared to early attenders.

A larger proportion of late attenders (≥ 5 months) reported being single (as opposed to married or living with a partner) relative to early attenders (50.0% vs. 45.5%), but this difference was not significant.

A significantly higher proportion of late attenders (≥ 5 months) reported not having completed high school compared to early attenders (69.6% vs. 48.4%, $p < 0.01$) (Table 2). There were no significant associations between employment status and the timing of ANC attendance.

Among all women who attended clinics for ANC there was an unplanned pregnancy rate of 77.9%, 27.4% of pregnancies were unwanted and 50.5% were mistimed (Table 2). Reporting any type of unplanned pregnancy was not significantly associated with ANC attendance ≥ 5 months. However, women who attended ANC ≥ 3 months were significantly more likely to report an unwanted pregnancy compared to early attenders (31.7% vs. 12.5%, $p < 0.05$).

The prevalence of alcohol consumption during pregnancy, a potential indicator of risky behaviour, was significantly higher amongst women who accessed ANC ≥ 5 months (30.3%) compared to early attenders (39.3% vs. 15.9%, $p < 0.05$) (Table 2).

Falling into the bottom (poorest) 40% of the wealth-index score distribution was significantly ($p < 0.05$) associated with late ANC attendance (Table 2). No significant pattern of association between timing of access and reported household income using a threshold of US$289 (Table 2) for late attenders was found.

Of all women who attended ANC at clinics, the majority 76.1% reported having five or more visits (Table 2). Women who attended late, however, were significantly more likely to have had fewer than five visits than early attenders ($p < 0.01$).

None of the predictors of late antenatal care attendance in our full multivariate logistic regression for women who

Table 2 Socio-demographic characteristics and health behaviour of those who attended public clinics by timing of ANC attendance (≥ 5 months)

Characteristics	Total (%)	Early (< 5 months) (%)	Late (≥ 5 months) (%)	p-value
Gravida/pregnancy number (including current) (n = 213/213)				
1st	74 (34.7%)	61 (38.9%)	13 (23.2%)	0.035**
Second or later	139 (65.3%)	96 (61.2%)	43 (76.8%)	
Population group/ethnicity (n = 213/213)				
Black	117 (54.9%)	89 (56.7%)	28 (50.0%)	0.669
Coloured	90 (42.3%)	64 (40.8%)	26 (46.4%)	
Other	6 (2.8%)	4 (2.6%)	2 (3.6%)	
Age distribution (n = 212/213)				
Ages 18–20	29 (13.7%)	21 (13.5%)	8 (14.3%)	0.241
Ages 21–34	158 (74.5%)	120 (76.9%)	38 (67.9%)	
Ages 35 plus	25 (11.8%)	15 (9.6%)	10 (17.9%)	
Language of interview (n = 212/213)				
English	115 (54.3%)	86 (55.1%)	29 (51.8%)	0.652
isiXhosa	23 (10.9%)	15 (9.6%)	8 (14.3%)	
Afrikaans	72 (34.0%)	53 (34.0%)	19 (34.0%)	
Other	2 (0.9%)	2 (1.3%)	0 (0.0%)	
Marital status (n = 212/213)				
Single	99 (46.7%)	71 (45.5%)	28 (50.0%)	0.369
Living together	76 (35.9%)	60 (38.5%)	16 (28.6%)	
Married	37 (17.5%)	25 (16.0%)	12 (21.4%)	
Education (n = 213/213)				
Less than high school/matric	115 (54.0%)	76 (48.4%)	39 (69.6%)	0.006***
Completed high school/matric	98 (46.0%)	81 (51.6%)	17 (30.4%)	
Employment status (n = 213/213)				
Employed (paid employment and self-employed)	89 (41.8%)	65 (41.4%)	24 (42.9%)	0.850
Not employed	124 (58.2%)	92 (58.6%)	32 (57.1%)	
Household income (n = 186/213)				
Household income ≤ R3200 (US$289) per month	122 (65.6%)	92 (65.7%)	30 (65.2%)	0.951
Household income ≥ R3200 (US$289) per month	64 (34.3%)	48 (34.3%)	16 (34.8%)	
Position in wealth index (n = 213/213)				
Top 60%	128 (60.1%)	101 (64.3%)	27 (48.2%)	0.034**
Bottom 40%	85 (39.9%)	56 (35.7%)	29 (51.8%)	
Pregnancy intention (n = 212/213)				
Yes (intended pregnancy)	47 (22.2%)	37 (23.7%)	10 (17.9%)	0.243
No, but I am happy that I am pregnant (mistimed pregnancy)	107 (50.5%)	81 (51.9%)	26 (46.4%)	
No and unhappy that I am pregnant (unwanted pregnancy)	58 (27.4%)	38 (24.4%)	20 (35.7%)	
Consumed any alcohol during pregnancy (n=213/213)				
Yes	42 (19.7%)	25 (15.9%)	17 (30.3%)	0.020**
No	171 (80.3%)	132 (4.1%)	39 (69.6%)	
Number of antenatal care visits (n = 213/213)				
1–3 Visits	29 (13.6%)	10 (6.4%)	19 (34.0%)	0.000***
4 Visits	22 (10.3%)	9 (5.7%)	13 (23.2%)	
5 or more visits	162 (76.1%)	138 (87.9%)	24 (42.9%)	

