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Original Research Article

Prevalence and determinants of home delivery in urban and rural Philippines: Evidence from the 2017 National Demographic and Health Survey

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Abstract

Background: Women's choice of place of delivery has implications on maternal and child mortality. This study aims to provide an updated and detailed comparison of prevalence and determinants of home delivery in the Philippines, and in urban and rural communities.

Methods: Based on data from the 2017 Philippine National Demographic and Health Survey (NDHS), we estimated the prevalence of home delivery and determined factors influencing women's decision to deliver at home. Analyses were restricted to data from 7229 women who were cohabiting or married, and their last-born child using logistic regression methods for survey data.

Results: There remain a considerable proportion of women aged 15–49 years old who delivered at home (17.92% (95% confidence interval (CI): 15.77, 20.30)). More women in rural areas delivered at home (23.53% (95% CI: 20.38, 26.99)) than their counterparts in urban areas (10.72% (95% CI: 8.23, 13.85)), reflecting a significant difference in the home delivery prevalence of women relative to their place of residence. Our regression analyses showed that there is a relatively greater effect observed for the rural population in most of the proximal factors considered including birth order, women's decision-making power, and emergency preparedness during pregnancy. Wealth index has the most pronounced effect with a significant increase in odds of home delivery among urban and rural women of the lowest wealth categories.

Conclusion: The use of institutional childbirth services remains suboptimal in the Philippines with significant disparities between urban and rural communities. Current strategies therefore need to adopt a multi-sectoral approach to address the complex factors influencing women's decision on place of delivery. Targeted efforts specific to population groups should also be made to contextualize and co-create health care services and solutions that will motivate them to deliver in health facilities.

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Introduction

The global health prioritization of improving maternal health outcomes and child survival has largely been successful.[1,2] From 2000 to 2015, world leaders committed to the Millennium Development Goals (MDGs) that aimed to meet development- and health-related targets.[3] This included MDG 4 that targeted a two-third reduction in child mortality and MDG 5 that aimed for a 75% reduction in the maternal mortality ratio (MMR).[3,4] Many developing countries however failed to meet the ambitious MDG targets, and this has given way to the subsequent maternal mortality- and child mortality-related targets for the Sustainable Development Goals (SDGs).[1,2,5] The global MMR declined in 2015, but progress needs to be accelerated to meet the SDG targets by 2030.[1,6] Similarly, global child mortality rates declined; however, only developed countries achieved MDG 4 with other countries far behind and seemingly far from meeting the SDG target of ending preventable deaths of newborns and children under 5 years of age.[2,6]

The intrapartum care strategy for women centers health care on women's needs to optimize experience of labor and childbirth.[7,8] This approach recognizes that most maternal deaths occur during labor, delivery, or 24-h postpartum, and that complications are not predictable, thus requiring care at a health facility.[8] It further emphasizes the importance of institutional deliveries, but at the same time allows a positive birthing experience. There is general consensus that delivery at a health facility is effective in bringing down high rates of maternal and child mortality,[7,9] and this is supported by interventions and policies instituted locally by countries. The Philippines makes for an interesting case study as it continues to fall behind the SDG targets for both women and children despite substantial improvements in facility-based deliveries and coverage of skilled attendants.[1,2,5,10]

The Philippines is an archipelagic low- and middle-income country with its health system transitioning toward universal health care that promises major reforms in the health sector to provide equitable access to health care for all Filipinos.[11] However, health resources and capacity remain poorly and unequally distributed with rural and remote areas disadvantaged, as evidenced in key maternal and child health indicators.[2,5,9–13] For example, the Philippines is one of the countries that accounts for 80% of child deaths worldwide[2] with a low relative reduction in MMR from 1990 to 2015.[1,14] More importantly, evidence suggests that 96% women who belonged to higher income classes delivered their child with a skilled provider increasing chances of survival, but this was only 42% for women in the poorest quintile.[15] Recognizing the importance of maternal health and the need to address related issues, the Philippine Department of Health (DOH) launched the Women's Health and Safe Motherhood Project 2 in 2006 and the Maternal, Newborn, Child Health and Nutrition (MNCHN) strategy in 2014 with focus on priority groups such as those in low-resource areas.[9,16] Because maternal, neonatal, and child mortalities can be prevented with timely receipt of appropriate emergency obstetric care, strategies and recommendations are focused on encouraging women to deliver in health facilities.[9,16,17] The MNCHN strategy and the Universal Health Care (UHC) Act of 2019 both identify service delivery networks to improve coordination across all health care levels and access to health facilities.[9,11] The MNCHN strategy specifically prohibits giving birth at home.[9,18]

Despite such policies, there is evidence that women continue to deliver at home because of financial and environmental or geographic barriers, influences from networks, individual preferences, and social and cultural factors.[19] These need to be studied at a local context to effectively inform interventions and programs to accelerate progress in improving maternal health. Previous studies have focused on health care utilization of women at the country level.[20–27] However, there is a need to conduct a disaggregated analysis of women in urban and rural communities given the differences in availability and access to services, their subsequent impact on health outcomes, and need for targeted interventions for each of these groups. Urban–rural estimates on place of delivery have been published using data from the African region and have shown that there are notable differences in the uptake of skilled delivery services in urban and rural communities.[28–30] Such studies are especially important with the ongoing COVID-19 pandemic overwhelming the health system and further discouraging women to seek health care and services in health facilities. Because women are often disproportionately affected during disasters, further strengthening the health facilities across the country and integrating in the pandemic response strategies for women to birth safely will be critical to advancing progress to reduce maternal mortality.[1,31] In this article, we aimed to determine the prevalence and factors influencing women's choice of delivering at home in the Philippines, and disaggregated for urban and rural communities. In doing so, we can contextualize and co-create innovations and solutions that will motivate women to deliver in health facilities. This article can further provide useful insights and recommendations to how disparities can be reduced to achieve the goal of Universal Health Care.

