

# Factors associated with four or more antenatal care services among pregnant women: a cross-sectional survey in eight South Central Coast provinces of Vietnam

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**Background:** In Vietnam, four or more antenatal care (ANC4+) visits/services among pregnant women have not been officially reported in the health system. Moreover, the factors associated with the use of ANC4+ services have not been studied in previous studies. In this study, we conducted an exploratory analysis to identify the rate of utilization of ANC4+ services and factors associated with use of ANC4+ services among pregnant women in rural areas of Vietnam.

**Methods:** The study was conducted in eight provinces in the South Central Coast region of Vietnam between August 2013 and May 2014. A total of 907 women, who delivered in the past 1 year, participated in the study. Multivariate logistic regression model was used to examine the association between all potential factors and utilization of ANC4+ services.

**Results:** The rate of utilization of ANC4+ services by women in eight South Central Coast provinces was 53.9%. Factors negatively associated with using ANC4+ services were belonging to ethnic minority groups having lower education, doing informal works, having lower income, having lower knowledge on ANC4+ services, and receiving no financial support from the husband. In particular, financial support from the husband was considered important in improving the use of ANC4+ services by women in rural areas.

**Conclusion:** The study asserted an inadequacy for ANC4+ utilization and can contribute to missed opportunities to achieve better maternal outcomes for women in rural areas of Vietnam. The necessity of introducing ANC4+ services in the national guidelines on maternal health care should be disseminated to health policy-makers. Strategies to increase ANC4+ utilization should focus on knowledge improvement and on poor, low-income, and ethnic minority women.

**Keywords:** pregnant women, antenatal care services, ethnic minority, male involvement, South Central Coast provinces, Vietnam

## Background

Antenatal care (ANC) services for pregnant women by skilled health providers improve maternal and child health outcomes.<sup>1</sup> It is one of the most important interventions in combating maternal and newborn mortality and in achieving the Millennium Development Goals 4 and 5.<sup>2</sup> Women attending ANC visits should receive sufficient evidence-based clinical interventions, such as tetanus toxoid immunization, deworming, iron and folic acid supplements, counseling on maternal health, and birth and emergency preparedness.<sup>3</sup> Attending ANC visits by skilled health providers are associated with an increase in institutional deliveries and use of postnatal services.<sup>1,4</sup> The World Health Organization recommends all women with uncomplicated pregnancies to attend four or more ANC (ANC4+) visits/services at fourth, sixth, seventh, eighth, and ninth

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month of pregnancy.<sup>5</sup> Attending three or less ANC visits in uncomplicated pregnancies increases perinatal mortality in low- and middle-income countries.<sup>6,7</sup> Having ANC4+ services among pregnant women has been widely used as a global benchmark, referring as adequacy of ANC.<sup>5</sup>

The recommended number of ANC visits/services varies between countries and is often higher in high-income countries. In Norway, a basic program of eight visits is recommended by the 40th week of pregnancy.<sup>8</sup> In Vietnam, the National Reproductive Health Guideline recommends at least three ANC visits for uncomplicated pregnancies, one in each trimester with adequate services during each visit.<sup>9</sup> Very recently, since September 2014, the ANC4+ services was added to the health information system in Vietnam as an official indicator.<sup>10</sup>

ANC services are recognized to be underutilized in developing countries.<sup>11,12</sup> Although most of women (88%) have at least one ANC visit, only 55% receive the recommended ANC4+ services.<sup>13</sup> In Vietnam, the proportion of pregnant woman having ANC4+ services has significantly increased from 29% in 2002<sup>14</sup> to more than 70% in 2014.<sup>15</sup> To date, Vietnam has achieved the Millennium Development Goal 5 on reducing maternal mortality.<sup>16</sup> Evidence, however, points to growing disparities in the utilization of antenatal services in recent years between disadvantaged and privileged women groups.<sup>17–19</sup> Disadvantaged women are less likely to have access to safe, affordable, and acceptable antenatal services, which lead to higher rates of both maternal morbidity and mortality.