***p < 0.01, **p < 0.05

attended ≥ 5 months was significant (Table 3). Three additional variables not discussed above were added to these regressions to increase the level of heterogeneity controlled for: whether the woman reported receiving any type of government grant (an indicator of vulnerability); reporting good access to the ANC clinic; and, reporting being satisfied with the ANC received. In a backward stepwise logistic regression model having completed high school emerged as

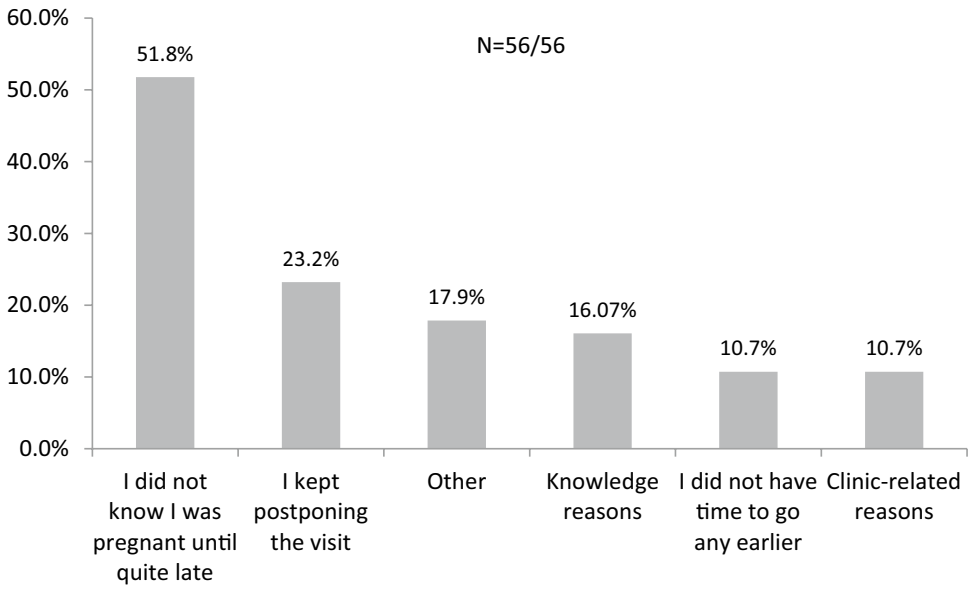

Fig. 2 Main reasons for late (≥ 20 weeks/5 months) antenatal care attendance. Multiple mentions to this question were possible. Responses therefore add up to more than 100%. This is an exploratory question to start gauging the type of responses women provide to this question

