**Conference Paper**

# Increasing Trends or Sociodemographic Changes? Decomposition Analyses of Maternal Complication in Indonesia

**V Widyaningsih and Khotijah**

[1]Department of Public Health and Preventive Medicine, Faculty of Medicine, Universitas Sebelas Maret, Indonesia
[2]Occupational Health and Safety Program, Faculty of Medicine, Universitas Sebelas Maret, Indonesia

## Abstract

Many Indonesian women experienced self-reported complications during pregnancy and delivery. These complications include prolonged labor, bleeding, infection, and other complications. This study aimed to examine the underlying determinants that influenced the increasing prevalence of maternal complication in Indonesia. Data from the two most recent Indonesian Demographic and Health Surveys (IDHS) were analyzed. We quantified the contribution of socio-demographic factors in the increase of maternal complications, using Oaxaca-Blinder regression-based decomposition analyses with STATA 'mvdcmp' procedure. Between IDHS 2007 and IDHS 2012, there was a significant increase in maternal complication prevalence from 50.5% to 54.1% (p < 0.001). Most (approximately 85.0%) was explained by differential responses of determinants, with unmeasured factors as the highest contributor. Differences in characteristics explained 15% of the increase, with parity and area of residence as the main contributors. The increasing prevalence of maternal complications in Indonesia was mostly due to differential responses of unmeasured factors, which might include increasing awareness of maternal complications and increasing prevalence of underlying causes of maternal complications, i.e., chronic diseases, anemia, and infection. A Further research study which identifies the contribution of these factors to the increasing prevalence of maternal complication is needed.

Corresponding Author:
V Widyaningsih
vitri_w@staff.uns.ac.id

🔓 OPEN ACCESS

## 1. Introduction

A maternal complication is an essential aspect of maternal health that should be considered [1]. Maternal complications can be defined as "any health condition attributed to and/or complicating pregnancy and childbirth that has a negative impact on a woman's well-being and/or functioning" [2], The effects of maternal complications influence not only the biological and physical wellbeing of the mother and newborn, but also the social and economic cost for the family [3, 4].

In Indonesia, reports have shown the increasing prevalence of self-reported maternal complications in Indonesia [5, 6]. However, the few studies that have examined risk factors for maternal complications in Indonesia were mostly hospital-based [7, 8]. Hence, information on the increasing prevalence of maternal complications in the community and the underlying factors is limited.

Previous studies in other low-middle income countries (LMCIs) have identified several risk factors for maternal complications. These risk factors include younger or older age [9–11], parity [9, 12, 13], low socioeconomic status [14, 15], prior history of pregnancy and/or labor complications [9, 12, 13], contact with health service provider, and pre-existing medical conditions including chronic diseases [12, 16]. With the increase in self-reported maternal complications and the changing socio-demographic factors in Indonesia, it is important to examine the contribution of the socio-demographic factors in the increase of self-reported maternal complications. Therefore, the specific analyses can provide better insights on whether the increasing prevalence of maternal complications was due to the changing demographics of Indonesian women, or indicating increasing trends in maternal complications.

This study used decomposition methods to quantify the contribution of determinants for the increase of maternal complications in Indonesia. The decomposition methods classified the contribution of the determinants into two parts: 1) differences in characteristics, i.e., the differences attributable to differences in the distribution of the characteristics that were examined, and 2) differences in effects/responses, i.e., differences attributable to differences in the regression coefficients which represents the effect/responses of each covariate that we considered in the analyses [17]. This current study aimed to describe the increasing prevalence of self-reported maternal complications in Indonesia, and to quantify the contribution of select socio-demographic factors in the increasing trends of self-reported maternal complications in Indonesia, using decomposition methods.

## 2. Methods

### 2.1. Study design and participants

This study used data from the two most recent rounds of the Indonesia Demographic and Health Surveys (IDHS) conducted in 2007 and 2012. The IDHS was a cross-sectional survey with multistage sampling designs conducted to obtain a nationally representative data of Indonesia. The IDHS collected data from women of reproductive age (15-49 years

old) who had at least one birth in five years preceding the IDHS survey year. In IDHS 2007 there was complete information from 16,664 births, meanwhile, from IDHS 2012, information from 17,067 births was included.

## 2.2. Variables and measurements

### 2.2.1. Outcome variables

Maternal complication status was obtained from the self-reported interview-based questionnaires. The self-reported maternal complication was constructed from the combination of self-reported pregnancy and labor complication. For pregnancy complication, women were asked if they experienced prematurity, bleeding, fever or infection, convulsion, and other complication during pregnancy. For complications during labor, the women were asked if they experienced prolonged labor, bleeding, fever or foul vaginal discharge, convulsions, and other complication.

