

# Inequality in Access to Health Care in Cambodia: Socioeconomically Disadvantaged Women Giving Birth at Home Assisted by Unskilled Birth Attendants

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## Abstract

Cambodia faces major challenges in its effort to provide access to health care for all. Although there is a sharp improvement in health and health care in Cambodia, 6 in 10 women still deliver at home assisted by unskilled birth attendants. This practice is associated with higher maternal and infant deaths. This article analyzes the 2005 Cambodia Demographic and Health Survey data to examine the relationship between socioeconomic inequality and deliveries at home assisted by unskilled birth attendants. It is evident that babies in poorer households are significantly more likely to be delivered at home by an unskilled birth attendant than those in wealthier households. Moreover, delivery at home by an unskilled attendant is associated with mothers who have no education, live in a rural residence, and are farmers, and with higher birth order children. Results from this analysis demonstrate that socioeconomic inequality is still a major factor contributing to ill health in Cambodia.

## Keywords

delivery at home, unskilled birth attendant, poverty, rural, Cambodia

## Introduction

Delivery at home and delivery assisted by an unskilled birth attendant are a common occurrence in Cambodia, in all regions and equally prevalent in rural and urban areas of the country.<sup>1</sup> Births that take place at home are attended by either qualified or skilled birth attendants (a doctor, nurse, or midwife) or unskilled birth attendants, such as traditional birth attendants (TBAs), who do not have any medical training and have limited knowledge usually passed on by others TBAs

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or older women in the community.<sup>2</sup> Sometimes, not only the TBA is a well-known and trusted figure for the mother's family, but her services are also easily available and not very expensive. However, many TBAs use nonsterilized equipment, putting the mother and the newborn at risk of complications and infections during the delivery.<sup>3</sup> The World Health Organization (WHO) does not classify TBAs (whether trained or not) as "skilled birth attendants."<sup>4</sup> With the lack of knowledge and understanding of complications of deliveries among women in many parts of the world, the TBA is the preferred choice of birth attendant for many women.<sup>5-8</sup> Also, in poverty-stricken Cambodia, expectant mothers largely rely on TBAs because they lack access to public health services since they do not have the means to pay for transport to the nearest clinic or hospital or for health care.<sup>9</sup>

Annually, there are an estimated 342 900 maternal deaths worldwide, the majority of these occurring in developing countries.<sup>10</sup> Studies have demonstrated that the proportion of deliveries assisted by a skilled attendant or performed in a health facility has a negative relationship with the maternal mortality ratio (MMR) in these countries. There is a greater chance of survival for mothers and their newborns if they receive immediate and effective professional care at the time of delivery. Also, this postdelivery care should be provided by a skilled professional who is able to act immediately if there are unpredictable complications arising during delivery; it is also important for these professional caregivers to be accessible to all and to be present close to where people live as well.<sup>11-14</sup> A study in Slovenia of an estimated 18 000 births between 1997 and 2005 demonstrated that deliveries in hospitals are 7 times safer than unplanned deliveries at home.<sup>15</sup>

According to the 2005 Cambodia Demographic and Health Survey (CDHS), the MMR of Cambodia was 472/100 000 live births (compared with 437/100 000 live births in 2000), which is among the highest in the region. The survey showed that, in 2005, 78% of deliveries in Cambodia were performed at home and 56% of deliveries were assisted by unskilled providers (TBAs, parents, or friends).<sup>1</sup>

Cambodia is facing major hurdles in its efforts to provide access to health care for all mothers and children. There has been an improvement in child survival rates and a decrease in the incidence of HIV/AIDS, tuberculosis, malaria, and vaccine-preventable diseases. The overall health, population, and economic indicators have substantially improved. However, many challenges remain. Maternal mortality is among the highest in the region, access to sanitation and clean water remains low, and malnutrition is prevalent (37% of children younger than 5 years are stunted).<sup>1</sup> In Cambodia, inequality in health status and access to health care between rich and poor and between urban and rural residents is phenomenal; also, out-of-pocket expenditures are high and extensive.<sup>9</sup> It is particularly difficult for people who live in remote and rural areas to have access to health care facilities.

