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ABSTRACT

The Government of Indonesian implemented maternal health service programs to minimize at-home childbirth services and increase mothers' utilization of its services. There is not enough evidence these policies are effectively decreasing the maternal mortality rate. Hence, this study aimed to analyze the predictors of each specific childbirth services in Indonesia. This study used the secondary dataset of the 2012 Indonesian demographic data survey (IDHS). The sample was 17,769 women ages 15 to 49 years old. We performed logistic regression for the multivariate case to identify the predictors of childbirth service. Geographical, education, and economic condition significantly predict childbirth services. Women who are not residents tend to use a community-based facility than institutionalized health. Women with higher parity, inadequate knowledge on pregnancy danger signs, lower antenatal care visits, and never had any discussion with their husbands about the planned place of giving birth tend to prefer giving birth at home than health facilities. Women's decision to use a safe childbirth service is hindered by demanding access to reach institutionalized healthcare. Our findings highlighted the importance of women empowerment to enable women to utilize safe labor in a health facility.

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1. INTRODUCTION

Maternal mortality rate in Indonesia is a problem that still cannot be resolved, which is still far from the global goal of 70 per 100,000 live births [1]. Behind this achievement, Indonesia has a long journey on its way to decreasing the maternal mortality rate. Both national and local governments have implemented various maternal health service programs accelerating efforts to reduce maternal mortality [2].

The Government of Indonesia has started placing midwives as a skilled birth attendant in every village since 1996. This policy is expected to ensure every pregnant woman has an equal opportunity to be assisted by qualified birth attendants. However, Indonesia's national health profile reported that only 86.28% of mothers delivered their child in a healthcare facility [3]. The practice of traditional birth attendants (TBAs) in Indonesia is still common and evolve to be the main factor for the low health facility utilization for childbirth [4]. It worsens by inadequate maternal referral facilities and poor infrastructure in rural areas [4].

A safe delivery service helps women get more appropriate treatment when complications occur around the delivery time [5]. Hence, the place of delivery is also crucial in saving the life of the mother. Many pregnant women in Indonesia still choose to give birth at home [6].

The probability of women assisted by trained delivery attendants for home deliveries in Indonesia increased with the increasing household wealth index and the parents' education level [7]. This probability is

even higher among women who delivered for their first-time birth, had any delivery complications, and had adequate mass-media exposure and knowledge about delivery complications. On the other hand, the lower probability of using the trained delivery attendants decreased among mothers who only attended less than four antenatal care visits had high parity or reported living in an area with difficult access to health facilities [7].

The government strongly encouraged women's empowerment [2]. Women empowerment has been reported as one of the factors for facility-based childbirth in Indonesia [8]. Women's intrapersonal conditions such as high level of education, high economic status, urban residence, working status, women involvement in decision-making, and having more than four visits to antenatal care centers have significant effects on women's decision to use health facilities for childbirth [8].

With disperse geographical and socio-cultural conditions in each Indonesian region; there is a possibility that these childbirth service's predictors have a complex interaction. Hence, this study aimed to analyze the predictors of each specific childbirth services in Indonesia. To our knowledge, our study is the first study that considers the geographical and women's empowerment in predicting women's decisions on their childbirth services.

2. RESEARCH METHOD

2.1. Data source and procedures

This study used the secondary dataset of the 2012 Indonesian demographic data survey (IDHS). The sample selection in the 2012 IDHS was performed in 33 provinces of Indonesia using stratification and multistage random sampling. The data collection survey was conducted from May to August, 2012. There were 43,852 households successfully interviewed in the 2012 DHS. The sample of this study is women with ages 15 years old to 49 years. We acquired 17,769 women as the sample with these criteria [9].

2.2. Variables

The dependent variable is the childbirth service. This variable explains women's decisions about where they gave birth and whether they used at-home, community-based, or health facility childbirth services. Women who answered that they gave birth at their home or another's home are grouped into at-home childbirth services. Community-based childbirth service is referred to as child birthing in village health post (*pondok kesehatan desa*/*ponkesdes*), village delivery post (*pondok bersalin desa*/*polindes)*, or integrated healthcare center (*pos pelayanan terpadu*/*Posyandu)* [10]. These three kinds of community-based health facilities are built and funded by the community in their village. The district health office and ministry of health only support the community-based health facility by placing a midwife or a nurse who is affiliated with the nearest public health center. As the reference category for the dependent variable, we use the health facility-based childbirth service. The health facility-based childbirth service is delivered in an institutionalized health facility such as a hospital, clinic, and public health center.

