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RESEARCH **Open Access**

Socio-demographic Characteristics of Delivery by Caesarean Section of the Vietnamese Population: A Cross-sectional study

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Abstract
The rising trend of caesarean deliveries in Vietnam, influenced by various social and demographic factors, has raised public health policy concerns as many procedures are performed without clear medical indications. This study seeks to explore the relationship between socio-demographic factors and the likelihood of caesarean section deliveries within the Vietnamese population. This study employed a cross-sectional design using data from the Vietnam Multiple Indicator Cluster Survey (MICS) 2020–2021, which utilized a two-stage stratified cluster sampling method to ensure national representativeness. The analysis focused on 1,049 women aged 15–49 who had at least one child. Data were collected through standardized questionnaires and analyzed using chi-square tests and binary logistic regression to examine associations between socio-demographic factors and caesarean section deliveries. Based on data from 1,343 Vietnamese women, this study found that 32.84% of deliveries were by caesarean section (CS). Bivariate analysis showed significant associations between CS and factors such as maternal age, education, residence, wealth, and place of delivery. However, multivariate logistic regression revealed that only maternal age, household wealth, and place of delivery remained significant predictors. Older women and those from wealthier households had higher odds of CS, while births at commune health centers were less likely to involve CS. Education level and rural residence were not independently associated with CS after adjustment.

Keywords: Caesarean section, Maternal health, MICS, Socio-demographic, Vietnam.

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1. INTRODUCTION

Caesarean section (CS) deliveries have seen a significant global increase over the past few decades, including in developing countries (Betran et al., 2021). While this method of delivery can be life-saving in specific medical circumstances, it also poses short- and long-term health risks for both mothers and infants when performed without proper medical indications (Sandall et al., 2018). Therefore, the rising trend of caesarean deliveries has become a major concern in public health and health policy discourse (Joyce et al., 2025).

In Vietnam, rapid socio-economic changes, urbanization, and improved access to healthcare facilities have contributed to a shift in delivery preferences (Trang et al., 2024). Previous studies have indicated that socio-demographic factors such as maternal age, educational level, economic status, and place of residence, influence the choice of delivery method, including an increasing tendency toward caesarean section (Giang et al., 2022). The high rate of Caesarean sections in Vietnam, particularly in Nha Trang city, is not entirely due to medical reasons, but is largely influenced by social, psychological, and systemic factors (Takegata et al., 2020). However, comprehensive empirical evidence regarding the association between socio-demographic characteristics and caesarean delivery in the Vietnamese population remains limited.

This information gap is crucial to address, as such data are essential for designing more effective and evidence-based maternal health interventions and policies. Without a deeper understanding of the social and demographic factors influencing delivery decisions, healthcare providers may find it challenging to properly educate patients and reduce unnecessary caesarean sections (Bam et al., 2021). Based on, several previous studies have attempted to identify factors influencing the choice of delivery method, particularly caesarean sections, in various countries, including Vietnam. For example, the mothers residing in urban areas were more likely to undergo caesarean delivery compared to those in rural areas, largely due to differences in healthcare access and individual preferences (de Loenzien et al., 2019). Higher educational attainment and greater household income were associated with increased rates of caesarean delivery, often driven by perceptions that caesarean birth is safer or more convenient (Manyeh et al., 2018). However, most of these earlier studies were conducted on a local scale or within limited geographic areas, highlighting the need for nationwide studies to strengthen and generalize these findings within the broader social and cultural context of Vietnam.

The socio-demographic theoretical framework is particularly relevant in highlighting how reproductive decisions, including childbirth methods, are shaped by medical, socio-economic, cultural, and familial factors (Ahinkorah et al., 2021; Etcheverry et al., 2024). According to contemporary socio-demographic approaches, health-related reproductive behaviors are shaped by the interaction of structural factors (such as economic status and healthcare access), individual factors (such as education and age), and prevailing social norms (Amoah & Phillips, 2020; Maricic et al., 2021). In the Vietnamese context, where traditional values remain influential alongside a modernizing healthcare system. This theoretical framework offers a strong conceptual basis for explaining how and why these factors affect the rising preference for caesarean delivery (de Loenzien et al., 2021; Heo et al., 2020). There remains an urgent need for systematic research exploring the association between socio-demographic characteristics and caesarean delivery, using national-level data and robust analytical methods. Accordingly, this study aims to examine the socio-demographic characteristics associated with caesarean section delivery among the Vietnamese population.