Studies were conducted to examine factors associated with the use of ANC services in Vietnam.<sup>18,20</sup> Low maternal education, poverty, and ethnic minority status are commonly reported as the most important factors for the less use of ANC services.<sup>18,20,21</sup> The associated factors to having ANC4+ services, to our knowledge, have not been studied in any previous studies in Vietnam. The objectives of this study are therefore to identify the rate of utilization of ANC4+ services among the pregnant women and factors that are associated with the ANC4+ services in rural areas of Vietnam.

## Methods

### Study setting and population

A cross-sectional household survey was conducted in the South Central Coast region of Vietnam between August 2013 and May 2014. The South Central Coast region in Vietnam encompasses a combination of eight mountainous and coastal provinces. Out of the total population of 8.93 million, a majority of Vietnamese (Kinh) people live in mainland, while most of the minority ethnic groups live in the mountainous part.

Two districts in each province representing the coastal and mountainous districts were purposively selected ( $n=16$ ). In each district, two communes were randomly selected ( $n=32$ ). The target population included all mothers who delivered in the past 1 year. Approximately 30 women who delivered in the past 1 year before the date of interview were systematically selected in each commune based on the lists provided by commune health centers (CHCs). A total of 907 respondents participated in this study.

### Data collection

Semi-structured questionnaires were used to gather data from women, who delivered in the past 1 year before the date of interview, to identify the coverage of ANC4+ services and its associated factors of sociodemographic characteristics, social determinants, sex equality, and husband's involvement in ANC services.

For 3 months (September–November) in 2014, trained interviewers (researchers from Hanoi School of Public Health) visited households and administered questionnaires in all eight provinces. If a selected mother could not speak Vietnamese, a village health worker helped to translate for the interviewers.

### Statistical analysis

Data were entered using EpiData and double-checked before analyzing using SPSS for Windows Version 16 statistical package (SPSS, Inc., Chicago, IL, USA). Proportion for all factors were compared between different categories of ANC visits (0, 1–3, and 4+) using  $\chi^2$  test of independence. This  $\chi^2$  test tested the null hypothesis that the number of ANC visit is independent of the contributing factors, such as ethnicity and occupation.<sup>22</sup> When the expected values in any of the cells of a contingency table are below 5, Fisher's exact test was calculated as it is more accurate than the  $\chi^2$  test in this situation.<sup>22</sup> Univariate and multivariate logistic regression analyses (stepwise backward likelihood ratio method) were conducted to analyze factors associated with having ANC4+ services. The independent variables were sociodemographic, social determinant, sex equality, and male involvement. Confidence interval (CI) of 95% was calculated, and  $P<0.05$  was considered statistically significant.

### Ethical consideration

Ethical clearance was obtained from the institutional review board of Hanoi School of Public Health. Ethical guidelines were followed, and participants were recruited after obtaining a written informed consent.

## Results

### Basic characteristics of the study population

#### Socio-demographic characteristics

A total of 907 mothers with children younger than 1 year participated in the study. The majority (80.6%) were aged between 20 and 34 years. More than half (68.5%) belonged to the nonethnic group. More mothers were living in mountainous areas than in coastal areas. More than half (66.5%) had secondary or higher education, and among them, most (83.1%) were doing informal works (housework or self-employed). Nearly half of the women classified themselves in poor or near-poor group. Most of them (88.1%) were living close to the CHC (within 5 km) (Table 1).

#### Sex equality

A majority of the women (85.1%) had unequal income compared to their husbands. Likewise, two-third of women

(66.5%) were not equal to their husbands in decision-making. There was also almost no communication between husbands and wives regarding ANC. However, two-third (66.9%) of women perceived equal roles of men and women in ANC (Table 1). Few husbands accompanied their wives to all ANC visits, and only one-third of them provided financial support to their wives during pregnancy (Table 1). At the bivariate level, several basic characteristics of the women had significant differences to the use of ANC. For instance, women with higher income were more likely to utilize the recommended ANC4+ services compared with those with lower income (68.1% vs 30.9%).

