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Socio-economic Factors Associated with Desired Number of Antenatal Care Visits in Tanzania

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Abstract

This study analyses socioeconomic factors associated with the desired number of Antenatal Care (ANC) visits in Tanzania. The data are extracted from the Tanzania Demographic Health Survey and Malaria Indicator. The study employed Multilevel Logistic Regression analysis using TDHS-MIS 2022. The findings show that more than two-thirds of women attended at least 4 visits (desirable), while one-third of women attended less than 4 visits (undesirable). Over half of women attained primary education, while the majority had health insurance. About half of women were aged between 25 and 34 years, and 41.2% were economically classified as poor. Furthermore, the study revealed that the place of residence, educational level, distance to the health facility, access to health insurance, marital status, husband/partner's education level, birth order, women's age, wealth index, work status, and family size indicated associations with the number of ANC visits. The study findings recommend that policymaking should focus on formulating policies and programmes that address factors reducing maternal and infant morbidity and mortality during pregnancy and birth. There is a need to carry out a qualitative survey to assess how and why social, cultural, and community factors influence desired number of ANC visits among women.

Keywords: Socioeconomic, Maternal Antenatal Care, morbidity, Infant morbidity, Tanzania

1. Introduction

Antenatal Care (ANC) is the care received from health personnel during pregnancy. ANC is vital to reducing maternal and infant morbidity and mortality during pregnancy and birth, by reaching pregnant women with interventions that may be vital to their health and well-being and that of their infants. According to Souza et al. (2024), nearly 500,000 women die globally due to pregnancy and birth complications. To reduce maternal and infant morbidity, it has been recommended by the World Health Organisation (WHO) that women have at least four ANC appointments during pregnancy. Also, it has been recommended that the first appointment should be held in the first 4 months of pregnancy (Battu et al., 2023) instead, many women do not receive such a service (Tripathy and Mishra, 2023), with 30% having at least four appointments (Penman et al., 2023). The actual attendance to health care is much lower in developing countries compared

to developed countries, with only 68% ever received care, and just 39% meeting the target of four or more appointments (Souza et al., 2024). Sub-Saharan Africa experiences the lowest levels of antenatal care visits (UNICEF, 2024), with 38.0% of ANC visits during the first trimester (Abdo et al., 2023).

Antenatal care is available in Tanzania for women having uncomplicated pregnancies (UNICEF, 2024), offering at least eight appointments throughout their pregnancy, starting in their first trimester. However, low attendance at ANC services is a significant issue. Even if women attend ANC services for at least one appointment (Ngowi et al., 2023), there is a particular issue with women not booking follow-up appointments or missing booked appointments. Furthermore, a study by Ndomba et al. (2023) indicated that late ANC service bookings were high at 85.3% among pregnant women who attended the clinic in the 13th week. This is not because women in Tanzania are having uncomplicated pregnancies and births; Tanzania has a stillbirth rate of 27.7 per 1,000 total births and an intra-facility neonatal death rate of 10.9 per 1,000 live births while pre-facility stillbirths accounted for 88.4% of the stillbirths (Sequeira Dmello, 2024). There is a notable difference between areas where mortality rates are highest in rural areas (Macharia et al., 2023). In a study conducted by Aziz et al. (2020) on pregnant and postnatal women on why appointments were missed, they identified personal barriers (lack of transport, attitudes towards the importance of care, and poor antenatal care facilities), while professionals believed low maternal literacy and education affected maternal attendance.

Understanding why women are not attending ANC services in Tanzania is a government priority (URT, 2017) but few studies have been conducted. The studies in this area were conducted outside Tanzania (See Aziz Ali et al., 2020; Battu et al., 2023; Chilot et al., 2023). Conversely, other studies in Tanzania have simply focused on exploring whether mothers value care rather than barriers to attendance (Chilot et al., 2023; Comfort et al., 2013; Khatri et al., 2022).

The study aimed at assessing factors associated with the desired number of antenatal care visits. The selected factors are education level, partner's education level, place of residence, marital status, covered health insurance, distance to the health facility, and birth order affect the uptake of antenatal care services. By documenting the factors influencing the desired number of ANC visits, policymakers can make well-informed choices when it comes to formulating and executing impactful programmes that contribute to improving maternal and child health outcomes. This study seeks to identify the motivating factors for antenatal care visits, thereby contributing to the ongoing scholarly conversation on maternal ANC services among women of reproductive age.