Methods

Data sources

The Demographic and Health Surveys (DHS) program provides estimates on demographic and health indicators. Part of the program, the Philippine National Demographic and Health Survey (NDHS) is a nationally representative survey that provides population, health, and nutrition data

in the country. We used the latest 2017 Philippine NDHS dataset in our analysis.[32]

The survey utilized a two-stage stratified sampling design referencing the Master Sampling Frame designed by the Philippine Statistics Authority. The first stage involved the selection of 1250 primary sampling units (PSUs) which were *barangays* (or villages), portions of large *barangays*, or two or more adjacent small *barangays*. The second stage involved systematic random sampling of 20 or 26 housing units. Women 15–49 years old who resided in the eligible households were asked on birth history and child mortality, knowledge and use of family planning methods, fertility preferences, pregnancy, delivery, postnatal care, infant feeding practices, vaccinations and childhood illnesses, and other health issues with reference to the index child. Survey weights were computed to ensure representative estimates of all indicators. Additional information on the survey methodology is provided in the 2017 Philippine NDHS published report.[32]

Study population

The 2017 Philippine NDHS surveyed over 31,000 households and more than 25,000 women ages 15–49.[32] For our analytic sample, we extracted a subset of the 2017 Philippine NDHS dataset using the following criteria: mother–child dyads (with women of reproductive age of 15–49 years and children being the last-born who are married or cohabiting). The basis for the criterion on marital status is that partner's educational attainment and women's decision-making power are significant determinants in women's choice for home delivery.[21,23,33–37] In the dataset, only married women and those living with their partners had data on decision-making power and more importantly, the outcome of interest. Data of last-born children were used to ensure that the woman's most recent delivery would match the questions pertaining to pregnancy and delivery and to minimize issues with reverse causality. The births recode (PHBR71FL) file was used, and we limited our regression analyses to women with no missing data in any of our study variables. To ensure that all models were comparable during model-building, we excluded from the multivariable analyses observations with missing data in any of the remaining variables of interest. Thus, only 7229 respondents were included in the final analysis for the overall population, 2266 respondents for the urban population, and 4963 for the rural population.

Study variables

In this study, our primary outcome variable is place of delivery, which we dichotomized into 0 if the woman delivered at a health facility and 1 if she delivered at home. We make comparisons based on place of location (urban or rural) and build three separate regression models for each,

namely, Philippines, urban, and rural. We selected potential determinants of home delivery based on evidence from previous studies and reviews.[19,21,23–25,33–42] Socio-economic factors included respondent's and partner's highest educational attainment, employment status, and wealth index. The wealth index was derived from a principal components analysis conducted by ICF International and was calculated as a score of ownership of household assets, durable goods, and household facilities. This index was classified into five categories with each household assigned to one of the categories: poorest, poorer, middle, richer, and richest. We used the combined wealth index for overall descriptive statistics, then recategorized into three because data for the richer and richest categories are sparse resulting to poor, middle, and rich categories. We used the wealth index separately computed for urban and rural populations for our urban–rural analyses. Similar categorizations were made. We also included in our models maternal age, marital status, women's decision-making power as measured by who makes decisions about health, parity, birth order, number of antenatal care (ANC) visits, and emergency preparedness during pregnancy. The operational definition of study variables is presented in Table 1.

Statistical analysis

We performed all analyses using complex survey data analysis considering the PSU, stratum, and sample weight adjusting for selection probabilities. All our analyses are weighted, except for analyses that do not have an option for weighting. Proportions, means, odds ratios (ORs), except for tests of normality and rank-sum tests, are weighted. However, we still showed the number of observations, which are unweighted. We described our study variables using percentages for categorical variables and measures of central tendency for continuous variables for the overall population and urban–rural residence. We then assessed the association between dependent variables and independent variables in the Philippines and urban–rural residence using Pearson's chi-square test for categorical variables and Wilcoxon rank-sum test for continuous variables. We categorized our study variables into distal and proximal factors based on how closer they are in the causal pathway of association. We identified mother's and partner's highest educational attainment, working status, maternal age, and marital status as distal factors. These factors are further back in the causal pathway and do not directly (or almost directly) influence the outcome of interest.[43] We considered wealth index and variables related to pregnancy (parity, birth order, women's decision-making power, emergency preparedness during pregnancy, ANC visits) as proximal factors. We included the location (urban–rural) variable in our model for the overall Philippine population and considered this as proximal. This categorization is consistent with the World Health

Table 1. List of study variables and their operational definition.

Variable	Description	Categories
Place of delivery (Outcome)	Where the mother gave birth for the index child	Health facility, home
Place of residence	Type of place of residence	Philippines (overall), urban, rural
Age	Current age of respondent at time of interview	Age in years (as is)
Marital status	Current marital status of respondent at time of interview	Married, cohabiting
Mother's education	Highest level of educational attainment of the mother/respondent	University or higher education, secondary education, primary education or lower
Partner's education	Highest level of educational attainment of respondent's husband/partner	University or higher education, secondary education, primary education or lower
Mother's employment status	Current working status of the mother/respondent	Employed, unemployed
Wealth index	Derived variable using ownership of household assets, durable goods, and household facilities	Rich, middle, poor
Women's decision-making power	Person who usually decides on respondent's health care	Respondent alone; both respondent and husband/partner; husband/partner, or someone else
Parity	Number of children ever born	Para 1, Para 2–4, Para 5 or more
Birth order	Birth order of index child	Birth order (as is)
ANC visits	Adequate number (4 or more) of ANC visits as per protocol	Adequate, inadequate
Emergency preparedness	Prepared money in case of emergency during pregnancy	Prepared, not prepared

ANC: antenatal care.