#### Having ANC4+ services

Out of 907 women who were involved in the study, 408 (46.1%) had zero or one to three ANC visits, whereas 489 (53.9%) had ANC4+ services. There were significant relationships between ANC visits and ethnicity, residency, education, occupation, household income, distance to CHC, knowledge

**Table 1** Basic characteristics and number of ANC services

Variable	Number of women N (%)	Number of ANC			$\chi^2$	P-value
		Zero N (%)	1–3 N (%)	4+ N (%)		
Total	907	17 (1.9)	401 (44.2)	489 (53.9)		
<b>Socio-demographic</b>						
1. Age (years)						
Under 19	68 (7.5)	1 (1.5)	40 (58.8)	27 (39.7)	Fisher's exact	0.050
20–34	731 (80.6)	16 (2.2)	310 (42.4)	405 (55.4)		
Above 35	108 (11.9)	0 (0.0)	51 (47.2)	57 (52.8)		
2. Ethnicity						
Ethnic minority	286 (31.5)	11 (3.9)	186 (65.0)	89 (31.1)	<b>89.9***</b>	0.000
Nonethnic minority	621 (68.5)	6 (1.0)	215 (34.6)	400 (64.4)		
3. Residency						
Coastal	413 (45.5)	5 (1.2)	141 (34.1)	267 (64.7)	<b>35.4***</b>	0.000
Mountainous	494 (54.5)	12 (2.5)	260 (52.6)	222 (44.9)		
4. Education						
Secondary school and under	631 (69.6)	14 (2.2)	321 (50.9)	296 (46.9)	<b>Fisher's exact***</b>	0.000
High school and higher	276 (30.4)	3 (1.1)	80 (29.0)	193 (69.9)		
5. Occupation						
Informal works	754 (83.1)	16 (2.0)	369 (49.0)	369 (49.0)	<b>Fisher's exact***</b>	0.000
Business owners	47 (5.2)	1 (2.1)	4 (8.5)	42 (89.4)		
Government officials	106 (11.7)	0 (0.0)	28 (26.4)	78 (73.6)		
6. Household income						
Poor and near poor	428 (47.2)	14 (3.3)	258 (60.3)	156 (36.4)	<b>Fisher's exact***</b>	0.000
Middle or higher income	479 (52.8)	3 (0.6)	143 (29.9)	333 (69.5)		
7. Distance to CHC						
5 km and above	108 (11.9)	5 (4.6)	54 (50.0)	49 (45.4)	<b>7.6*</b>	0.023
Under 5 km	799 (88.1)	12 (1.5)	347 (43.4)	440 (55.1)		

(Continued)