We use the respondents' region, residence, health insurance coverage, socio-demographics (local immigrant status, sex of household head, relationship with the head of the household, age, education level, work status, marital status, parity, wealth status), and the women empowerment factors (autonomy of family finances, the autonomy of health, knowledge of the pregnancy dangers, antenatal care, violence against wife, discussion about the place of giving birth with a husband during pregnancy) as the independent variables.

2.3. Statistical analysis

We describe each variable descriptively for the univariate analysis. We then examine the relationship between the independent variables and childbirth service as the dependent variable. We use the Chi-squared test for categorical data and the t-test for continuous data to test our argument. We performed logistic regression for the multivariate case to identify the predictors of childbirth service utilization.

3. RESULTS AND DISCUSSION

This study reported that most of the women (40.3%) deliver their babies at home. Also, 33.9% of the women deliver in a health facility, and 25.8% deliver in a community-based facility. Table 1 (see in Appendix) presents these different childbirth service utilizations in Indonesia.

We found that all geographical predictors in this study are related to childbirth service preference. At-home delivery is highly demanded in the Sumatera region and Indonesia's rural area. While the utilization of community-based and health-facility-based childbirth services commonly happens in the Java-Bali region and the urban area. Otherwise, at-home delivery is dominantly preferred by the local people with non-immigrant status. The predictors of childbirth services in Indonesia are presented in Table 2. We use health facility childbirth services like the reference group in the regression analysis.

Table 2. Multinomial logistic regression of childbirth services in Indonesia

Predictors	At-home delivery			Community-based services		
	OR	Lower bound	Upper bound	OR	Lower bound	Upper bound
Region: Sumatra	*2.168	1.707	2.754	*9.614	5.915	15.628
Region: Java-Bali	*1.757	1.375	2.244	*10.512	6.454	17.124
Region: Nusa Tenggara Islands	*0.483	0.372	0.627	*2.345	1.415	3.886
Region: Kalimantan	*1.474	1.139	1.909	*4.578	2.779	7.543
Region: Sulawesi	1.180	0.927	1.501	1.616	0.979	2.667
Region: Maluku Islands	*2.631	2.019	3.428	0.919	0.502	1.684
Place of residence: Urban	*0.797	0.728	0.873	*1.108	1.002	1.225
Local immigrant status: No	1.055	0.970	1.146	*1.171	1.066	1.286
Sex of household head: Male	1.084	0.921	1.276	1.042	0.871	1.247
Relationship with the head of the household: Head	*1.624	1.119	2.357	1.429	0.943	2.167
Relationship with the head of the household: Wife	*1.377	1.130	1.678	1.142	0.907	1.439
Relationship with the head of the household: Daughter	1.132	0.923	1.388	1.074	0.849	1.36
Relationship with the head of the household: Daughter in law	1.211	0.970	1.512	1.007	0.778	1.303
Age: 15-19	*1.535	1.031	2.286	*2.053	1.275	3.308
Age: 20-24	*1.486	1.077	2.049	*1.902	1.284	2.818
Age: 25-29	*1.508	1.111	2.047	*2.016	1.382	2.941
Age: 30-34	1.319	0.980	1.775	*1.688	1.168	2.441
Age: 35-39	1.129	0.842	1.515	*1.487	1.032	2.144
Age: 40-44	0.924	0.680	1.255	1.133	0.775	1.657
Education level: No education	1.306	0.878	1.943	1.652	0.950	2.873
Education level: Primary	1.077	0.932	1.246	*1.899	1.595	2.261
Education level: Secondary	*0.890	0.792	1.000	*1.736	1.505	2.001
Work status: No work	1.012	0.932	1.099	1.021	0.932	1.119
Marriage status: Never in union	0.717	0.235	2.193	0.512	0.054	4.836
Marriage status: Married	0.883	0.482	1.618	2.157	0.831	5.597
Marriage status: Living with partner	0.763	0.391	1.492	0.605	0.187	1.953
Marriage status: Widowed	0.670	0.305	1.471	2.078	0.695	6.218
Marriage status: Divorced	0.895	0.466	1.718	2.292	0.857	6.134
Parity	*1.091	1.051	1.133			
Wealth status: Poorest	*0.789	0.674	0.924	*0.701	0.583	0.844
Wealth status: Poorer	*0.514	0.443	0.596	0.900	0.765	1.058
Wealth status: Middle	*0.485	0.420	0.559	*0.845	0.726	0.985
Wealth status: Richer	*0.626	0.546	0.717	0.91	0.785	1.055
Covered by health insurance: No	*1.416	1.300	1.542	*1.831	1.669	2.009
Autonomy of family financial: No	1.051	0.949	1.165	0.972	0.870	1.087
Autonomy of health: No	0.947	0.823	1.090	0.973	0.834	1.135
Knowledge of the pregnancy dangers: No	*1.210	1.109	1.321	0.981	0.888	1.084
Antenatal care: <4 times	*1.544	1.343	1.774	1.010	0.846	1.206
Violence against wife: No	0.986	0.906	1.073	0.983	0.893	1.082
Discussion about the place of giving birth with a husband during pregnancy: No	*1.645	1.444	1.875	1.115	0.950	1.308
Discussion about the cost of giving birth with a husband during pregnancy: No	1.032	0.923	1.154	0.882	0.772	1.008