Report,[43] and findings reported in previous studies in which we based the variables to be included and that showed strong association between pregnancy-related factors and wealth with birthing place decisions. For each potential determinant, we ran bivariate logistic regression separately with the outcome variable before carrying out the multivariable analyses. Study variables with p value of less than 0.20 were entered into the multivariable models to determine factors associated with home delivery in the Philippines and in urban–rural settings. Distal factors were then regressed on proximal factors, and both distal and proximal risk factors were regressed on home delivery in the three separate models. We included variables with p values of 0.05 in our final model. Variables that had p values greater than 0.05, but were important in the decision for home delivery based on literature were also retained in our final model.[19,21,23–25,33–42] Only participants with complete data were included in our logistic regression analyses. We used Stata 14.0 IC for our analyses and set the level of significance at 0.05.[44] We present the results of multivariable logistic regression for women with adjusted odds ratio (aOR) and 95% confidence interval (CI) for each of the three models (Philippines, urban, and rural).

Results

Participant characteristics

Among 7229 women aged 15–49 years with a median age of 30 years old, majority were married with a significant proportion of women and their partners having finished at least secondary education. Almost half were employed and were classified as having lower wealth index scores. A greater proportion of women in rural communities were married compared to the overall and urban populations. More urban women were employed, finished at least secondary education with a partner who similarly had a secondary-level of education, and belonged to high-income classes compared to the overall and rural populations (Table 2).

Place of birth and related study variables across geographic strata

Among 7229 women aged 15–49 years old included in our analyses, 1554 women (17.92% (95% CI: 15.77, 20.30)) gave birth at home while 5675 (82.08% (95% CI: 79.70, 84.23)) women gave birth at health facilities. More women in rural areas delivered at home (23.53% (95% CI: 20.38, 26.99)) than their counterparts in urban areas (10.72% (95% CI: 8.23, 13.85)), reflecting a significant difference in the prevalence of home deliveries relative to their place of residence.

Our study consistently found a higher home delivery prevalence for women with secondary education and whose partners had primary education or lower in all three models (national, urban, rural). Home delivery prevalence is highest among women who are unemployed and who belong to the poorest wealth category. Home delivery is more prevalent among rural women who are married (74.51% (95% CI: 70.13, 78.44)) compared to their overall Philippine and rural counterparts. Proportions of women

Table 2. Characteristics of women 15–49 years of age, 2017 Philippine NDHS.

Characteristic	Philippines (n = 7229)		Urban (n = 2266)		Rural (n = 4963)	
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
Age (median, IQR)	30 (25–36)		30 (25–35)		30 (25–36)	
Marital status						
Cohabiting	2356	37.69 (35.86, 39.56)	926	44.50 (41.51, 47.53)	1430	32.40 (30.12, 34.77)
Married	4873	62.31 (60.44, 64.14)	1340	55.50 (52.47, 58.49)	3533	67.60 (65.23, 69.88)
Mother's education						
Primary or lower	1534	17.88 (16.22, 19.67)	289	12.33 (9.82, 15.37)	1245	22.20 (19.95, 24.63)
Secondary	3580	51.68 (49.50, 53.85)	1162	53.06 (49.74, 56.36)	2418	50.60 (47.72, 53.49)
University or higher	2115	30.43 (28.09, 32.88)	815	34.60 (31.21, 38.16)	1300	27.19 (23.84, 30.82)
Partner's education						
Primary or lower	2212	25.32 (23.45, 27.29)	416	16.67 (14.08, 19.62)	1796	32.05 (29.31, 34.93)
Secondary	3125	45.42 (43.35, 47.51)	1029	46.92 (43.88, 49.99)	2096	44.25 (41.47, 47.07)
University or higher	1892	29.26 (26.76, 31.89)	821	36.41 (33.39, 39.54)	1071	23.69 (19.79, 28.09)
Employed	3442	46.47 (44.70, 48.26)	1106	47.68 (44.57, 50.82)	2336	45.53 (43.46, 47.61)
Wealth index						
Poor	4221	47.74 (45.11, 50.39)	1177	48.23 (44.32, 52.16)	2812	49.19 (45.36, 53.03)
Middle	1280	20.27 (29.10, 35.02)	436	20.37 (17.90, 23.08)	939	19.46 (17.56, 21.50)
Rich	1728	31.99 (29.10, 35.02)	653	31.41 (27.93, 35.11)	1212	31.35 (27.12, 35.93)

CI: confidence interval; IQR: interquartile range.

who gave birth at home were comparable across the three models among those who made their own health care decisions and those who had an emergency preparedness plan. A considerable proportion of urban and rural women still delivered at home despite having adequate ANC visits (Table 3).