**Table 1** (Continued)

Variable	Number of women	Number of ANC			$\chi^2$	P-value
	N (%)	Zero N (%)	1–3 N (%)	4+ N (%)		
8. Health insurance						
No	268 (29.5)	4 (1.5)	104 (38.8)	160 (59.7)	Fisher's exact	0.078
Yes	639 (70.5)	13 (2.0)	297 (46.5)	329 (51.5)		
9. Knowledge on ANC4+						
No	504 (55.6)	11 (2.2)	313 (62.1)	180 (35.7)	<b>152.4***</b>	0.000
Yes	403 (44.4)	6 (1.5)	88 (21.9)	309 (76.7)		
10. Having danger signs during pregnancy						
No	340 (37.6)	5 (1.5)	152 (44.7)	183 (53.8)	0.5	0.777
Yes	567 (62.4)	12 (2.1)	249 (43.9)	306 (54.0)		
<b>Sex equality</b>						
11. Equal amount of income to that of the husband						
No	772 (85.1)	13 (1.7)	355 (46.0)	404 (52.3)	<b>Fisher's exact*</b>	0.021
Yes	135 (14.9)	4 (3.0)	46 (34.1)	85 (62.9)		
12. Equal in decision-making						
No	603 (66.5)	14 (2.3)	272 (45.1)	317 (52.6)	Fisher's exact	0.240
Yes	304 (33.5)	3 (1.0)	129 (42.4)	172 (56.6)		
13. Equal roles in ANC care						
No	300 (33.1)	6 (2.0)	154 (51.3)	140 (46.7)	<b>9.5**</b>	0.008
Yes	607 (66.9)	11 (1.8)	247 (40.7)	349 (57.5)		
14. Communication on ANC						
No	747 (82.4)	5 (3.1)	88 (55.0)	67 (41.9)	<b>11.9**</b>	0.003
Yes	160 (17.6)	12 (1.6)	313 (41.9)	422 (56.5)		
15. Domestic violence						
No	764 (84.2)	12 (1.6)	325 (42.5)	427 (55.9)	<b>9.0*</b>	0.011
Yes	143 (15.8)	5 (3.5)	76 (53.2)	62 (43.3)		
<b>Male involvement in ANC</b>						
16. Accompanied to ANC visits by the husband						
Sometime	170 (18.8)	6 (3.5)	89 (51.2)	79 (45.3)	<b>8.1*</b>	0.018
Every time	733 (81.2)	11 (1.5)	213 (42.6)	410 (55.9)		
17. Accompanied to ANC visits by the husband						
No	347 (38.3)	9 (2.6)	169 (48.7)	109 (48.7)	<b>6.9*</b>	0.031

**Notes:** \*Represents statistically significant at  $P < 0.05$ ; \*\*represents statistically significant at  $P < 0.01$ ; \*\*\*represents statistically significant at  $P < 0.001$ . Bold values indicate significance that are less than 0.05.

**Abbreviations:** ANC, antenatal care; ANC4+, four or more antenatal care visits/services; CHC, commune health center.

on ANC4+, having equal amount of income to that of the husband, perceived equal roles in ANC, couple communication on ANC, experiencing domestic violence, being accompanied to ANC visits by the husband, and receiving financial supports from the husband during pregnancy ( $P < 0.05$ ) (Table 1). Women, who attended ANC4+ services, were more likely to be in the nonethnic group, live in coastal region, have higher education, have a business or be a government official, have better off income, have better knowledge on ANC, have equal amount of income to that of the husband, have perceived equal roles in ANC care, have couple communication on ANC, have not experienced domestic violence, be accompanied frequently to ANC by their husbands, and receive financial support from the husband during pregnancy (Table 2).

## Factors associated with having ANC4+ services

The multivariate analyses adjusted for all factors were included in the final model (Table 2). Age, residency, distance to the CHC, having danger signs during pregnancy, having equal amount of income to that of their husbands, perceived equal roles in decision-making, perceived equal roles in ANC, having couple communication on ANC, experiencing domestic violence, and being accompanied to ANC by their husbands were not significantly associated with ANC4+. The remaining variables, ethnicity, education, occupation, household income, knowledge on ANC4+, and financial support from the husband, were significantly associated with ANC ( $P < 0.05$ ). Nonethnic women were two times