2.0. Material and Methods

2.1. Data Sources

The data are sourced from the Tanzania Demographic Health Survey and Malaria Indicator Survey (TDHS-MIS) of 2022, marking the seventh DHS survey carried

out in Tanzania as part of the DHS initiative. The DHS-MIS 0f 2022 allowed for the acquisition of the datasets by visiting https://www.dhsprogram.com. The predictors derived from the datasets include the place of residence, educational level, sex of household head, want of last child, distance to the health facility, access to health insurance, marital status, husband/partner's education level, a decision on respondent's health care, birth order, women's age, wealth index, current in working, and family size.

2.2. Estimation Techniques

The estimation started with a descriptive analysis of the characteristics of the respondents. For data processing and analysis, we utilised Stata Version 16. We conducted a univariate analysis of the dependent variable, and then a bivariate analysis to examine the relationship between the dependent variable and each independent variable. We finally included the variables that showed statistical significance as predictors of the desired number of ANC visits among pregnant women aged 15-49 in the Multilevel Logistic Model.

2.3. Model Specification

The multilevel logistic regression model, which takes into account the clustering of women within the region, can estimate both fixed effects (individual-level effects) and random effects (region-level effects) (Wong and Mason, 1985; Khan and Shaw, 2011; Austin and Merlo, 2017). It provides insights into the parameters that impact the desired number of ANC visits while taking the heterogeneity and context of each place into consideration, as follows in two levels.

At level one, the model would assess individual-level predictors to predict the likelihood of a desired number of ANC visits, as illustrated in equation (i).

$$\log\left(\frac{p_{ij}}{1-p_{ij}}\right) = B_{0j} + B_{ij}X_{ij} \ldots\ldots\ldots\ldots (i)$$

Where:

p_{ij} represents the probability of a desired number of ANC visits for individual *i* in region *j*.

X_{ij} is a vector of individual-level predictors for woman *i* in region *j*.

B_{0j} is the intercept for region *j*.

B_{ij} is the coefficient associated with the individual-level predictors' X_{ij} for region *j*.

At level two, the model would take into consideration regional factors that can affect the required number of ANC visits in different regions, as illustrated in equations (ii) and (iii).

$$B_{0j} = \gamma_{00} + \gamma_{01}Z_j + \varepsilon_{0j} \ldots\ldots\ldots\ldots\ldots (ii)$$

$$B_{0j} = \gamma_{10} + \varepsilon_{1j} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (iii)$$

Where:

Z_j is a vector of region-level predictors.

γ_{00} is the fixed intercept (average intercept across all regions).

γ_{01} is the coefficient associated with the region-level predictor Z_j.

γ_{10} is the fixed coefficient associated with the individual-level predictors.

ε_{0j} and ε_{1j} are random effects representing the deviations of the intercept and slope, respectively, for region j from the population average.

2.4 Variable Definition and Measurement

The outcome variable is the recommended number of antenatal care (ANC) visits, which is coded as a dummy

variable: '1' for a pregnant woman who had at least four ANC visits and '0' for a pregnant woman with less than four ANC visits. A minimum of four ANC visits is essential for monitoring the health of both the mother and the fetus, ensuring early detection and management of complications, and providing essential interventions (Ministry of Health [Tanzania Mainland], Ministry of Health [Zanzibar], National Bureau of Statistics (NBS), Office of the Chief Government Statistician (OCGS), and ICF, 2022).

The predictors derived from the study are the place of residence (Urban/Rural), educational level (No education/Primary/Secondary/Post-Secondary), sex of household head (Male/Female), want last child (Wanted then/Wanted later/Wanted no more), distance to health facility(Big problem/Not a big problem), covered by health insurance (No/Yes), current marital status(Married/Living with a partner), husband/partner's education level (No education/Primary/Secondary/Post-Secondary/Don't know), a decision on respondent's health care (Respondent alone/Respondent and husband or partner/Husband or partner alone/Someone else/Don't know), birth order (One/Two to five/More than five), women's age (15 – 24/25 – 34/35 - 49), wealth index (Poor/Middle/Rich), current working (No/Yes), and family size (1- 4/5-10/11+).