Determinants of home delivery in the Philippines

The weighted univariate logistic regression analysis showed that home delivery is negatively associated with cohabiting and making health care decisions with their husband or partner, and positively associated with all other determinants in the unadjusted model as shown in Table 4. The weighted multivariable logistic regression analysis indicates that the odds of home delivery is 2% less with each year increase in age (aOR: 0.98 (95% CI: 0.96, 0.99)) while each increase in birth order results in a 12% increase in the odds of home delivery (aOR: 1.12 (95% CI: 1.03, 1.23)). For education of mothers and their partners, the observed relationship is similar with an increasing trend in the odds of home delivery from secondary to primary education or lower. We observe similar positive trends for home delivery for wealth index with those in the middle category having 2.25 times higher odds (aOR: 2.25 (95% CI: 1.32, 3.83)), and those categorized as poor having 3.25 higher odds of home delivery (aOR: 3.25 (95% CI: 1.97, 5.37)). A similar increasing trend is observed for parity with those having two to four (aOR: 1.41 (95% CI: 1.05, 1.89)) and five or more children (aOR: 1.69 (95% CI: 1.03,

2.78)) being more likely to deliver at home compared to those with only one child. Women whose decision-making power depends on other individuals but themselves are more likely to have a home delivery by 1.41 times (95% CI: 0.99, 2.01) compared to those who decide for themselves, although there is relatively weak evidence for this association (p = 0.06). Inadequate ANC visits and having no emergency preparedness plan also increase the odds of the mother giving birth at home (aOR: 3.64 (95% CI: 2.88, 4.61); aOR: 1.08 (95% CI: 0.84, 1.39)). We also included location in this model and found that women belonging in rural communities had 59% times higher odds of delivering at home compared to those in urban areas (aOR: 1.59 (95% CI: 1.12, 2.26)). We found no apparent differences in the effect of proximal and distal factors in the decision of women to deliver at home.

Determinants of home delivery for urban and rural communities in the Philippines

The weighted univariate logistic regression analysis presented in Table 5 shows that similar to the overall analysis for the Philippines, home delivery is negatively associated with age and cohabiting for urban and rural populations, and making health care decisions with their husband or partner but only among urban women. Home delivery is positively associated with all other determinants in the unadjusted models in both populations. The weighted multivariable logistic regression analyses show that the odds of home delivery decreased by 4% and 2% for each year increase in age among urban and rural women, respectively

Table 3. Prevalence of home delivery by study factors among women aged 15–49 years.

Variable	Philippines			Urban			Rural		
	n	% home delivery (95% CI)	p value	n	% home delivery (95% CI)	p value	n	% home delivery (95% CI)	p value
Age	—	—	0.02	—	—	0.58	—	—	<0.01
Marital status			<0.01			0.32			<0.01
Cohabiting	359	29.37 (25.82, 33.18)		95	40.29 (31.47, 49.79)		264	25.49 (21.56, 29.87)	
Married	1195	70.63 (66.82, 74.18)		179	59.71 (50.21, 68.53)		1016	74.51 (70.13, 78.44)	
Mother's education			<0.01			<0.01			<0.01
Primary or lower	726	44.03 (39.18, 48.99)		117	42.27 (29.15, 56.58)		609	44.65 (40.17, 49.23)	
Secondary	669	46.98 (41.52, 52.51)		129	49.41 (36.72, 62.17)		540	46.12 (40.25, 52.09)	
University or higher	159	8.99 (6.32, 12.64)		28	8.32 (5.01, 13.52)		131	9.23 (5.97, 13.99)	
Partner's education			<0.01			<0.01			<0.01
Primary or lower	919	54.27 (48.64, 59.79)		134	48.77 (35.77, 61.93)		785	56.21 (49.85, 62.38)	
Secondary	501	36.28 (32.33, 40.42)		107	39.45 (29.22, 50.69)		394	35.16 (31.14, 39.40)	
University or higher	134	9.45 (6.73, 13.13)		33	11.78 (6.93, 19.33)		101	8.63 (5.52, 13.24)	
Mother's employment status			0.16			0.70			0.20
Unemployed	877	56.82 (51.85, 61.66)		158	54.28 (43.85, 64.36)		719	57.72 (52.20, 63.06)	
Employed	677	43.18 (38.34, 48.15)		116	45.72 (35.64, 56.15)		561	42.28 (36.94, 47.80)	
Wealth index			<0.01			<0.01			<0.01
Poor	1340	79.64 (75.72, 83.07)		239	85.87 (78.59, 90.96)		1027	71.31 (63.31, 78.16)	
Middle	154	13.86 (11.29, 16.92)		24	7.69 (4.34, 13.27)		163	16.91 (13.20, 21.41)	
Rich	60	6.50 (4.04, 10.28)		11	6.44 (3.32, 12.14)		90	11.78 (8.29, 16.47)	
Parity			<0.01			<0.01			<0.01
Para one	213	13.42 (11.09, 16.14)		39	11.40 (7.07, 17.88)		174	14.13 (11.57, 17.16)	
Para 2–4	821	54.05 (50.83, 57.24)		161	60.53 (52.77, 67.80)		660	51.75 (48.42, 55.07)	
Para 5 or more	520	32.53 (29.43, 35.80)		74	28.07 (21.09, 36.30)		446	34.12 (30.84, 37.55)	
Birth order	—	—	<0.01	—	—	<0.01	—	—	<0.01
Women's decision-making power			0.02			0.07			0.21
Respondent alone	664	46.90 (43.33, 50.50)		124	47.81 (40.99, 54.71)		540	46.58 (42.31, 50.90)	
Both respondent and husband/partner	786	46.77 (43.21, 50.36)		132	45.27 (38.04, 52.71)		654	47.30 (43.17, 51.46)	
Husband/partner, or someone else	104	6.33 (4.79, 8.33)		18	6.92 (4.27, 11.02)		86	6.13 (4.33, 8.60)	
ANC visits			<0.01			<0.01			<0.01
Inadequate ANC visits (less than 4)	594	34.53 (29.48, 39.95)		93	37.94 (26.07, 51.45)		501	33.32 (28.25, 38.80)	
Adequate ANC visits (at least 4)	960	65.47 (60.05, 70.52)		181	62.06 (48.55, 73.93)		779	66.68 (61.20, 71.75)	
Emergency preparedness during pregnancy			<0.01			<0.01			<0.01
Not prepared	346	20.66 (16.88, 25.02)		59	21.66 (15.45, 29.50)		287	20.30 (15.79, 25.70)	
Prepared	1208	79.34 (74.98, 83.12)		215	78.34 (70.50, 84.55)		993	79.70 (74.30, 84.21)	