*significant at 95% level

Table 1 shows that the region is one of the predictors of childbirth services in Indonesia. Women living in the Sumatra region, Indonesia are 2.168 times more likely than those in the Papua region to give birth at home than in the health facilities (OR 2.168; 95% CI 1.707-2.754).

Otherwise, women living in the Java-Bali region are 10.512 times more likely than those living in the Papua region to access community-based facilities than health facilities (OR 10.512; 95% CI 6.454-17.124). The urban and rural status of women's residence is also the predictor of childbirth service. Women who live in an urban area is 0.797 more likely than those who live in a rural area to deliver their baby at home (OR 0.797; CI 0.728-0.873) and 1.108 more likely to use community-based childbirth service (OR 1.108; CI 1.002-1.225) than using the health facility.

Our study found that women's age, education, household economic condition, and health insurance coverage are other predictors of Indonesia's childbirth services. Younger women (15 to 19 years old) are 1.535 more likely than the older (45 to 49 years old) to give birth at home (OR 1.535; CI 1.031-2.286) and 2.053 more likely to use community-based childbirth services (OR 1.535; C1 1.275-3.308) than using health facility for childbearing. Women with lower education also tend to be in labor at home and community-based facilities. Moreover, the household economic condition predicts that the poorest households are 0.789 more likely to give birth at home (OR 0.789; CI 0.674-0.924) and 0.701 more likely using community-based childbirth (OR 0.701; C1 0.583-0.844) than in the health facility. Women with no health insurance protection

prefer to deliver their baby at home (OR 1.416; CI 1.300-1.542) and community-based facilities than a health facility (OR 1.831; CI 1.669-2.009).

We also found any specific predictors for different childbirth services. Women who are not residents tend to use a community-based facility than a health facility (OR 1.171; CI 1.066-1.286) even though it is not a predictor for at-home baby delivery. Women with higher parity (OR 1.091; CI 1.051-1.133), inadequate knowledge on pregnancy danger signs (OR 1.210; CI 1.109-1.321), and lower antenatal care visits (OR 1.544; CI 1.343-1.774) tend to prefer giving birth at home than health facilities. Women who never had any discussion with their husbands about the planned place of birth during pregnancy are 1.645 more likely to give birth at home than at the health facility (OR 1.645; CI 1.444-1.875).

Safe delivery is a delivery that is attended by skilled birth attendants in a health facility. Giving birth in a health facility is safe since the birth attendant will have adequate health resources to help the mother. Otherwise, more than half of pregnant women in Indonesia give birth at home and community-based health facilities. Giving birth in community-based health services is less safe than giving birth in institutionalized health facilities since this facility is not well-prepared for maternity purposes.