**Table 2** Logistic regression analysis of factors associated with ANC4+

Variables	Bivariate analyses		Multivariate analyses	
	OR (95% CI)	P-value	OR (95% CI)	P-value
<b>Socio-demographic</b>				
1. Age (years)				
Under 19	Ref		Ref	
20–34	<b>1.9 (1.13–3.14)*</b>	<b>0.013</b>	0.7 (0.38–1.38)	0.331
Over 35	1.7 (0.91–3.16)	0.09	0.5 (0.24–1.17)	0.101
2. Ethnicity				
Ethnic minority group	Ref		Ref	
Nonethnic minority group	<b>4 (2.9–5.5)***</b>	<b>0.000</b>	<b>2 (1.24–3.16)**</b>	<b>0.004</b>
3. Residence				
Coastal	Ref		Ref	
Mountainous	<b>0.44 (0.34–0.59)***</b>	<b>0.000</b>	0.92 (0.62–1.36)	0.068
4. Education				
Secondary school and under	Ref		Ref	
High school and higher	<b>2.6 (1.93–3.58)***</b>	<b>0.000</b>	<b>1.7 (1.16–2.48)**</b>	<b>0.006</b>
5. Occupation				
Informal works	Ref		Ref	
Owner business	<b>10.2 (3.89–26.76)***</b>	<b>0.000</b>	<b>3.1 (1.08–8.78)*</b>	<b>0.035</b>
Government officials	<b>3.4 (2.12–5.40)***</b>	<b>0.000</b>	<b>1.9 (1.11–3.26)*</b>	<b>0.018</b>
6. Household income				
Poor and near poor	Ref		Ref	
Middle/higher income	<b>4 (2.9–5.3)***</b>	<b>0.000</b>	<b>2.3 (1.63–3.30)***</b>	<b>0.000</b>
7. Distance to CHC				
5 km and above	Ref		Ref	
Within 5 km	0.7 (0.4–1.0)	0.057	0.8 (0.46–1.26)	0.287
8. Knowledge on ANC4+				
No				
Yes	<b>5.9 (4.3–8.2)***</b>	<b>0.000</b>	<b>2.4 (2.06–2.86)***</b>	<b>0.000</b>
9. Having danger signs during pregnancy				
No	Ref		Ref	
Yes	1 (0.8–1.3)	0.966	1.1 (0.80–1.54)	0.530
<b>Sex equality</b>				
10. Equal amount of income to that of the husband				
No	Ref		Ref	
Yes	<b>1.5 (1.1–2.3)*</b>	<b>0.022</b>	1.3 (0.8–2.04)	0.307
11. Equal in decision-making				
No	Ref		Ref	
Yes	1.2 (0.9–1.55)	0.253	1.2 (0.86–1.74)	0.255
12. Equal roles in ANC care				
No	Ref		Ref	
Yes	<b>1.5 (1.2–2.0)**</b>	<b>0.002</b>	1.1 (0.74–1.53)	0.727
13. Couple communication on ANC				
No	Ref		Ref	
Yes	<b>1.8 (1.3–2.6)***</b>	<b>0.000</b>	1.1 (0.70–1.69)	0.704
13. Experiencing domestic violence				
No	Ref		Ref	
Yes	<b>0.6 (0.4–0.9)**</b>	<b>0.005</b>	0.8 (0.50–1.22)	0.280
14. Accompanied to ANC				
Sometime	Ref		Ref	
Every time	<b>1.5 (1.1–2.1)*</b>	<b>0.012</b>	1 (0.65–1.48)	0.912
15. Financial support during pregnancy				
No	Ref		Ref	
Yes	<b>1.4 (1.1–1.8)*</b>	<b>0.013</b>	<b>2.2 (1.54–3.07)***</b>	<b>0.000</b>

**Notes:** \*Represents statistically significant at  $P < 0.05$ ; \*\*represents statistically significant at  $P < 0.01$ ; \*\*\*represents statistically significant at  $P < 0.001$ .

**Abbreviations:** ANC, antenatal care; ANC4+, four or more antenatal care visits; OR, odds ratio; CI, confidence interval; CHC, commune health center.



more likely to have ANC4+ services than those of ethnic origin (adjusted odds ratio [aOR] =2.0, CI =1.24–3.16). Women with higher education were 1.7 times more likely to have ANC4+ services than those with lower education (aOR =1.7, CI =1.16–2.48). Women who were having formal job (business owners or government officials) were more likely to have ANC4+ services than those having informal job. Women with high income were 2.3 times more likely to have ANC4+ services than those in poor or near-poor group (aOR =2.3, CI =1.63–3.3). Women who had better knowledge on ANC were 2.4 times more likely to have ANC4+ services than those with poor knowledge (aOR =2.4, CI =2.06–2.86). Women who received financial support from their husbands were 2.2 times more likely to have ANC4+ services than those who did not receive financial support (aOR =2.2, CI =1.54–3.07) (Table 2).