Table 3 Logistic linear regression results for women who attended ANC ≥ 5 months: full model and reduced stepwise model

	Full model odds ratio (95% CI)	Reduced stepwise model odds ratio (95% CI)
Black African (reference category: non-Black African)	0.818 (0.409–1.638)	
Grant recipient (reference category: non-grant recipient)	0.937 (0.435–2.019)	
Completing high school (reference category: high school not completed)l	0.564 (0.279–1.139)	0.403*** (0.210–0.773)
Employed (reference category: non employed)	1.168 (0.582–2.344)	
Bottom 40% of wealth index (reference category: top 60% of wealth index)	1.579 (0.760–3.280)	
Partner (reference category: no partner)	0.88 (0.449–1.725)	
First pregnancy (reference category: second or later pregnancy)	0.518 (0.216–1.239)	
Consumed alcohol (reference category: did not consume alcohol)	1.933 (0.884–4.227)	
Age (years)	0.975 (0.913–1.041)	
Good access to health services (reference category: poor access to health services)	2.551 (0.590–11.02)	
Unwanted pregnancy (reference category: wanted pregnancy)	1.409 (0.703–2.821)	
Satisfied with health services (reference category: dissatisfied with health services)	1.409 (0.703–2.821)	
Constant	0.819 (0.115–5.835)	0.534*** (0.362–0.788)
Observations	208	208

***p < 0.01; **p < 0.05

the only significant (negative) predictor of late ANC access (OR 0.403, CI 0.210–0.773, p < 0.01).

Clinic-Related Factors

Women who attended ≥ 5 months were asked whether any clinic-related factors played a role in their late attendance. Two-thirds (67.3%) indicated that nothing about the clinic would have made them attend earlier (Fig. 3). However, shorter waiting times (13.5%), extended opening times (9.6%) and not having to return to the clinic at a later time (11.5%) may have enabled earlier ANC attendance for some (Fig. 3).

All women were asked about the screening tests and service elements they received (Table 4). While there were differences in reported levels of service-element provision between late and early attenders, the difference was significant for only one service element. Women who had delayed ANC attendance ≥ 5 months were more likely than early attenders (91.9% vs. 76.9%, p < 0.05) to report the provision of HIV-counselling services (before the HIV test) at their ANC screening visit (Table 4).