As we know that Indonesia consists of more than 13,000 islands with vast disparities of health infrastructure, community-based health facility is developed by local government in Indonesia to reaching a population in a location with no health facility [11]. Previous studies reported that the quality of care in this community-based health facility is unstandardized and tends to have an inadequate infrastructure [12]–[15]. For instance, reported community-based health facilities in the Sumatra region do not have electricity [14]. The physical infrastructure readiness varies based on the local government's ability to allocate non-health sector funding to build these facilities [12], [16]. With disperse geographical conditions and unequal infrastructure between regions in Indonesia, women living in the Sumatra region has a higher possibility of giving birth at home. It is also related to the utilization of community-based health facilities. Most women who accessed community-based health facilities for their antenatal care tend to choose to give birth at home because they think it is safer [13], [17].

In remote areas of the Sumatera region, giving birth at home is also preferred due to the problematic physical access in reaching institutionalized health facilities and community-based facilities [14]. The health facility's distance is one predictor for women's decision to use a health facility for delivery or not [8]. Women who decide not to access a health facility for delivery reasoned that they had short labor while the nearby health facility did not exist [18]. They did not have enough time to reach the nearest health facility. Physical and adequate access is still a bold barrier for mothers accessing safe delivery in a health facility [19]. We also found that women who live in urban areas tend to use an institutionalized health facility, showing that they have more opportunities to choose more ideal childbirth services. This reason could be described because skilled birth attendants (SBAs) presence in the rural area or low-resource area is insufficient in Indonesia [19], [20]. Many reports also mentioned that compare to the urban area, the rural area's safe delivery number is lower [18].

Otherwise, at-home delivery is dominantly preferred by the local people with non-immigrant status. This could correspond to the fact that the practice of TBAs in Indonesia is the main factor for the low health facility utilization for childbirth [4]. The health system problem of inadequate referral facilities and poor infrastructure in rural areas makes many women prefer TBAs for childbirth [4], [21]

This study found that specific socio-demographic factors predict women's decisions in childbirth services. Women of younger age, lower education, poor household economic condition, and unprotected health insurance coverage tend to give birth at home [22]. These findings are similar to the previous studies which found that facility-based delivery is associated with women's educational status [8], [18], [19], [23], the wealth quintile of the family [8], [24], and the residential area of the family [18].

Our study found that women's knowledge of pregnancy danger signs predicts their preference in using childbirth services. Women who do not have adequate knowledge on pregnancy danger signs tend to give birth at home. This finding is strengthened by other studies which report that women with low educational status [8], [18], [23] and limited access to information have less probability of delivering in a health facility [8], [23]. In contrast, women who can access media information during pregnancy and have intended pregnancies are more likely to access sufficient antenatal care [24]. Women's access to antenatal care during pregnancy is also a predictor for women continuing to access health facilities for childbirth [8]. Attending antenatal care increases the mother's ability to decide using only skilled attendance or facility-based delivery [18]. Women's knowledge about the onset of delivery reportedly becomes why many women who previously access antenatal healthcare do not access health facilities for childbirth [25]. Maternal education will increase women's probability of using health facilities for safe delivery [18], [19]. Women with no exposure to delivery care information and just started their first antenatal care (ANC) visit from the second trimester of pregnancy have less probability of using health facilities for delivery [25].

Our study also explained that the existence of health facility in remote area does not merely attract mother to deliver their baby in a health facility. Mothers in remote area tend to percept that the service

quality in their region are poor which makes them doubting to deliver in health facility in their area [26]. Mother tend to use health facility outside their region because the they already have information on how to easily access the health facility [27].

Another reason explained that women prefer not to use facility-based delivery because of the mother's willingness to be supported by their close family during labor [18], [19]. It relates to the issue of women's authority and empowerment about pregnancy and delivery. We found that women's participation in deciding which childbirth services they will use for labor is one predictor for at-home delivery. Women's decision-making involvement has significant effects on women's decision to use health facilities for childbirth [8]. Preparing adequate information regarding health facility is essential to ensure that mother will have a plan to use health facility. Innovative health intervention which initiating mother and husband engagement to health facility during pregnancy is important to initiate their willingness for choosing facility-based delivery [28], [29]. Whereas, delivery services utilization itself will impact the mother utilization on postnatal care [30]. All in all, women's decision to use a safe childbirth service is hindered by demanding access to reach an institutionalized healthcare facility. Rather than utilizing a community-based childbirth service as their second choice, women deliver their babies at home. Our findings highlighted the importance of women empowerment to enable women to utilize safe labor in a health facility.