CI: confidence interval; ANC: antenatal care.

Table 4. Determinants of home delivery among 15- to 49-year-old women in the Philippines.

Variable	Crude OR (95% CI)	p value	Adjusted OR (95% CI)[a]	p value
Age	1.02 (1.01, 1.03)	0.01	0.98 (0.96, 0.99)	0.03
Marital status				
Married	1.00	–	1.00	–
Cohabiting	0.64 (0.53, 0.76)	<0.01	0.69 (0.56, 0.86)	<0.01
Mother's education				
University or higher	1.00	–	1.00	–
Secondary	3.48 (2.27, 5.34)	<0.01	1.66 (1.13, 2.44)	0.01
Primary or lower	14.12 (9.43, 21.15)	<0.01	3.19 (2.25, 4.52)	<0.01
Partner's education				
University or higher	1.00	–	1.00	–
Secondary	2.72 (1.91, 3.86)	<0.01	1.15 (0.82, 1.62)	0.41
Primary or lower	10.14 (6.55, 15.71)	<0.01	1.84 (1.21, 2.80)	<0.01
Wealth index				
Rich	1.00	–	1.00	–
Middle	3.70 (2.11, 6.49)	<0.01	2.25 (1.32, 3.83)	<0.01
Poor	11.29 (6.74, 18.91)	<0.01	3.25 (1.97, 5.37)	<0.01
Location				
Urban	1.00	–	1.00	–
Rural	2.56 (1.81, 3.62)	<0.01	1.59 (1.12, 2.26)	0.01
Parity				
Para one	1.00	–	1.00	–
Para 2–4	2.02 (1.59, 2.55)	<0.01	1.41 (1.05, 1.89)	0.02
Para 5 or more	6.15 (4.76, 7.94)	<0.01	1.69 (1.03, 2.78)	0.04
Birth order	1.35 (1.30, 1.41)	<0.01	1.12 (1.03, 1.23)	0.01
Women's decision-making power				
Respondent alone	1.00	–	1.00	–
Both respondent and husband/partner	0.98 (0.82, 1.16)	0.78	1.01 (0.83, 1.22)	0.91
Husband/partner, or someone else	1.61 (1.15, 2.26)	0.01	1.41 (0.99, 2.01)	0.06
ANC visits				
Adequate ANC visits (at least 4)	1.00	–	1.00	–
Inadequate ANC visits (less than 4)	5.83 (4.52, 7.50)	<0.01	3.64 (2.88, 4.61)	<0.01
Emergency preparedness during pregnancy				
Prepared	1.00	–	1.00	–
Not prepared	2.06 (1.57, 2.71)	<0.01	1.08 (0.84, 1.39)	0.54

OR: odds ratio; CI: confidence interval; ANC: antenatal care.
[a]Weighted multivariable logistic regression analysis, with place of delivery (health facility or home) as the dependent variable, and all other variables in this table as independent. Age and birth order were modeled as continuous variables.

(urban aOR: 0.96 (95% CI: 0.93, 0.99); rural aOR: 0.98 (95% CI: 0.96, 1.01)). Among urban mothers, the odds of home delivery is 1.03 times more (95% CI: 0.86, 1.23) for each increase in birth order with evidence for this being weak (p=0.77). A similar association was observed for rural women (aOR: 1.18 (95% CI: 1.06, 1.31)) with strong evidence for it (p<0.01). Among urban women, a significant negative association is observed for cohabiting (aOR: 0.58 (95% CI: 0.39, 0.86)). Negative associations were also observed between home delivery and making decisions with her husband or partner (aOR: 0.79 (95% CI: 0.53, 1.19)) and not having emergency preparedness plans during pregnancy (aOR: 0.91 (95% CI: 0.54, 1.54)) with evidence being weak for both (p>0.05). For rural women, a negative association was only observed for cohabiting

(aOR: 0.73 (95% CI: 0.57, 0.93)). Lower levels of education among mothers and their partners increased the odds of a home delivery for both population groups. There is an increasing trend in home delivery favoring the poorest wealth category with an increased odds of home delivery compared to those in the richest category (urban aOR: 3.28 (95% CI: 1.57, 6.85); rural aOR: 1.79 (95% CI: 1.17, 2.75)). Evidence for this association with wealth index is strong for both populations (p<0.01). This positive association is similarly observed for parity, with those having five or more children having the highest odds of home delivery for both urban and rural populations although evidence is weak for rural women. Urban women with inadequate ANC visits have a higher odds of giving birth at home compared to those with at least four ANC visits (aOR: 3.66 (95% CI:

Table 5. Determinants of home delivery among 15- to 49-year-old women in urban and rural communities in the Philippines.