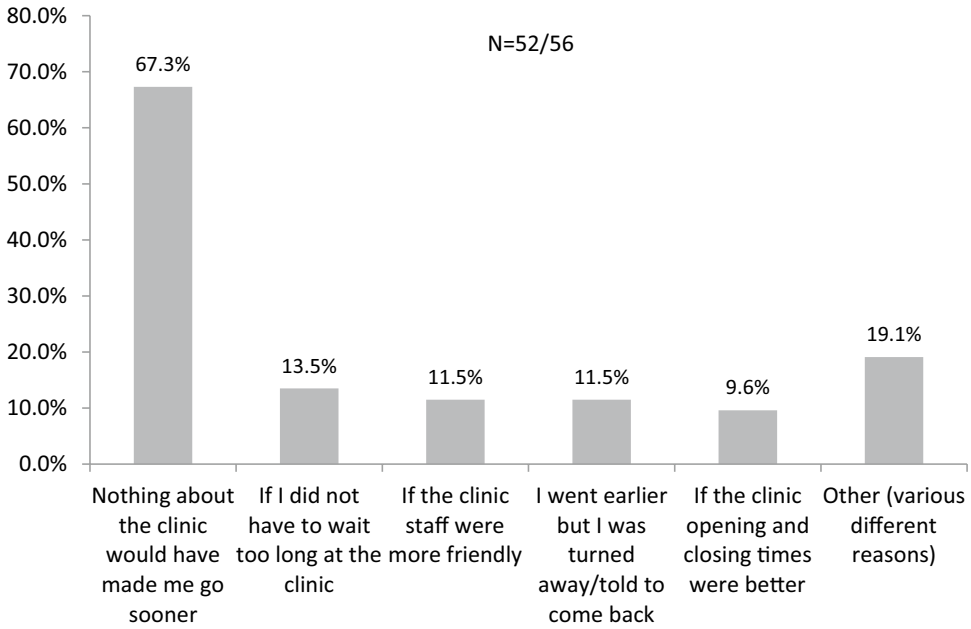

Fig. 3 Clinic factors that could have enabled earlier attendance for women who attended ANC ≥ 5 months. Multiple mentions to this question were possible. Responses therefore add up to more than 100%. This is an exploratory question to start gauging the type of responses women provide to this question

Table 4 Individual screening test and service elements provided by the clinic at the first screening visit for two definitions of late attendance (≥ 5 months and ≥ 3 months)

Service elements	Total (%)	Early attendance (< 5 months) (%)	Late attendance (≥ 5 months) (%)	p-value
Blood pressure	209 (98.6)	155 (99.4)	54 (96.5)	0.111
Weighed	208 (98.1)	153 (98.1)	55 (98.2)	0.948
Urine sample	202 (95.3)	149 (95.5)	53 (94.6)	0.792
Blood taken	198 (93.4)	145 (92.5)	53 (94.6)	0.661
Antenatal card completed	188 (88.7)	140 (89.7)	48 (85.7)	0.414
Offered HIV test	175 (82.6)	131 (84.0)	44 (78.6)	0.361
HIV counselling	171 (80.7)	120 (76.9)	51 (91.1)	0.021**
Told how to stay healthy	159 (75.0)	115 (73.7)	44 (78.6)	0.472
Nutrition information	158 (74.5)	118 (75.6)	40 (71.4)	0.535
Breast feeding information	156 (73.6)	117 (75.0)	39 (69.6)	0.435
Pregnancy danger signs	137 (64.6)	105 (67.7)	32 (57.1)	0.172
Told how many visits	135 (63.7)	96 (61.5)	39 (69.6)	0.279
Physical examination	212 (61.3)	97 (62.2)	33 (58.9)	0.668

***p < 0.01; **p < 0.05

The individual service elements were combined into an ANC service index. No significant associations were found between different groupings (terciles) of the health service index and late attendance.

Discussion

This study found a late ANC attendance rate of 26.3% among women who attended ≥ 5 months. More than half (51.8%) reported not knowing that they were pregnant as the main reason. Women may not have the necessary knowledge to enable them to recognise the signs of pregnancy, or there may be biological or behavioural reasons why it is difficult to identify pregnancy. The theme of "not knowing" was identified after semi-structured interviews with a sample of late ANC care attenders in the United Kingdom (Haddrill et al. 2014). These women did not identify the symptoms of pregnancy or were unable to link physical signs or experiences to the realisation of pregnancy. Late recognition of pregnancy has previously been identified as a possible reason for late access in South African studies (Solarin and Black 2013; Abrahams et al. 2001).

This follow-on study to that of Solarin and Black (2013) was conducted to identify whether the factors influencing late access to ANC is the same or different in a different

health delivery setting of South Africa. The main reasons for and covariates associated with late access in our study were demand-side related, with strong associations between late attendance, indicators of socio-economic vulnerability and behavioural factors. This is in contrast to Solarin and Black (2013) who found delayed ANC access mainly related to supply-side barriers.

The poorest 40% of women (according to the SES measure) who attended ANC ≥ 5 months were more likely to access ANC late. The role of lower SES in late ANC care access has been identified in previous qualitative studies (Haddrill et al. 2014; Downe et al. 2009). Data from the South African National HIV Prevalence, Incidence, Behaviour and Communication Survey (2008) showed a large disparity in ANC attendance rates before 20 weeks of gestation for women in the poorest compared to the richest quartile (Wabiri et al. 2013).