2. RESEARCH METHOD

This study employs a cross-sectional research design using data from the Vietnam MICS 2020–2021. MICS is a large-scale household survey conducted by UNICEF in collaboration with national statistical offices. The Vietnam MICS 2020–2021 was designed to provide nationally representative estimates on the situation of children and women, including

stratification by urban and rural areas, six geographical regions (Red River Delta, Northern Midlands and Mountain Areas, North Central and Central Coastal Areas, Central Highlands, Southeast, and Mekong River Delta), and two major cities (Hà Nội and Hồ Chí Minh City), as well as for ethnic minority groups.

Fieldwork for the Vietnam MICS 2020–2021 was carried out between November 2020 and February 2021. Interviewer training was conducted in two phases. The survey covered all major regions of Vietnam and was designed to capture both urban and rural disparities across the country.

The sampling framework was based on the 2020 General Statistics Office (GSO) household listing. A total of 30,008 households were successfully interviewed from a sample of 34.540, resulting in a 94.7% response rate. The sampling design was stratified by urban and rural areas within each province. The sample selection involved a two-stage process: enumeration areas (EAs) were first selected using Probability Proportional to Size (PPS), followed by systematic sampling of households within each EA. Households were categorized by the presence of children under five. This study focuses on women aged 15–49 who had at least one child at the time of the survey, resulting in a sample of 1.343 respondents.

Data were collected using the standard MICS women's questionnaire, which was translated into Vietnamese and pretested in April 2020. Adjustments were made following the pilot to improve clarity and accuracy. The key dependent variable was whether the most recent birth was delivered via caesarean section, further classified as elective (planned before labor) or emergency (decided after labor onset). The primary independent variable was the household wealth index. Control variables included maternal age, place of residence, education level, marital status, health insurance coverage, place of delivery, and region.

Data collection was conducted using Computer-Assisted Personal Interviewing (CAPI) with CSPro Version 7.6 software on Windows 10 tablets. A total of 98 field teams were deployed, each consisting of two to four interviewers and one supervisor. In areas with large ethnic minority populations, translators accompanied teams. Bluetooth-enabled applications facilitated real-time transfer of assignments and submission of completed questionnaires. Daily synchronization and software updates were managed through the CSWeb system integrated into supervisors' tablets.

All data were transferred to the General Statistics Office's central system and underwent cleaning and editing based on MICS6 secondary editing guidelines. Preliminary analyses were conducted using SPSS Version 24. For this study, univariate, bivariate, and multivariate analyses were performed using STATA Version 17. Chi-square tests and t-tests were applied for bivariate analysis, and binary logistic regression was used for multivariate analysis to examine the associations between socio-demographic characteristics and caesarean section delivery.

All respondents were informed about the voluntary nature of their participation and assured of the confidentiality and anonymity of their responses. Participants were made aware of their right to decline to answer any question or to withdraw from the survey at any point. The MICS followed national and local ethical protocols, in compliance with the regulations set forth by the Ministry of Health and other relevant authorities in Vietnam. Permission to use the MICS dataset was obtained from UNICEF, and all analyses were conducted in accordance with the data use agreement and ethical guidelines provided by the MICS program.

3. RESULTS AND DISCUSSION

Table 1. The general characteristics of the study sample.

Variables (N=1.343)	Frequency	Percentage
Delivery by caesarean section		
No	902	67.16
Yes	441	32.84
Age group		
15-19	82	6.11
20-24	276	20.55
25-29	416	30.98
30-34	343	25.54
35-39	178	13.25
40-44	41	3.05
45-49	7	0.52
Education level		
Pre-primary or none	69	5.14
Primary	134	9.98
Lower Secondary	381	28.37
Upper Secondary	346	25.76
Vocational High School	82	6.11
University/College/Higher	331	24.65
Place of residence		
Urban	402	29.93
Rural	941	70.07
Wealth index		
Poorest	436	32.46
Poor	254	18.91
Middle	227	16.90
Rich	216	16.08
Richest	210	15.64
Place of delivery		
Public hospital	1,074	79.97
Local clinic	84	6.25
Commune health centre	85	6.33
Private hospital	100	7.45

Table 1 shows that the data from 1.343 respondents, 32.84% of deliveries were performed by caesarean section, while the majority (67.16%) were vaginal births. Most mothers were aged between 25 and 34 years, with the highest proportion in the 25–29 age group (30.98%). In terms of education, the majority had lower or upper secondary education (28.37% and 25.76%, respectively), followed by university or higher education (24.65%). A significant proportion of the sample resided in rural areas (70.07%), and nearly one-third belonged to the poorest wealth quintile (32.46%). Most deliveries took place in public hospitals (79.97%), while private hospitals accounted for only 7.45% of births. These figures highlight socio-demographic disparities in delivery methods and access to maternal healthcare services in Vietnam.