3.0 Results

Table 1 presents the descriptive analysis of respondents of the key variables of interest. The results show that more than two-thirds (65%) of women attended at least 4 visits (desirable), while 35% of women attended less than 4 visits (undesirable). Also, the majority of women (73.6%) resided in rural areas. Over half of them (51.5%) attained primary education while 86.1% were from male households. A significant proportion (73.7%) of women desired their last child by that time. Regarding perceived distance, 67.7% of women did not consider perceived distance to be a significant issue. Most (95.4%) had access to health insurance, while about three-quarters (72.7%) were married. More than half (53.4%) made health care decisions with their husbands/partners. Concerning birth order, most women (61.8%) fell within the 2nd to 5th positions. Regarding age, 46.2% were aged between 25 and 34, while 41.2% were economically classified as poor. Nearly two-thirds (62.4%) were employed, while the majority (58.8%) had family sizes ranging from 5 to 10 people.

The study also delved into the correlation between the number of ANC visits and various predictors. Variables namely; place of residence, highest educational level, wanted last child, distance to the health facility, access to health insurance, marital status, husband/partner's education level, the decision on respondent's health care, birth order, women's age, wealth index, work status, and family size exhibited noteworthy associations with the recommended number of ANC visits at a significance level ($p<0.5$). Conversely, the sex of the household head did not demonstrate a significant association and consequently was excluded from further statistical analysis.

Table 1: Profile of the women and the association of predictors with the number of ANC visits

Variable	Category	Desired number of ANC visits		Total	p-value
		No *n* (%)	Yes *n* (%)		
Overall		**1629 (35.4)**	**2974 (64.6)**		
Place of residence	Urban	289(6.3)	925(20.1)	1214(26.4)	<0.001
	Rural	1340(29.1)	2049(44.5)	3389(73.6)	
Educational level	No education	461(10.0)	509(11.1)	970(21.1)	<0.001
	Primary	895(19.4)	1477(32.1)	2372(51.5)	
	Secondary	267(5.8)	947(20.6)	1214(26.4)	
	Post-Secondary	6(0.1)	41(0.9)	47(1.0)	
Sex of household head	Male	1414(30.7)	2551(55.4)	3965(86.1)	0.336
	Female	215(4.7)	423(9.2)	638(13.9)	
Wanted last-child	Wanted then	1172(25.5)	2222(48.3)	3394(73.7)	<0.001
	Wanted later	376(8.2)	688(14.9)	1064(23.1)	
	Wanted no more	81(1.8)	64(1.4)	145(3.2)	
Distance to health facility	Big problem	644(14.0)	842(18.3)	1486(32.3)	<0.001
	Not a big problem	985(21.4)	2132(46.3)	3117(67.7)	
Covered by health insurance	No	1588(34.5)	2805(60.9)	4393(95.4)	<0.001
	Yes	41(0.9)	169(3.7)	210(4.6)	
Current marital status	Married	1139(24.7)	2209(48.0)	3348(72.7)	<0.001
	Living with partner	490(10.6)	765(16.6)	1255(27.3)	
Husband/partner's education level	No education, preschool/early childhood education	325(7.1)	334(7.3)	659(14.3)	<0.001
	Primary	998(21.7)	1583(34.4)	2581(56.1)	
	Secondary	262(5.7)	893(19.4)	1155(25.1)	
	Post-Secondary	25(0.5)	115(2.5)	140(3.0)	
	Don't know	19(0.4)	49(1.1)	68(1.5)	
Decision on respondent's health care	Respondent alone	282(6.1)	578(12.6)	860(18.7)	<0.001
	Respondent and husband/partner	817(17.7)	1643(35.7)	2460(53.4)	
	Husband/partner alone	522(11.3)	740(16.1)	1262(27.4)	
	Someone else	6(0.1.)	11(0.2)	17(0.4)	
	Don't know	2(0.0)	2(0.0)	4(0.1)	
Birth order	One	202(4.4)	649(14.1)	851(18.5)	<0.001
	Two to five	984(24.1)	1862(40.5)	2846(61.8)	
	More than five	443(9.6)	463(10.1)	906(19.7)	
Woman's age	15 - 24	451(9.8)	911(19.8)	1362(29.6)	<0.001
	25 - 34	727(15.8)	1398(30.4)	2125(46.2)	
	35 - 49	451(9.8)	665(14.4)	1116(24.4)	
Wealth index	Poor	901(19.6)	997(21.7)	1898(41.2)	<0.001
	Middle	306(6.6)	611(13.3)	917(19.9)	
	Rich	422(9.2)	1366(29.7)	1788(38.8)	
Working status	No	680(14.8)	1049(22.8)	1729(37.6)	<0.001
	Yes	949(20.6)	1925(41.8)	2874(62.4)	
Family size	1- 4	403(8.8)	1019(22.1)	1422(30.9)	<0.001
	5- 10	1009(21.9)	1696(36.8)	2705(58.8)	
	11+	217(4.7)	259(5.6)	476(10.3)	