### 2.2.2. Independent variables

We considered multiple groups of variables that could influence self-reported maternal complications and might explain the increase in the prevalence of self-reported complications from the IDHS 2007 to IDHS 2012. These included: 1) self-reported socio-demographics, i.e., family wealth, maternal education level, and residence area; 2) self-reported pregnancy-related factors, i.e., age at birth, parity, twin pregnancy, and antenatal care (ANC). For the ANC, we used the World Health Organization (WHO) standard for ANC visits, which consisted of four visits during pregnancy.

## 2.3. Statistical analyses

STATA survey (svy) Chi-square tests were used to assess the differences in proportion between the two IDHS survey years. STATA survey (svy) ANOVA tests were used to assess differences of the two IDHS survey years. The survey logistics regression was used to assess the association between the selected socio-demographic factors and self-reported maternal complications within the two different IDHS survey years. The regression-based Oaxaca-Blinder decomposition methods [18] with the "mvdcmp" extension in STATA was used to further quantify the contribution of each factor to the

increase of self-reported maternal complications between the IDHS 2007 and IDHS 2012.

# 3. Results and Discussion

There was a significant increase in the prevalence of self-reported maternal complication from 50.5% in IDHS 2007 to 54.1% in IDHS 2012. Significant differences between IDHS 2007 and IDHS 20012 were also observed in the proportion of age at birth and parity (Table 1). In 2012, there was a higher proportion of women who delivered after the age of 35 years old, and more women were nulliparous (Table 1). There was no significant difference in twin pregnancy prevalence as well as the wealth distribution of the two IDHS. Women in IDHS 2012 had a significantly better education level, with more women completed secondary school and college level education, compared to women from IDHS 2007. There were also significant differences in residential area and the proportion of women completing the WHO standard of ANC 4 visits. More women in IDHS 2012 lived in urban areas and completed the WHO standard of ANC 4 visits than women in IDHS 2007 (Table 1).

The multivariate logistics regression within the IDHS 2007 and IDHS 2012 showed slightly different results. Although parity showed to have a significant effect on self-reported maternal complication in both IDHS survey years, twin pregnancy was only significantly affecting self-reported maternal complications in IDHS 2007. Other socio-demographic factors showed to have no significant effect on the self-reported maternal complication (Table 1).

The results of the decomposition analyses are presented in Table 2. The increase in self-reported maternal complications between the IDHS 2007 and IDHS 2012 was mostly due to differences in responses/effects (85%). Meanwhile, differences in characteristics only contributed to 15% of the increase in self-reported maternal complication. The differences in characteristics represented the gap attributed to the differences (changes) in the distribution of the factors in the decomposition analyses. For the differences in characteristics, parity was shown to be the only factors that significantly contributed to the increase in self-reported maternal complications. Previous studies have reported the importance of parity, particularly nulliparity, as a risk factor for maternal complication [12, 15].

Meanwhile, differences in responses (the differences attributed to the differences in effects/responses of the factors in IDHS 2007 and IDHS 2012) were more dominant. Unmeasured variables (represented by the constant) were the major contributor to the

TABLE 1: Socio-demographic characteristics of women, by region.