## Discussion

In this study, we have analyzed the proportion of women having ANC4+ services and the association between having ANC4+ services and other determinants of health. Our findings demonstrated that nearly one-half of the women in rural areas did not have ANC4+ services. This inadequacy for ANC can contribute to missed opportunities to achieve better maternal outcomes. Having ANC4+ services was significantly associated with ethnicity, education, occupation, household income, knowledge on ANC4+, and the financial support from the husband.

## Proportion of having ANC4+ services

ANC4+ visit is a programmatically useful indicator to point out how services are utilized by pregnant women.<sup>23</sup> In our study and other previous studies, the research on ANC+ services asserted an observed trend of increasing rate of utilization of ANC4+ services in Vietnam. The rate of utilization of ANC4+ services increased from 11% in 1999<sup>14</sup> to 30% in 2002,<sup>24</sup> to 59.6% in 2010,<sup>25</sup> and to 73.7% in 2014.<sup>15</sup> Compared to other countries, it can be seen that the rate of utilization of ANC4+ services in Vietnam is higher than that in other developing countries (52%), but lower than that in Southeast Asian countries (80%) in 2012.<sup>26</sup> This could be due to the economic growth and better investment and awareness on maternal and child health care in the past 3 decades.<sup>27</sup>

Our study presented a general picture of current situation and the associated factors with having ANC4+ services in eight coastal provinces in Vietnam. Compared to national level, the rate of utilization of ANC4+ services in our study was much lower (59.6%) in 2010 and in 2014 (73.7%). In Vietnam, only recently, the Ministry of Health introduced the ANC4+ services indicator in the maternal health program,

and women might not be aware of this program. This could be a reason for the low rate of utilization of ANC4+ services in our study. Moreover, women in rural and mountainous areas often have many disadvantages, including low quality of health services. Other studies asserted the low percentage of women who have received antenatal health education during ANC visits.<sup>20,28</sup> They tend to seek for ANC services in private clinics, although these clinics have higher cost than that in the public clinics.<sup>20</sup> Women tend to seek services, such as ultrasound examination, that are not widely provided in all CHCs.<sup>28</sup> Owing to the high out-of-pocket payment, they would have fewer visits at private clinics than they could have received in the public clinics. Therefore, to improve utilization of ANC4+ services in the rural areas, the quality of care in public centers should be improved in parallel with the education program to improve the awareness of using ANC services in public primary health-care facilities.

## Factors associated with having ANC4+ services

Six factors were positively associated with the utilization of ANC4+ services: mothers with better education, with formal job (business or officials), with better off economic conditions, of nonethnic origin, having more knowledge on ANC, and receiving financial support from their husbands were more likely to have ANC4+ services. Consistent with other studies, mothers having lower education level often have lower income and have less knowledge on ANC services.<sup>21,28</sup> These women often face difficulties, including intellectual and financial disadvantages, to get access to ANC services.<sup>21,28</sup> Sufficient knowledge on the necessity of ANC services and the complications occurring during pregnancy could increase the accessibility to ANC services.<sup>29</sup> Notably, in our study, many women with high-risk pregnancy did not have higher rate of utilization of ANC4+ services than that of low-risk pregnant women. The explanation is likely to be that high-risk pregnant women do not recognize these risks.<sup>28</sup>

Consistent with our findings about occupation, a previous study points out that informal working women (housework or self-employed) are underutilizing ANC services.<sup>30</sup> These women do not have health insurance, and this may be one of the reasons that they hesitate to seek ANC.<sup>30</sup> Although Vietnamese government has the policy to expand health insurance for the poor and near-poor groups,<sup>27</sup> the utilization of health services is still low in the highland and difficult regions due to several reasons, including geographical, transport, and financial barriers.<sup>27,31</sup> Therefore, there was a need to improve the universal health coverage for informal groups, especially in difficult regions, including coastal and mountainous areas.