Cambodia has adopted a variety of innovative health care-financing schemes.<sup>16</sup> With support from the international donor community, it established equity funds to help poor Cambodians pay their health care bills, the performance-based contracting of health services to encourage public health care facilities to improve their key health service indicators, and several fee-for-service programs to compensate for weak public funding of health care. Nonetheless, these schemes have yet to expand their coverage nationwide. Moreover, Cambodia still has a relatively small formal medical workforce (0.16 physician per 1000 people and 0.35 nurse per 1000 persons).<sup>17</sup>

The objective of this study is to examine the inequality in the percentage of deliveries at home and deliveries that are assisted by an unskilled birth attendant between the poor and the rich and other selected factors. The fact that a high percentage of home deliveries are assisted by unskilled birth attendants may be responsible for the increased risk of maternal and neonatal mortality because the women or their birth attendants lack the knowledge to prevent or recognize complications during the delivery as well as the knowledge and means for immediate referral of the

women to an appropriate health care facility for emergency obstetric care. This study is the first population-based study to identify the factors associated with deliveries at home and those assisted by unskilled birth attendants in Cambodia.

## Materials and Methods

The 2005 CDHS interviewed a nationally representative sample of 14 243 households. The sample included a nationally representative sample of 17 256 women aged 15–49 years. A total of 16 823 women responded to the survey, yielding a response rate of 98%. Among these, 5865 women reported having at least 1 live birth between 2000 and 2005, with a total of 7789 live births during that 5-year period. The outcome variable in this study is formed by combining the 2 primary variables: (1) place of delivery (at a health facility or at home) and (2) type of birth attendant (skilled or unskilled). As a result, it has 3 categories: (1) delivery at a health facility by a skilled birth attendant, (2) delivery at home by a skilled birth attendant, and (3) delivery at home by an unskilled birth attendant.

CDHS did not collect direct information on the income and expenditure of the women or the households. This study used the household wealth index, which was created from a number of variables indicating the durable assets owned by the households, using principal component analysis.<sup>18</sup> This household wealth index was used as a proxy indicator for household economic status in this study. Economic disparity was measured by dividing the wealth index into quintiles. The lowest quintile represents the poorest 20% and the highest quintile represents the richest 20% households in Cambodia. Economic disparity could be presented by a concentration curve. However, this study used only the wealth index quintiles. In a previous study, Hong et al<sup>19</sup> demonstrated the association of wealth index quintiles, a proxy for economic status, and infant mortality in Cambodia using the results of the 2010 CDHS. In a separate study carried out by Anh et al,<sup>20</sup> they confirmed that ill health was more pronounced among lower income groups in Korea.

The relationship between the outcome variable and household wealth quintile was estimated after adjusting for the effects of the child demographic characteristics that may have influenced and affected the outcome variable, such as child's gender (boy, girl) and birth order (1, 2–3, 4–5, 6+). The analysis was also adjusted for the sociodemographic characteristics of the mother, such as mother's age at childbirth (<20, 20–34, 35–49), education level (no education, primary or lower, secondary or higher), and occupation (professional/sales/service, agriculture, household help/housewife/no occupation), and for the geographic characteristics of residence (urban, rural) and geographic region (Phnom Penh, plain, Great Lake, coastal, plateau/mountain). For the definition of geographic region, see Table 1, Footnote a.

Bivariate analysis was used to present the unadjusted relationship of place of delivery and type of attendant during delivery with household wealth quintile and other characteristics. Adjusted relationships were estimated using multivariate multinomial logistic regression, with delivery at a health facility by a skilled birth attendant as the base category, using the STATA statistical package version 10.2.<sup>21</sup> In this study, in certain geographical areas (province and urban/rural) the sample was drawn slightly differently from other areas depending on the population density in those areas, to obtain a representative sample. Additionally, response rates to the interview varied from one geographical region to another.<sup>1</sup> The analysis used weights to adjust the effect of the sample design and response rate. Results are presented as odds ratios (ORs) with 95% confidence intervals (CIs) and *P* values.