Table 2. Chi-square results on the association factors of caesarean section

Variables = 1.343	Delivery by caesarean section			
	No (%)	Yes (%)	Total	Chi-square test (p-value)
Age group				45.7222***
15-19	90.24	9.76	82	

Variables = 1.343	**Delivery by caesarean section**			
	No (%)	**Yes (%)**	**Total**	**Chi-square test (p-value)**
20-24	77.17	22.83	276	
25-29	65.62	34.38	416	
30-34	60.35	39.65	343	
35-39	59.55	40.45	178	
40-44	60.98	39.02	41	
45-49	57.14	42.86	7	
Education level				48.6403***
Pre-primary or none	78.26	21.74	69	
Primary	76.12	23.88	134	
Lower Secondary	73.75	26.25	381	
Upper Secondary	69.65	30.35	346	
Vocational High school	52.44	47.56	82	
University/College/Higher	54.68	45.32	331	
Place of residence				23.2398***
Urban	57.71	42.29	402	
Rural	71.20	28.80	941	
Wealth index				62.7706***
Poorest	80.05	19.95	436	
Poor	66.93	33.07	254	
Middle	65.64	34.36	227	
Rich	56.94	43.06	216	
Richest	52.86	47.14	210	
Place of delivery				24.3374***
Public hospital	66.85	33.15	1074	
Local clinic	70.24	29.76	84	
Commune health centre	85.88	14.12	85	
Private hospital	52.00	48.00	100	

Note: ****p-value<0.001, **p-value<0.01, *p-value<0.05*

Table 2 from the bivariate analysis shows significant associations between socio-demographic factors and caesarean section (CS) delivery ($p < 0.001$). CS rates increase with maternal age, from 9.76% at 15–19 years to 42.86% at 45–49 years. Women with higher education (45.32%) undergo CS more often than those without schooling (21.74%). Urban residents (42.29%) and wealthier households (47.14%) also report higher CS rates compared to rural (28.80%) and poorest groups (19.95%). By facility, CS is most common in private hospitals (48.00%) and least at commune health centers (14.12%).

Table 3. Binary logistic regression results factors associated with caesarean section.

Variables = 1.343	**Adj odds ratio**	**95% conf interval**		**p-value**
Age group				
15-19	ref			
20-24	2.41	1.09	5.30	**0.029**
25-29	3.26	1.51	7.06	**0.003**
30-34	3.98	1.83	8.68	**0.001**
35-39	4.32	1.92	9.72	**0.000**
40-44	4.68	1.74	12.55	**0.002**

Variables = 1.343	Adj odds ratio	95% conf interval		p-value
45-49	6.38	1.11	36.83	**0.038**
Education level				
Pre-primary or none	ref			
Primary	0.97	0.47	2.00	0.930
Lower Secondary	1.09	0.56	2.13	0.794
Upper Secondary	1.14	0.58	2.26	0.704
Vocational High school	1.68	0.76	3.73	0.201
University/College/Higher	1.53	0.75	3.11	0.244
Place of residence				
Urban	ref			
Rural	0.89	0.67	1.18	0.433
Wealth index				
Poorest	ref			
Poor	1.58	1.09	2.29	**0.016**
Middle	1.46	0.98	2.18	0.066
Rich	1.90	1.25	2.88	**0.003**
Richest	1.83	1.15	2.91	**0.011**
Place of delivery				
Public hospital	ref			
Local clinic	0.80	0.48	1.33	0.391
Commune health centre	0.44	0.23	0.85	**0.014**
Private hospital	1.39	0.90	2.13	0.136
cons	0.09	0.04	0.25	0.000

LR chi2(19) = 109.87
Prob > chi2 = 0.0000
Log likelihood = -795.20695
Pseudo R2 = 0.0646

Table 3 shows that the multivariate logistic regression analysis identifies several significant predictors of caesarean section (CS) delivery among Vietnamese women. Compared to the youngest age group (15–19 years), the odds of undergoing a CS increase significantly with age. Women aged 20–24 have 2.41 times higher odds (p = 0.029), while those aged 45–49 have the highest adjusted odds (AOR = 6.38, p = 0.038), indicating a strong positive association between maternal age and CS delivery. In contrast, educational attainment does not show a statistically significant association with CS, as none of the education categories differ significantly from the reference group (pre-primary or none). Similarly, place of residence (rural vs. urban) is not a significant predictor (AOR = 0.89, p = 0.433). Regarding economic status, women from wealthier households are more likely to deliver by CS. Specifically, those in the "poor" (AOR = 1.58, p = 0.016), "rich" (AOR = 1.90, p = 0.003), and "richest" (AOR = 1.83, p = 0.011) categories have significantly higher odds of CS compared to the poorest group. Place of delivery also plays a role; women giving birth at commune health centers are significantly less likely to have a CS compared to those delivering at public hospitals (AOR = 0.44, p = 0.014). Deliveries in local clinics or private hospitals, however, do not show statistically significant differences. Overall, the model suggests that maternal age and household wealth are the strongest socio-demographic predictors of caesarean section delivery in Vietnam, while education and rural residence do not independently predict CS after adjusting for other factors.