Mothers of nonethnic origins were likely to have higher rate of utilization of ANC4+ services than those of ethnic origins. Despite the overall improvement in the use of maternal health care, the disparity among the ethnic and nonethnic origins is growing in Vietnam.<sup>17,32</sup> Ethnic minority women, who live in remote and mountainous areas, tend to have lower income, lower education,<sup>33</sup> and less knowledge on maternal health care. They have the following difficulties: fewer physical assets, longer travel distance, lack of transportation, and high indirect costs of seeking and utilizing health-care services.<sup>34</sup> Although there are many policies to support the most difficult districts and communes, there exist many challenges such as poor accessibility and acceptability of services.<sup>27</sup> Thus, programs with specific strategies for ethnic women in hard-to-reach areas, such as the mobile health communication and services,<sup>35</sup> should be considered.

In Vietnam, with Confucius influence, men are expected to be the decision-maker in the family.<sup>36</sup> Pregnancy and delivery are considered as female matters. Men are often not expected to accompany their wives ANC visit. Moreover, men in decision-making position were found to be associated with low utilization of ANC and more home-based deliveries in other studies.<sup>37,38</sup> This could be explained why our sex equality variables, such as equal amount of income to that of husband and equal in decision-making position, were not reported as significant factors to ANC4+ services in our study.

Women who received financial support from their husband were more likely to have higher ANC4+ services. This finding is consistent with other studies in Vietnam and other developing countries, which identified the importance of male involvement in reproductive health care for women.<sup>30,39,40</sup> The 1994 International Conference on Population and Development pointed that men's involvement in the improvement of reproductive health outcomes is crucial as without their engagement, change would be very difficult or impossible. Male involvement should be included in all frameworks and plans for improving women's reproductive health.<sup>39</sup> Men could be involved as clients, as partners, and as agents of positive changes in reproductive health care.<sup>41</sup> However, there is no one-size-fits-all strategy to involve men in reproductive health programs.<sup>42</sup> Programs that intend to incorporate male involvement should aim for adequate involvement with specific measures.<sup>41</sup> Thus, programs should be evaluated based on the sex dynamics, how decisions are made and implemented, and the changing needs of both sexes and their interaction.

## Methodological considerations

This study was conducted with a large sample size, which was adequate to gain general estimates of having ANC4+ visits/services and its associated factors. With a cluster sampling

strategy for data collection in eight South Central Coast provinces, the studied subjects were expected to be reasonably representative of not only South Central Coast region but also rural areas in Vietnam. All associated factors were taken in compliance with the theoretical framework.

This study also has limitations. The data were collected by interviewing mother who delivered within 1 year, which could be prone to recall biases. Some of the ethnic minority respondents, Vietnamese, may not fully understand some of the questions. There could have been some socially desirable responses, especially questions related to the equality in decision-making and sex equality. To accommodate this, interviews were conducted confidentially, in the absence of spouses, to avoid biased responses.

## Conclusion

The study asserted the low ANC4+ services among pregnant women in eight South Central Coast provinces. It was found that having ANC4+ services was negatively associated with lower education, having informal job (simple work or unemployed), lower economic conditions, belonging to ethnic minority group, having less knowledge on ANC, and receiving no financial support from the husband. There was a demand on concerted efforts from all relevant stakeholders to improve socioeconomic conditions in the difficult regions, targeting ethnic minority people, to reduce the existing disparity in the use of ANC4+ services.

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## Author contributions

All authors contributed toward data analysis, drafting and revising the paper and agree to be accountable for all aspects of the work.

## Disclosure

The authors report no conflicts of interest in this work.

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