| Variable | IDHS 2007 | | IDHS 2012 | |
|---|---|---|---|---|
| | %(SD) | aOR (SE) | %(SD) | aOR |
| Total women | 13,943 | | 14,576 | |
| Total live births | 16,664 | | 17.067 | |
| **Maternal Complications** | **50.5 (0.8)** | | **54.1 (0.8)** | |
| **Age** | | | | |
| < 20 years | **8.6 (0.3)** | 0.8 (0.1) | **7.0 (0.5)** | 1.0 (0.7) |
| 20-35 years | **79.3 (0.5)** | Ref | **79.3 (0.4)** | Ref |
| > 35 years | **12.1 (0.4)** | 1.0 (0.1) | **13.7 (0.4)** | 0.9 (0.1) |
| **Parity** | | | | |
| 1 | **34.9 (0.6)** | **Ref** | **38.4 (0.6)** | **Ref** |
| 2 | **27.8 (0.6)** | **0.7 (0.1)** | **30.3 (0.6)** | **0.7 (0.0)** |
| >2 | **37.3 (0.6)** | **0.6 (0.0)** | **31.2 (0.2)** | **0.7 (0.0)** |
| **Twin** | | | | |
| Singleton | 98.8 (0.1) | **Ref** | 98.4 (0.1) | Ref |
| Twin | 1.2 (0.1) | **1.7 (0.4)** | 1.6 (0.1) | 1.4 (0.4) |
| **Wealth** | | | | |
| Poorest | 18.7 (0.5) | Ref | 20.9 (0.5) | Ref |
| Poorer | 19.0 (0.5) | 1.0 (0.1) | 22.2 (0.5) | 1.1 (0.1) |
| Middle | 19.7 (0.5) | 1.0 (0.1) | 20.5 (0.5) | 1.1 (0.1) |
| Richer | 19.6 (0.5) | 0.9 (0.1) | 19.3 (0.5) | 1.2 (0.1) |
| Richest | 23.0 (0.4) | 0.9 (0.1) | 17.1(0.4) | 1.0 (0.1) |
| **Education** | | | | |
| Primary school/less | **44.4 (0.6)** | Ref | **34.0 (0.6)** | Ref |
| Secondary school | **47.7 (0.6)** | 1.1 (0.1) | **54.1 (0.6)** | 1.0 (0.1) |
| College and higher | **7.9 (0.3)** | 1.1 (0.1) | **11.9 (0.4)** | 0.9 (0.1) |
| **Area** | | | | |
| Urban | **42.0 (0.6)** | Ref | **49.7 (0.6)** | |
| Rural | **58.0 (0.6)** | 0.9 (0.2) | **50.3 (0.6)** | 0.9 (0.1) |
| **ANC 4 visits** | | | | |
| No | **29.3 (0.6)** | Ref | **22.3 (0.5)** | Ref |
| Yes | **70.7 (0.6)** | 1.1 (0.1) | **77.7 (0.5)** | 1.0 (0.1) |

increase in self-reported maternal complications due to responses/effects, between IDHS 2007 and IDHS 2012. These unmeasured variables might include underlying factors contributed to the self-reported maternal complications, including increasing awareness and diagnosis of maternal complications, and increasing prevalence of the underlying disease. Previously, a retrospective hospital-based study reported hemorrhage and pregnancy-related hypertension as the two major causes of maternal

near-miss in Indonesia [7]. Other underlying conditions that might cause maternal complications were anemia, hypertension, diabetes mellitus, and obesity.

TABLE 2: Decomposition results of the increase in self-reported maternal complications between IDHS 2007 and IDHS 2012.

| Variable | Differences in Characteristics | | Differences in Responses/Effects | |
|---|---|---|---|---|
| | Absolute contribution (SE) | % contribution | Absolute contribution (SE) | % contribution |
| **Total** | 0.50 (0.23) | 15.00 | 2.62 (0.91) | 85.00 |
| Age at delivery | 0.02 (0.04) | 0.62 | -4.26 (5.41) | -138.13 |
| Parity | **0.40 (0.11)** | 13.08 | 2.30 (1.92) | 7.49 |
| Wealth | 0.00 (0.00) | 0.48 | 3.23 (2.36) | 104.88 |
| Education | -0.00 (0.1) | -4.48 | -2.39 (1.07) | -77.58 |
| Twin | 0.02 (0.01) | 0.58 | -0.00 (0.01) | -1.90 |
| Area | 0.14 (0.01) | 4.59 | 1.69 (3.25) | 54.915 |
| ANC WHO 1 | 0.04 (0.01) | 1.20 | -1.34 (0.01) | -43.55 |
| Constant | n/a | n/a | 5.51 (0.06) | 178.89 |

This study is subject to several potential limitations. First, the self-reported nature of the DHS, which is susceptible to information bias and limited information on the severity of maternal complications. Second, the DHS data limit our analyses to only some socio-demographic and pregnancy-related factors, and there may be other vital covariates not to be measured in this study. These factors might include; underlying diseases for maternal complications, knowledge, and awareness of maternal complications which influence self-reported maternal complications.

Despite the limitations, this study makes significant contributions. First, this study describes the increase in self-reported maternal complications and estimates the relative importance of several socio-demographic factors. Second, this study can identify the importance of unmeasured variables which might lead to further investigation in this area.

## 4. Conclusions

This study showed an increasing trend in self-reported maternal complications between 2007 and 2012. The increase in maternal complications prevalence in Indonesia was only partially attributed to the differences in selected socio-demographic characteristics; we examined in this study. The more dominant factors contributing to the increase in maternal complication were differences in responses/effects of unmeasured factors. These findings signify the importance of conducting a future research study that includes

other risk factors for maternal complications. In particular, investigations on the pre-existing medical condition and history of previous pregnancy, and awareness of maternal complications.