4. CONCLUSION

Women's decision to use a safe childbirth service is hindered by demanding access to reach an institutionalized healthcare facility. Rather than utilizing a community-based childbirth service as their second choice, women deliver their babies at home. Our findings highlighted the importance of women empowerment to enable women to utilize safe labor in a health facility.

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APPENDIX

Table 1. Descriptive statistics of childbirth services in Indonesia

Characteristics	Childbirth services: At-home delivery	Community-based services	Health facility services	n	p
Geographic					
Region					0.000
Sumatra	1,979 (27.65%)	1,503 (32.74%)	1,223 (20.31%)	4,705 (26.48%)	
Java-Bali	1,698 (23.73%)	2,178 (47.44%)	1,477 (24.53%)	5,353 (30.13%)	
Nusa Tenggara Islands	441 (6.16%)	223 (4.86%)	870 (14.45%	1,534 (8.63%)	
Kalimantan	636 (8.89%)	386 (8.41%)	608 (10.10%)	1630 9.17%)	
Sulawesi	1,203 (16.81%)	246 (5.36%)	1,267 (21.04%)	2,716 (15.29%)	
Maluku Islands	897 (12.53%)	33 (0.72%)	328 (5.45%)	1,258 (7.08%)	
Papua (ref.)	303 (4.23%)	22 (0.48%)	248 (4.12%)	573 (3.22%)	
Place of residence					0.000
Urban	2,997 (41.88%)	2,708 (58.98%)	3,018 (50.12%)	8,723 (49.09%)	
Rural	4,160 (58.12%)	1,883 (41.01%)	3,003 (49.88%)	9,046 (50.91%)	
Local immigrant status					0.000
No	4,326 (60.44%)	2,882 (62.77%)	3,469 (57.62%)	10,677 (60.09%)	
Visitor (ref.)	2,831 (39.56%)	1,709 (37.22%)	2,552 (42.38%)	7,092 (39.91%)	
Demographic					
Sex of household head					0.015
Male	6,524 (91.16%)	4,156 (90.52%)	5,399 (89.67%)	16,079 (90.49%)	
Female (ref.)	633 (8.84%)	435 (9.48%)	622 (10.33%)	1,690 (9.51%)	
Relationship with the head of the household					0.000
Head	144 (2.01%)	83 (1.81%)	117 (1.94%)	344 (1.94%)	
Wife	4,805 (67.14%)	2,967 (64.63%)	3,779 (62.76%)	11,551 (65.01%)	
Daughter	1,221 (17.06%)	936 (20.39%)	1,185 (19.68%)	3,342 (18.81%)	
Daughter in law	677 (9.46%)	418 (9.10%)	597 (9.92%)	1,692 (9.52%)	
Others (ref.)	310 (4.33%)	187 (4.07%)	343 (5.70%)	840 (4.73%)	
Age (years)					0.001
15-19	183 (2.56%)	108 (2.35%)	145 (2.41%)	436 (2.45%)	
20-24	1,093 (15.27%)	747 (16.27%)	959 (15.93%)	2,799 (15.75%)	
25-29	1,833 (25.61%)	1,242 (27.05%)	1,483 (24.63%)	4,558 (25.65%)	
30-34	1,897 (26.51%)	1,213 (26.42%)	1,579 (26.22%)	4,689 (26.39%)	
35-39	1,415 (19.77%)	897 (19.54%)	1,188 (19.73%)	3,500 (1970%)	
40-44	588 (8.22%)	326 (7.10%)	561 (9.32%)	1,475 (8.30%)	
45-49 (ref.)	148 (2.07%)	58 (1.26%)	106 (1.76%)	312 (1.76%)	
Education level					0.000
No education	182 (2.54%)	25 (0.54%)	62 (1.03%)	269 (1.51%)	
Primary	2,051 (28.66%)	1,067 (23.24%)	1,313 (21.81%)	4,431 (24.94%)	
Secondary	3,572 (49.91%)	2,933 (63.89%)	3,374 (56.04%)	9,879 (55.60%)	
Higher (ref.)	1,352 (18.89%)	566 (12.33%)	1,272 (21.13%)	3,190 (17.95%)	
Work status					0.000
No work	3,376 (47.17%)	1,990 (43.35%)	2,919 (48.48%)	8285 946.63%)	
Work (ref.)	3781 (52.83%)	2,601 (56.65%)	3,102 (51.52%)	9484 (53.37%)	
Marriage status					0.000
Never in union	11 (0.15%)	1 (0.02%)	17 (0.28%)	29 (0.16%)	
Married	6,802 (95.04%)	4,441 (96.73%)	5,693 (94.55%)	16,936 (95.31%)	
Living with partner	132 (1.84%)	10 (0.22%)	134 (2.23%)	276 (1.55%)	
Widowed	46 (0.64%)	25 (0.54%)	39 (0.65%)	110 (0.62%)	
Divorced	129 (1.80%)	107 (2.33%)	108 (1.79%)	344 (1.94%)	
No longer living together/separated (ref.)	37 (0.52%)	7 (0.15%)	30 (0.50%)	74 (0.42%)	
Parity (mean)	7,157 (2.7)	4,591 (2.32)	6,021 (2.42)	1,7769 (2.51)	0.000
Socioeconomic					
Wealth status					0.000
Poorest	2,692 (37.61%)	682 (14.86%)	1,559 (25.89%)	4,933 (27.76%)	
Poorer	1,191 (16.64%)	1,014 (22.09%)	1,265 (21.01%)	3,470 (19.53%)	
Middle	988 (13.80%)	1,053 (22.94%)	1,207 (20.05%)	3,248 18.28%)	
Richer	1,038 (14.50%)	1,027 (22.37%)	1,057 (17.56%)	3,122 (17.57%)	
Richest (ref.)	1,248 (17.44%)	815 (17.75%)	933 (15.50%)	2,996 (16.86%)	