Women who attended ANC ≥ 5 months were significantly more likely to not have completed high school. Having completed high school was also identified as protective of late antenatal care access in stepwise logistic regression analysis (OR 0.403, CI 0.210–0.773, $p < 0.01$). Lower levels of education have also been identified by other studies as being associated with late attendance (Haddad et al. 2016; Solarin and Black 2013).

A positive association was found between late attendance (≥ 5 months) and multiparous women, as opposed to first-time pregnant women. The reason for this is not clear. There is conflicting evidence on the nature of the relationship. It may be more difficult to recognise pregnancy symptoms with a first pregnancy, leading to delayed attendance (Downe et al. 2009). Alternatively, women may postpone attendance if earlier pregnancies were problem-free (Finlayson and Downe 2013).

The survey did not ask questions about contraceptive usage and methods. If women struggled to link pregnancy symptoms to the realisation of pregnancy, it is possible that they did not anticipate pregnancy due to contraceptive usage. The low likelihood of pregnancy anticipation is confirmed by the high level of unplanned pregnancies amongst women in the sample. Various studies report relatively high levels of unplanned pregnancies amongst sub-samples of South African women (Solarin and Black 2013; MacPhail et al. 2007; Schwartz et al. 2012).

Pregnancy intention and, in particular, reporting an unwanted pregnancy was identified as a significant covariate of late attendance for women who attended ANC ≥ 3 months. Pregnancy intention is an important predictor of behaviour during pregnancy (Kost et al. 1998), while unwanted pregnancy has been identified as a significant correlate of late ANC attendance (Haddad et al. 2016).

Better access to testing may aid in early identification of pregnancy. Better access and usage of urine pregnancy tests are significantly associated with lower gestational age at presentation for ANC (Morroni and Moodley 2006; Jeffery et al. 2000) and abortion services (Morroni and Moodley 2006). Termination of pregnancy in South Africa is currently offered up to 12-week' gestation at primary healthcare facilities (Morroni and Moodley 2006) and, under exceptional circumstances, will be performed by a doctor at a public health sector hospital up to 20-week' gestation. A large proportion of women in our study may have missed these timing windows.

Limitations of the Study

This study used self-reported data on timing of access to ANC which may be biased because of poor recall and social-desirability responses. It would have been interesting to compare timing as recorded in administrative data with self-reported timing. The reliability of self-reported timing is an important question to consider in future studies. Furthermore, cross-sectional studies suffer from various limitations, including an inability to collect and track data on outcomes over time as is possible in longitudinal studies.

The study excluded women < 18 years as ethical clearance was not obtained for this group. Interviews with women < 18 years require both participant assent and parental consent and would not be compatible with the study approach of interviewing women in hospital as one of their parents may not be present to provide consent. Late ANC attendance among this young vulnerable group is an important question and should be investigated.

The questionnaire was not designed to explore self-reported causes of late attendance for women who attended ≥ 3 months as this group was not the primary focus of the study. It would have been valuable to compare these causes between the two groups.

A factor specific to the South context associated with late access to ANC is fear of bewitchment of the pregnancy (Ngomane and Mulaudzi 2012; Haddad et al. 2016). This was not explicitly explored in our study.

Conclusions

In conclusion, women reported delayed recognition of pregnancy as the major cause of late ANC access. Access to better pregnancy confirmation methods particularly urine-based tests could allow women to detect pregnancy early (Morroni and Moodley 2006), empowering them to access ANC earlier, a key focus for improved maternal and infant care in South Africa.

We did not find strong evidence of supply-side barriers to early antenatal care access. The significant associations between various demand-side indicators of vulnerability and

late ANC attendance implies that an effective supply-side is a necessary but not sufficient requirement for early ANC attendance. Specific interventions among vulnerable women highlighting the importance of early ANC attendance for their own and their babies' health may be required.

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

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