# References

[1] Hardee K, Gay J, and Blanc A K 2012 Maternal morbidity: a Neglected dimension of safe motherhood in the developing world. *Glob. Public Health* **7** 603–17

[2] Chou D Tunçalp Ö Firoz T Barreix M Filippi V von Dadelszen, van den Broek N Cecatti J G and Say L 2016 Constructing maternal morbidity – towards a standard tool to measure and monitor maternal health beyond mortality. *BMC Pregnancy Childbirth* **16** 45

[3] Rocha Filho EA, Costa ML, Cecatti J G, Parpinelli MA, Hadda S M, Sousa M H, Melo E F, Surita F G, Souza JP and The Brazilian Network for Surveillance of Severe Maternal Morbidity Study Group 2015 Contribution of antepartum and intrapartum hemorrhage to the burden of maternal near miss and death in a national surveillance study *Acta Obstet. Gynecol. Scand.* **94** 50–8

[4] Geller S E, Cox S M, Callaghan W M and Berg C J 20016 Morbidity and mortality in pregnancy. Laying the Groundwork for Safe Motherhood. *Women's Heal. Issues* **16** 176–88

[5] Statistics Indonesia (Badan Pusat Statistik [BPS]), National Population and Family Planning Board (BKKBN), Indonesia Ministry of Health (Depkes RI) and ICF International 2013 *Indonesia Demographic and Health Survey 2012* (Jakarta: Indonesia)

[6] Widyaningsih V, Khotijah and Balqis 2017 Expanding the scope beyond mortality: burden and missed opportunities in maternal morbidity in Indonesia. *Glob. Health Action* **10** 1339534

[7] Adisasmita A, Deviany PE, Nandiaty F, Stanton C and Ronsmans C 2008 Obstetrics near miss and deaths in public and private hospitals in Indonesia. *BMC Pregnancy Childbirth* **8** 10

[8] D'Ambruoso L, Martha E, Izati Y, Kiger A, and Coates A 2013 Maternal mortality and severe morbidity in rural Indonesia Part 1: The community perspective. *Soc. Med.* **7** 47–67

[9] Sikder SS, Labrique AB, Shamim AA, Ali H, Mehra S, Wu L, Shaikh S, West Jr K P and Christian P 2014 Risk factors for reported obstetric complications and near misses in rursal northwest Bangladesh: analysis from a prospective cohort study. *BMC Pregnancy Childbirth* **14** 347

[10] Oliveira F C De, Costa M, Cecatti J G, Pinto E, Silva J L, and Surita F G 2013 Maternal morbidity and near misses associated with maternal age: the innovative approach of the 2006 Brazilian demographic health survey. *Clinics (Sao Paulo)* **68** 922–7

[11] Oliveira F C J, Surita F G, Pinto E Silva J L, Cecatti J G, Parpinelli MA, Haddad SM, Costa ML, Pacagnella R C, Sousa M H and Souza J P 2014 Severe maternal morbidity and maternal near miss in the extremes of reproductive age: results from a national cross-sectional multicentre study. *BMC Pregnancy Childbirth* **14** 77

[12] Gray K E, Wallace ER, Nelson K R, Reed SD and Schiff M A 2012 Population-based study of risk factors for severe maternal morbidity. *Paediatr. Perinat. Epidemiol.* **26** 506–14

[13] Norhayati M N, Nik Hazlina N H, Aniza A A and Sulaiman Z 2016 Factors associated with severe maternal morbidity in Kelantan, Malaysia: A comparative cross-sectional study. BMC Pregnancy Childbirth **16** 185

[14] Adisasmita A, Smith CV, El-Mohandes A A E, Deviany PE, Ryon J J, Kiely M, Rogers-Bloch Q, and Gipson R F 2015 Maternal Characteristics and Clinical Diagnoses Influence Obstetrical Outcomes in Indonesia. *Matern. Child Health J.* **19** 1624–33

[15] Severe Maternal Morbidity: A 10-Year Review of the Literature. *Asia Pac J Public Heal.*

[16] Zanette E, Parpinelli MA, Surita F G, Costa ML, Haddad SM, Sousa M H, E Silva J L, Souza JP and Cecatti J G 2014 Maternal near miss and death among women with severe hypertensive disorders: A Brazilian multicentre surveillance study. *Reprod. Health* **11** 4

[17] Powers D A, Yodhioka H and Yun M S 2011 Mvdcmp: Multivariate decomposition for nonlinear response models. *Stata J* **11** 556–76

[18] O'Donnell O, Doorslaer E, Wagstaff A and Lindelow M 20018 Explaining differences between groups: Oaxaca Decomposition. *Analyzing health equity using household survey data: A guide to techniques and their implementation*. 147–57