Variable	Urban				Rural			
	Crude OR (95% CI)	p value	Adjusted OR (95% CI)[a]	p value	Crude OR (95% CI)	p value	Adjusted OR (95% CI)[a]	p value
Age	1.00 (0.97, 1.03)	0.88	0.96 (0.93, 0.99)	0.02	1.03 (1.01, 1.04)	<0.01	0.98 (0.96, 1.01)	0.17
Marital status								
Married	1.00	–	1.00	–	1.00	–	1.00	–
Cohabiting	0.82 (0.56, 1.20)	0.32	0.58 (0.39, 0.86)	<0.01	0.65 (0.52, 0.81)	<0.01	0.73 (0.57, 0.93)	0.01
Mother's education								
University or higher	1.00	–	1.00	–	1.00	–	1.00	–
Secondary	4.19 (2.34, 7.51)	<0.01	1.71 (0.92, 3.18)	0.09	3.15 (1.84, 5.36)	<0.01	1.80 (1.09, 2.96)	0.02
Primary or lower	21.96 (10.33, 46.63)	<0.01	4.28 (2.18, 8.39)	<0.01	10.35 (6.38, 16.77)	<0.01	3.21 (2.09, 4.94)	<0.01
Partner's education								
University or higher	1.00	–	1.00	–	1.00	–	1.00	–
Secondary	2.76 (1.57, 4.85)	<0.01	1.44 (0.77, 2.68)	0.25	2.45 (1.53, 3.93)	<0.01	1.20 (0.78, 1.85)	0.40
Primary or lower	12.72 (5.99, 27.02)	<0.01	2.47 (1.18, 5.18)	0.02	7.49 (4.20, 13.36)	<0.01	1.88 (1.12, 3.15)	0.02
Wealth index								
Rich	1.00	–	1.00	–	1.00	–	1.00	–
Middle	1.88 (0.78, 4.54)	0.16	1.19 (0.47, 3.02)	0.72	2.65 (1.88, 3.74)	<0.01	1.50 (1.06, 2.12)	0.02
Poor	10.49 (5.15, 21.37)	<0.01	3.28 (1.57, 6.85)	<0.01	5.34 (3.32, 8.58)	<0.01	1.79 (1.17, 2.75)	<0.01
Parity								
Para one	1.00	–	1.00	–	1.00	–	1.00	–
Para 2–4	2.79 (1.61, 4.81)	<0.01	2.54 (1.39, 4.63)	<0.01	1.75 (1.36, 2.24)	<0.01	1.13 (0.82, 1.57)	0.45
Para 5 or more	8.92 (4.58, 17.36)	<0.01	4.40 (1.65, 11.69)	<0.01	4.68 (3.61, 6.05)	<0.01	1.16 (0.67, 2.01)	0.59
Birth order	1.37 (1.25, 1.51)	<0.01	1.03 (0.86, 1.23)	0.77	1.31 (1.26, 1.37)	<0.01	1.18 (1.06, 1.31)	<0.01
Women's decision-making power								
Respondent alone	1.00	–	1.00	–	1.00	–	1.00	–
Both respondent and husband/partner	0.91 (0.65, 1.26)	0.57	0.79 (0.53, 1.19)	0.26	1.01 (0.83, 1.23)	0.91	1.10 (0.90, 1.35)	0.02
Husband/partner, or someone else	1.89 (1.07, 3.34)	0.03	1.37 (0.68, 2.74)	0.37	1.45 (0.95, 2.22)	0.08	1.79 (1.17, 2.75)	0.01
ANC visits								
Adequate ANC visits (at least 4)	1.00	–	1.00	–	1.00	–	1.00	–
Inadequate ANC visits (less than 4)	6.96 (4.00, 12.10)	<0.01	3.66 (2.36, 5.68)	<0.01	5.38 (4.05, 7.14)	<0.01	3.56 (2.72, 4.65)	<0.01
Emergency preparedness during pregnancy								
Prepared	1.00	–	1.00	–	1.00	–	1.00	–
Not prepared	2.03 (1.29, 3.18)	<0.01	0.91 (0.54, 1.54)	0.73	2.17 (1.55, 3.04)	<0.01	1.18 (0.88, 1.58)	0.27

OR: odds ratio; CI: confidence interval; ANC: antenatal care.

[a]Weighted multivariable logistic regression analysis, with place of delivery (health facility or home) as the dependent variable, and all other variables in this table as independent variables for all models.

Age and birth order were modeled as continuous variables.

2.36, 5.68)), but this association is slightly attenuated among rural women (aOR: 3.56 (95% CI: 2.72, 4.65)). We found that most of the proximal factors considered had a greater effect on the decision to deliver at home among rural women compared to those in urban communities.

Discussion

Our study showed that 18% of women aged 15–49 years in the Philippines delivered at home. This proportion was higher than what was reported among urban mothers (11%) but much lower than what was reported in the rural communities (24%). This has been the lowest proportion of home deliveries since the 1993 NDHS[32] and mirrors the improvements made in reducing the infant mortality rate, under-5 mortality rate, and maternal mortality rate in the country.[1,9] Despite this progress and policies prohibiting home births,[9,18] surveys and the present analysis continue to show that women still deliver at home where there is low possibility of being assisted by skilled birth attendants. More importantly, delivering at home could delay life-saving treatment should complications due to childbirth occur.[8] Compared to similar studies in the African region,[28–30] we found wealth index had the most pronounced effect on both urban and rural estimates although there is consistency in the finding that more rural women deliver at home. This may be driven by income differences with use of maternal and child health services favoring the rich despite subsidies.[25,45] Therefore, achieving Universal Health Care will require strategies that address these urban–rural and rich–poor disparities.