Predictors of ANC visits

The results of multilevel logistic regression for the fixed effects of the predictors on the desired number of ANC visits are shown in Table 2. Women whose husbands or partners attained secondary education had higher odds of achieving an optimal number of ANC visits compared to those with no education (OR=1.36, 95% CI: 1.05-1.75, p=0.018). Similarly, for the wealth index, women classified as the middle (OR=1.47, 95% CI: 1.23-1.77, p=0.00) and rich (OR=1.66, 95% CI: 1.34-2.05, p=0.00) had a higher likelihood of achieving a desirable number of ANC visits compared to those categorised as poor. Additionally, women with health insurance coverage (OR=1.49, 95% CI: 1.00-2.20, p=0.046) were associated with higher odds of achieving an optimal number of ANC visits compared to those without health insurance. Concerning the desire for the last child, women who wanted no more had lower odds of achieving a desirable number of ANC visits compared to those who desired a child at that time. Women who were employed (OR=1.47, 95% CI: 1.27-1.69, p=0.000) had higher odds of achieving an optimal number of ANC visits compared to those who were not employed. Similarly, women who perceived distance to reach the health facility as not a significant problem (OR=1.19, 95% CI: 1.03-1.39, p=0.017) were associated with higher odds of achieving a desirable number of ANC visits compared to those who considered it a significant issue. Regarding birth order, women with 2 to 5 children (OR=0.60, 95% CI: 0.48-0.74, p=0.000) and 5+ (OR=0.45, 95% CI: 0.33-0.61, p=0.000) born in lower positions had lower odds of achieving an optimal number of visits compared to those who were the firstborn. In terms of random effects, the estimated variance (σ=0.516) reflects the variability of these effects across regions.

The low correlation coefficient between random effects (ρ=0.0750) indicates that households within the same region show less correlation concerning the desirable number of ANC visits.

Table 2: A Multilevel logistic regression for the predictors for the desirable number of ANC visits

Variable	Odds Ratio	Std. Err.	z	p-value	95% confidence interval	
Age						
15-24	**Reference**					
25-34	0.990323	0.092651	-0.1	0.917	0.824406	1.189631
35-49	0.960638	0.120536	-0.32	0.749	0.7512	1.228469
Education level						
No education	**Reference**					
Primary	1.010873	0.089504	0.12	0.903	0.849826	1.20244
Secondary	1.108922	0.139452	0.82	0.411	0.866679	1.418874
Higher	1.196392	0.589308	0.36	0.716	0.455613	3.1416
Husband/partner's education level						
No education	**Reference**					