Table 1. Descriptive statistics of childbirth services in Indonesia (*continued*)

Characteristics	At-home delivery	Childbirth services Community-based services	Health facility services	n	p
Covered by health insurance					0.000
No	2,793 (39.02%)	2,084 (45.39%)	1,824 (30.29%)	6,701 (37.71%)	
Yes (ref.)	4,364 (60.98%)	2,507 (54.61%)	4,197 (69.71%)	11,068 (62.29%)	
Autonomy of family financial					0.000
No	5,307 (74.15%)	3,297 (71.81%)	4,554 (75.64%)	13,158 (74.05%)	
Yes (ref.)	1,850 (25.85%)	1,294 (28.19%)	1,467 (24.36%)	4,611 (25.95%)	
Autonomy of health					0.009
No	6,140 (85.79%)	3,943 (85.89%)	5,268 (87.49%)	15,351 (85.39%)	
Yes (ref.)	1,017 (14.21%)	648 (14.11%)	753 (12.51%)	2,418 (13.61%)	
Knowledge and behavior					
Knowledge of the pregnancy dangers					0.000
No	3,043 (45.52%)	1,375 (29.95%)	1,946 (32.32%)	6,364 (35.82%)	
Yes (ref.)	4,114 (57.48%)	3,216 (70.05%)	4,075 (67.68%)	11,405 (64.18%)	
Antenatal care					0.000
< 4 times	2,235 (31.23%)	847 (18.45%)	1,157 (19.22%)	4,239 (23.86%)	
≥ 4 times (ref.)	4,922 (68.77%)	3,744 (81.55%)	4,864 (80.78%)	13,530 (76.14%)	
Experience of partnership					
Violence against wife					0.000
No	4,719 (65.94%)	3,199 (69.68%)	3,985 (66.19%)	11,903 (66.99%)	
Yes (ref.)	2,438 (34.06%)	1,392 (30.32%)	2,036 (33.81%)	5,866 (33.01%)	
Discussion about the place of giving birth with a husband during pregnancy			0.000		
No	1,137 (19.98%)	425 (10.61%)	585 (11.17%)	2,147 (14.38%)	
Yes (ref.)	4,553 (80.02%)	3,581 (89.39%)	4,652 (88.83%)	12,786 (85.62%)	
Discussion about the cost of giving birth with a husband during pregnancy			0.000		
No	1,382 (24.30%)	598 (14.93%)	978 (18.69%)	2,958 (19.82%)	
Yes (ref.)	4,306 (75.70%)	3,408 (85.07%)	4,256 (81.31%)	11,970 (80.18%)	

Note: Chi-square test was used for dichotomous variables; t-test for continuous variables

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