There are a number of factors that influence the choice of women to deliver at home: age, marital status, mother's education, husband's or partner's education, wealth index, parity, birth order, women's decision-making power, ANC visits, and emergency preparedness. Our findings suggest these factors yield similar results in the three models (overall, urban, and rural), consistent with the findings of a previous study that there were shared determinants between urban and rural populations.[30] The present study also highlights existing disparities between women in the rural communities with more home deliveries despite comparable proportions of rural to urban women on key variables such as having adequate ANC visits and being prepared financially during pregnancy for emergencies. These likely reflect the inequalities associated with health service delivery, specifically in the distribution of health professionals and low investments in the health sector infrastructure.[24] We also found that proximal factors – birth order, women's decision-making power, and emergency preparedness during pregnancy – had a more pronounced effect in rural women's decision to deliver at home. This could point to the need for a multi-sectoral approach in addressing this public health problem. A local study on the trends in neonatal mortality and child health

inequality used facility-based delivery as a proxy of health service delivery, and determined that it is an effective but complex intervention that requires a fully functional system.[24] The government has since made efforts to make health care services more accessible through the MNCHN Strategy and the newly passed Universal Health Care Act.[9,11] Our study also identified wealth through assets and wealth proxied by having emergency funds during pregnancy as important factors influencing the choice of home delivery. The odds of home delivery is most pronounced in the poorest wealth category with a slightly larger effect among urban women. The observed association between home delivery and wealth index is consistent with the results of other studies.[34,37,40,41] Women of low economic status are likely to choose birth at home because of associated costs with health facility delivery.[41] The National Health Insurance Program (NHIP) covers health expenses during antenatal period and delivery of women.[46] However, there are other costs related to pregnancy and delivery that need to be considered and acknowledged when interpreting our findings and when advocating for institutional delivery. In our analyses, we found that lack of emergency funds during pregnancy resulted in an increased likelihood for home delivery among rural women but found the reverse for urban women. Especially in rural areas and geographically isolated and disadvantaged areas (GIDA), transportation costs to the facility are expensive because of the long distance travel, which could discourage women from seeking care at these facilities. However, this hypothesis of distance and transportation costs being associated with place of delivery has been refuted by a local study, with most home deliveries being close to health facilities.[42] A geospatial analysis in Indonesia supports this finding that area of residence is not associated with place of delivery.[47] Increasing health insurance coverage is likely effective in increasing facility-based deliveries,[25] but we also need to account for cultural context and maternal satisfaction when we interpret findings on this topic and make recommendations for policy.[26,42,48]

Women's decision-making power in health care also influences the choice of place of delivery. We found that women in both urban and rural settings whose health care decisions were based on their husband, partner, or someone else were more likely to give birth at home. This is consistent with previous reports that there is a negative effect on the use of institutional services when women themselves are not the ultimate decision maker.[34,49–51] This observed relationship however is more complex as others have documented an increase in home deliveries among women who make decisions for themselves.[23,52] In our study population, there were more married women than those living with their partners, and we found cohabiting decreases the odds of giving birth at home among urban and rural women. This may be related to empowerment of

women in making decisions as more women living with their partners made health care decisions on their own. However, we were not able to account for the beliefs of the women and their partners that could influence the association and could explain the slightly higher odds for home delivery observed among rural women. Also related is education, which is sometimes used as a proxy measure for women's autonomy.[50] About half of women and their partners in our study received a secondary education with an increased odds of home delivery among those with lower levels of education. The association is attenuated among rural women. Most studies on pregnancy and delivery have studied the role of education in influencing women's health care decisions.[23,33,34,36,37,39–42,49] Possible explanations that support our results include educated individuals having better access to health service information and having the ability to evaluate and apply such information, making them more health literate and thus more likely to seek care during pregnancy. These individuals are also likely to belong in richer wealth categories, allowing them to access quality health services better and with greater ease. Women who belong in poorer wealth categories in our study also had fewer ANC visits and having inadequate ANC visits increases the odds of home delivery among urban and rural women. Our findings on decision-making power, the role of partners and networks, and the role of education highlight the importance of co-creation and patient participation in health service delivery involving not only the mother and her partner, but her parents and other family members, and close networks as well.[36,37] This includes developing innovative strategies that leverage social capital and networks of women such as providing incentives to traditional birth attendants whom women go to for health care to refer them to health facilities.[53] In addition to empowering women and making health information and services more accessible, providing women with better formal education is also as important as it influences health outcomes of both mother and child.[50]