Variable	Odds Ratio	Std. Err.	z	p-value	95% confidence interval	
Primary	1.138819	0.113525	1.3	0.192	0.936701	1.384549
Secondary	1.361828	0.177982	2.36	0.018	1.054086	1.759416
Higher	1.389417	0.37989	1.2	0.229	0.813018	2.374462
Don't know	0.98424	0.303902	-0.05	0.959	0.537374	1.802707
Place of residence						
Urban	**Reference**					
Rural	0.93399	0.095563	-0.67	0.505	0.764275	1.141393
Wealth index						
Poor	**Reference**					
Middle	1.478548	0.138211	4.18	<0.001	1.231027	1.775839
Rich	1.664139	0.177851	4.77	<0.001	1.349646	2.051917
Aceess to health insurance						
No	**Reference**					
Yes	1.49064	0.298105	2	0.046	1.00727	2.20597
Wanted last child						
Wanted then	**Reference**					
Wanted later	0.976179	0.079885	-0.29	0.768	0.831519	1.146005
Wanted no more	0.597134	0.114805	-2.68	0.007	0.409657	0.870409
Marital status						
Married	**Reference**					
Living with partner	0.908543	0.074314	-1.17	0.241	0.773966	1.066519
Current working						
No	**Reference**					
Yes	1.472488	0.105344	5.41	<0.001	1.279839	1.694136
Family size						
1—4	**Reference**					
5—10	0.953185	0.080449	-0.57	0.57	0.807859	1.124653
11+	0.84384	0.108581	-1.32	0.187	0.65574	1.085897
Decision on respondent's health care						
Respondent alone	**Reference**					
Respondent and husband/partner	0.999854	0.094835	0	0.999	0.830235	1.204126
Husband/partner alone	0.84575	0.092088	-1.54	0.124	0.68322	1.046943
Someone else	0.858994	0.469158	-0.28	0.781	0.294502	2.505486
Other	0.624242	0.651487	-0.45	0.652	0.080724	4.827309
Distance to health facility						
Big problem	**Reference**					
Not a big problem	1.198848	0.09116	2.39	0.017	1.032854	1.39152
Birth order						

Variable	Odds Ratio	Std. Err.	z	p-value	95% confidence interval	
One	**Reference**					
Two to five	0.600007	0.066277	-4.62	<0.001	0.483207	0.745041
Greater than five	0.452257	0.069203	-5.19	<0.001	0.335072	0.610426
Constant	1.775412	0.377615	2.7	0.007	1.170189	2.693658
/lnsig2u	-1.32084	0.3036			-1.91589	-0.7258
sigma_u	0.516634	0.078425			0.383681	0.695657
Rho	0.075043	0.021073			0.04283	0.128236

Based on the level of significance of the study variables, all the variables with p-values less than 0.05 were considered significant. Table 2 indicates that the amount of wealth, access to insurance, husband or partner secondary education, current work, distance from a health facility and birth order had a p-value less than 0.05. These were the significant variables associated with the desired number of antenatal care visits in the study area.

4.0. Discussion

Our results showed that socioeconomic factors play a notable role in influencing the likelihood of achieving the desired number of ANC visits, and the variation in these factors contributes to the observed differences across regions. Additionally, the low correlation between households within the same region implies that the factors influencing desirable ANC visits are more individualised at the household level rather than being consistent across all households.

It was also revealed that the proportion of pregnant women with the recommended number of ANC visits is equal to 65% for the year 2022, which is higher compared to the previous proportion (48%) of the 2015/16 TDHS-MIS. This is possible because the Tanzanian government has made progress in building health facilities and continuing campaigns for maternal services through the Ministry of Health.

The study also showed that women whose husbands or partners attained secondary education had higher odds of achieving an optimal number of ANC visits compared to those with no education. These results are in line with research from Ethiopia, Uganda, and Northern Ghana, which discovered that women with secondary-educated spouses had a 1.33-fold increased likelihood of having four ANC visits in comparison to women with husbands without formal education (Tessema and Animut, 2020; Tumwizere et al., 2024; Apanga et al., 2022). This implies that the value of prenatal care (ANC) visits may be more widely understood by partners with greater educational backgrounds. They may be aware of the advantages of early and frequent examinations for the development of the infant as well as the mother.

Similarly, in the wealth index, women classified as middle and rich had a higher likelihood of achieving a desirable number of ANC visits compared to those classified as poor. These findings are supported by studies conducted by Arroyave et al. (2021), Ng'ambi et al.

(2022), and Merid (2024). The adjusted odds ratio showed that pregnant women in low and middle-income countries (LMICs) who belonged to wealthier households used ANC more frequently and that in almost all of these countries, women with greater levels of empowerment had higher ANC mean scores. This might be explained by the possibility that wealthy or middle-class women have easier access to financial resources. It becomes possible for them to pay for ANC visit-related costs (transportation and medical). Impoverished women could have financial difficulties that make it difficult for them to attend ANC appointments.