The findings of this study highlight that maternal age and household wealth are significant socio-demographic predictors of caesarean section (CS) delivery in Vietnam, while education level and rural residence lose their predictive power in multivariate analysis. This aligns with global trends showing that advanced maternal age is associated with higher CS rates

due to increased obstetric risks and medical indications that come with older pregnancies (Claramonte Nieto et al., 2019; Correa-de-Araujo & Yoon, 2021). However, in contexts such as Vietnam, where healthcare access and patient preferences are rapidly evolving, the role of age may also reflect a combination of medical precaution and cultural beliefs regarding childbirth safety among older women (McKinn et al., 2019; Nguyen et al., 2021).

In terms of economic status, the positive association between higher household wealth and CS delivery is consistent with previous studies which found that wealthier women are more likely to opt for CS, possibly due to greater access to private healthcare services and a perception that CS is a safer or more convenient option (Colomar et al., 2021; Panda et al., 2020). This pattern supports the theory of health behavior proposed which suggests that health decisions, including mode of delivery, are shaped not only by medical necessity but also by structural and cultural factors, such as income, healthcare system trust, and societal norms (Rangan, 2024). The increased use of CS among wealthier groups in Vietnam may also reflect the commercialization of medical services and provider-induced demand, particularly in urban and private healthcare settings (McBride et al., 2024).

Contrary to expectations and some prior studies, education level and place of residence did not independently predict CS delivery in the adjusted model. Although bivariate analysis suggested that urban women and those with higher education were more likely to undergo CS, these factors lost significance after controlling for other variables. This may indicate that education and residence act as proxies for wealth and healthcare access, rather than as direct determinants. Previous research in Southeast Asia has shown mixed findings on the influence of education on CS use, with some suggesting that educated women are more empowered in health decision-making (Sohn & Jung, 2020). while others argue that wealth and institutional delivery practices play a stronger role (Islam et al., 2022).

The place of delivery was also a notable factor in this study. Women delivering in commune health centers were significantly less likely to undergo CS, which likely reflects both limited surgical capacity and a focus on low-risk, routine births in such facilities. Although private hospitals showed a higher proportion of CS deliveries in the bivariate analysis, this association was not statistically significant after adjustment. This may reflect sample size limitations or variability in CS practices across private institutions in Vietnam. Nonetheless, the trend is consistent with concerns that CS rates are often higher in private healthcare due to financial incentives or patient preferences (Yu et al., 2022).

Overall, the results underscore the importance of socio-economic stratification in maternal health outcomes in Vietnam. The findings support the socio-demographic transition theory, where changes in fertility behavior and health service utilization reflect broader socio-economic and cultural shifts. With Vietnam undergoing rapid urbanization and healthcare reform, understanding the determinants of rising CS rates is essential for designing policies that promote safe, equitable, and medically appropriate childbirth practices. On the other hand, this study has several limitations. First, the cross-sectional design of the Vietnam MICS 2020–2021 prevents establishing causal relationships between socio-demographic factors and caesarean section delivery. Second, the analysis relied on self-reported data, which may be subject to recall bias or misclassification, particularly regarding the type of caesarean section. Third, while the dataset is nationally representative, some potentially important determinants such as maternal health status, pregnancy complications, or provider-level factors were not captured, which may limit the explanatory power of the model.

4. CONCLUSION

This study reveals that maternal age and household wealth are the most significant socio-demographic factors associated with caesarean section deliveries in Vietnam. Women of older reproductive age and those from higher-income households are more likely to deliver by CS,

indicating that both biological and socio-economic considerations influence delivery decisions. Although higher education and urban residence initially appeared to be associated with CS, their effects diminished after controlling for other variables, suggesting that wealth and access to services play a more central role. The findings underscore the need to understand CS utilization within the broader context of Vietnam's healthcare system, socio-economic disparities, and evolving cultural norms. To ensure the medically appropriate use of caesarean sections, health policies should prioritize equitable access to maternal care and strengthen guidelines to prevent non-essential CS, particularly among wealthier populations. In sum, Maternal age and household wealth are key socio-demographic factors influencing caesarean section deliveries in Vietnam, with older and wealthier women more likely to undergo CS. To promote appropriate use of CS, health policies should focus on equitable access to maternal care and enforce stricter guidelines to reduce non-medically indicated procedures, especially among affluent groups.

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