Our study showed that each year of increase in age of women decreased the odds of home delivery in our study. This is in conflict with other studies that reported an increase in maternal age increased the odds of home delivery.[36,37] Previous experiences in health services may have been positive among our study population. It is also possible that these women had pregnancy complications that required an institutional delivery or that older women have greater autonomy and decision-making power. However, only decision-making power was measured in our study with complications and past experiences not measured in the NDHS. Because there is still a considerable proportion of women who deliver at a relatively young age, the reproductive health program may need to integrate and emphasize the importance of institutional deliveries. In our study, we also found that a significant proportion of women reported parity of at least two and a relatively high birth

order number. The odds of home delivery increased with parity of two or more for both urban and rural women. For birth order, each increase in birth order also increased the odds of home delivery for both populations. Previous literature similarly reported that multiparity is associated with home delivery with the following possible explanations: larger family sizes demand more time and resources from the mother that could limit her ability to avail of health services, and uneventful deliveries with traditional birth attendants may lower risk perceptions of home delivery.[33,41] Because the risk of complications increases with each additional pregnancy,[54] women should be supported throughout pregnancy and delivery to encourage them to continue having institutional deliveries for all their pregnancies. Beyond factors working at the individual level, a newly published research has also demonstrated that localities with ordinances prohibiting home birthing without a skilled birth attendant have higher rates of facility-based births, highlighting the importance of implementing such policies.[18] This should be coupled with local government investments on transportation vehicles to health facilities, both from the public sector (e.g. ambulance) and the private sector (e.g. public transportation).[18] The study has important methodological limitations that should be considered. There is potential selection bias because our analyses excluded data from women who are single, separated, widowed, or divorced as they did not have the outcome of interest in our analytic sample. We also excluded observations due to missing data, which could also potentially lead to selection bias. However, we are unable to quantify the magnitude of bias in our analysis. Our study may also have unmeasured confounding that could affect the observed associations as our analyses relied on data collected and reported in the 2017 Philippine NDHS. Some possible factors based on previous studies include receipt of health information during pregnancy, knowledge of danger signs, transport availability, time and distance to a health facility, past experiences, and history of complications. However, we considered other known important factors such as women's decision-making power, wealth index, parity, birth order, ANC visits, and emergency preparedness. In addition, because MMR remains high in the country,[1,5,9] our study could potentially have Neyman bias,[55] where those with poor maternal outcomes or those who have died due to complications during pregnancy or delivery could not be included in the survey. Because this is a secondary analysis, we are not able to quantify the biases present arising from various sources such as non-participation. There also could be recall and/or social desirability biases present because the information collected in the survey was based on self-reporting. We therefore restricted the present analysis to the last-born child of women and no longer included information from other births from previous years to minimize potential for recall issues and reverse causality. Our study also focused mainly on variables that are "static" and unchanged over time that could further

minimize these problems. Typical in cross-sectional study designs, our study cannot establish a clear temporal association between the study factors and place of delivery. Despite these limitations, our study provides updated contextual evidence on key determinants of home delivery in the Philippines, which is one of the countries that accounts for 80% of child deaths worldwide.[2] In addition, to our knowledge, no other study in the country has conducted disaggregated analyses to compare the prevalence and determinants of home delivery in urban and rural communities. Poor access to services, and high neonatal and maternal mortality rates reflect a weak primary care system. In our study, more women in rural areas continue to deliver at home despite policies and strategies that promote facility births, and there is evidence that unequal access to services result in unnecessary deaths.[56] Our article therefore provides quantitative data that can be used to improve current approaches that will reduce urban–rural disparities among women.

Conclusion

The use of institutional childbirth services remains suboptimal in the Philippines with significant disparities between urban and rural communities. Our findings showed that there are shared determinants among the urban and rural populations, but with a relatively greater effect observed for the rural population in most of the proximal factors considered. Current strategies therefore need to adopt a multi-sectoral approach to address the complex factors influencing women's decision to deliver at home. In addition, these should be revisited to narrow the gap in health care access and utilization between urban and rural women. Innovative interventions targeting women with specific characteristics as reported in our study are needed and should be considered as the country transitions to Universal Health Care that aims equitable access for all Filipinos. Efforts should also be made to contextualize and co-create health care services and solutions that will motivate women to deliver in health facilities. Our study points to several recommendations that could encourage women to choose an institutional childbirth: (a) empower women to make informed health care decisions by making health information accessible, but at the same time targeting and involving their partners and close networks; (b) encourage women to pursue formal education with the necessary support needed from the government; (c) allow cultural birthing procedures as long as these do not conflict with scientific medical practice (e.g. massages); (d) effectively implement local ordinances prohibiting home birthing without a skilled birth attendant; (e) establish additional health facilities with other services such as transport (e.g. ambulance) as these expenditures further burden the mother and discourage her from seeking care; (f) encourage positive experiences in the health facility. With the ongoing COVID-19 pandemic, it will be equally important to identify areas for improvement in the continuum of women's health care from pregnancy to childbirth. Providing women with the support they need and engaging them in a discussion on their choice of place of birth is critical in establishing trust in the health care system, especially at a time when health services are not easily accessible and risk-free to women in disadvantaged communities. Further studies could explore these themes in-depth using a mixed methods approach or qualitative study design to complement our findings.

Declarations

Ethics approval and consent to participate

This study received ethics approval from the Ateneo de Manila University Research Ethics Committee (Protocol ID: SMPH DATA 2020). Since the study involved secondary analysis of publicly available data, consent to participate in this study was not needed. Furthermore, data from the NDHS are not individually identifiable and therefore their analysis does not constitute human subjects research. The Code of Federal Regulations (CFR) 45 CFR 46.102(f) defines human subjects as living individuals about whom an investigator obtains identifiable private information for research purposes.

Consent for publication

Not applicable.

Author contributions

Arianna Maever L. Amit: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Writing – original draft; Writing – review & editing.
Veincent Christian F. Pepito: Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Resources; Supervision; Validation; Writing – review & editing.
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Competing interests

Availability of data and materials

The 2017 Philippine National Demographic and Health datasets and questionnaires are available from the Demographic and Health Surveys Program Website (https://www.dhsprogram.com/methodology/survey/survey-display-510.cfm.

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