Additionally, women with health insurance coverage were associated with higher odds of achieving an optimal number of ANC visits compared to those without health insurance. This might be explained by the fact that women with insurance may obtain treatments without suffering severe financial hardship. This result is similar to studies by Dadjo et al. (2022), Khatri et al. (2022), Wang et al. (2014), and Comfort et al. (2013). Their study found that in comparison to their counterparts without insurance, women with health insurance had a 1.55-fold higher chance of meeting the minimum number of recommended ANC visits.

Concerning the desire for the last child, women who did not desire to have more had lower odds of achieving a desirable number of ANC visits compared to those who desired a child at that time. Researchers Ng'Ambi et al. (2022), Tumwizere et al. (2024), and Kasagama et al. (2022) found a similar finding: women who wanted no more children had a lower likelihood of receiving ANCs than women who were actively seeking a child at that time. This may be because women who are not interested in having children may not feel as driven to make ANC visits a priority. Their lack of desire to have more children may cause them to feel less pressure to get prenatal care right away.

Our finding also revealed that women who were employed had higher odds of achieving an optimal number of ANC visits compared to those who were not employed or stay-at-home moms. This finding was also observed in studies by Ng'ambi et al., (2022), Agmas and Asmare (2022), and Kasagama et al., (2022) where they found that ANC achievement was more likely to be attained by employed women than by unemployed ones. This is because women who are employed are likely to be exposed to information about health. Women in the workforce could be more aware of the value of ANC checkups and maternal health.

Similarly, women who perceived distance to the health facility as not significant were associated with higher odds of achieving a desirable number of ANC visits compared to those who considered it a significant issue. Similar findings were made by Alibhai et al. (2022), Uwimana et al. (2023), and Hijazi et al. (2018) in their investigations, which showed that women who lived closer to healthcare facilities or knowing the closest facility was nearby used ANC more frequently. It makes sense that women who believe there is no difference in distance between their

home and the medical institution would live closer to one or have greater access to transportation, which would make getting ANC treatments easier for them. ANC visits may increase as a result of enhanced accessibility. Regarding birth order, women with 2-5 and 5+ children had lower odds of achieving an optimal number of visits compared to those who were the firstborn. A similar finding was reported by Chilot et al. (2023), who found a substantial correlation between birth order and ANC use. ANC visits were lower among women with birth orders of two to five and more than five children than among those with single birth orders. This might be because parents frequently provide firstborn children with more resources and attention, especially in their formative years. When compared to women born later in the birth order, this might result in firstborn women receiving superior prenatal care. Overall, our findings are useful in Tanzania and other developing countries since ANC visits may increase as a result of enhanced educational backgrounds, access to health insurance, access to income, and reduced distance from home place to health centres.

5.0. Conclusion and Policy Implication

Our results highlight that more than 65% of women attended at least 4 visits (desirable), while 35% of women attended less than 4 visits (undesirable). The number of ANC visits has been influenced by place of residence, level of education, distance to the health facility, access to health insurance, husband/partner's education level, birth order, women's age, wealth index, work status, and family size. Women whose husbands or partners attained secondary education were likely to attend more ANC visits compared to those with no education. The wealth index was associated with a desirable number of ANC visits, indicating that women with adequate resources would access more services compared to poor people. Women with health insurance were likely to experience more ANC visits because even when they do not have the cash, they can access the health services. It was also noted that women who desired more children were to have fulfilled the desirable number of ANC visits. Furthermore, women who are employed are exposed to desirable ANC visits since they have income that covers transport and other health-associated costs. On the contrary, women with 2 to 5 and 5+ born experienced a lower number of ANC visits compared to those who were the firstborn.

The study recommends that policymakers and programme implementers work towards formulating policies and programs to address factors significantly reducing late ANC attendance. For example, integrating family planning with other services, such as ANC and postnatal care education, could enable women to seek antenatal care within the recommended first trimester. This would not only reduce late ANC attendance but would go a long way in improving maternal and child health outcomes. The study findings highlight the need to increase health facility-based deliveries. This study calls for increased support for programmes for education, sensitisation, and advocacy for health facility-based

deliveries. There is also a need to target men with health education programmes so that they can support their partners in health-seeking behaviour. Men should be sensitized and educated about health issues and programmes to address health problems such as poor maternal outcomes, which could easily be prevented through their active participation. Male involvement efforts should be strengthened.

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