## Ethics

This study was based on secondary analysis of existing survey data, with all identifying information removed. Informed consent was obtained from the women included in this study before any

**Table 1.** Sample Distribution of Births Between 2000 and 2005 by Place of Delivery, by Type of Birth Attendant During Delivery, and by Selected Child, Woman, and Household Characteristics, Cambodia 2005.

	Percentage	Number
Place of delivery		
Health facility	21.7	1688
Home	78.3	6097
Data missing	0.1	4
Assistance during delivery		
Skilled birth attendant	43.8	3410
Unskilled birth attendant/no one	56.2	4379
Health insurance status of the mother		
Health facility with skilled birth attendant	21.5	1674
Home with skilled birth attendant	22.3	1736
Home without skilled birth attendant	56.0	4362
Other/data missing	0.2	17
Wealth quintile		
Richest (first)	16.2	1259
Richer (second)	16.1	1253
Middle (third)	17.7	1381
Poorer (fourth)	22.9	1786
Poorest (fifth)	27.1	2111
Child's gender		
Male	50.1	3901
Female	49.9	3887
Birth order		
1	27.5	2140
2-3	39.3	3063
4-5	19.4	1512
6+	13.8	1074
Age of mother at childbirth (years)		
<20	10.7	831
20-34	71.2	5546
35-49	18.1	1411
Mother's education		
None	24.2	1885
Some primary	59.0	4595
Some secondary or higher	16.8	1308
Occupation		
Professional/sales/service	20.0	1560
Agriculture	53.3	4153
Household help/housewife/no occupation	26.3	2046
Data missing	0.4	29
Urban/rural		
Urban	14.0	1093
Rural	86.0	6696
Geographic region <sup>a</sup>		
Phnom Penh	7.9	614
Plain	38.2	2974
Great Lake	31.7	2467

(continued)

**Table 1. (Continued)**

	Percentage	Number
Coastal	7.6	593
Plateau/mountain	14.7	1141
Total	100.00	7789

<sup>a</sup>Phnom Penh is the capital city; the plain region includes the provinces of Kampong Cham, Kandal, Prey Veng, Svay Rieng, and Takeo; the Great Lake region includes the provinces of Banteay Mean Chey, Bat Dambang, Kampong Chhnang, Kampong Thom, Pousat, and Siem Reap; the coastal region includes the provinces of Kampot, Koh Kong, Kep City, and Preah Sihanouk City; and the plateau/mountain region includes the provinces of Kampong Speu, Kracheh, Mondol Kiri, Preah Vihear, Rattanak Kiri, Stung Traeng, Otdor Mean Chey, and Pailin City.

questions were asked. The survey protocol was approved by the Cambodia National Ethical Committee and by the Macro International Institutional Review Board.<sup>1</sup>

## Results

As of 2005, almost 8 in 10 deliveries (78%) in Cambodia were performed at home, and 56% were assisted by unskilled birth attendants. Of 78% of those deliveries carried out at home, 22% were assisted by a doctor, nurse, or midwife, whereas the remaining 56% were assisted by unskilled persons, such as a TBA or relatives. Distribution by household wealth index quintile shows slightly fewer births among the richest and richer household quintiles (16%) than among the poorest (27%) and poorer (23%) quintiles. This demonstrates that rich households have fewer children than poorer households. Of the 7789 births, half were female; 28% of all births were of first birth order, 39% were of second or third birth order, 19% were of fourth or fifth birth order, and 14% were of sixth birth order or higher. Only 1 in 10 births was to mothers younger than 20 years of age at the time of delivery. The majority of them (71%) were to mothers aged 20 to 34, and the rest were to mothers aged 35 to 49. About 6 in 10 births (59%) were to mothers with primary education, 24% were to illiterate mothers, and only 17% were to mothers with secondary education or higher. In more than half of the births, the mothers were farmers (53%), whereas only 20% were to mothers who worked in the professional/sales/service sector and 19% to mothers who were employed as household help, who were housewives, or who did not have any occupation at the time of the interview. Eighty percent of births were in the rural areas, and 14% were in urban areas. Distribution by region shows that 8% of births were in Phnom Penh, another 8% were in the coastal region, and 15% were in the plateau or mountain region. About 32% and 38% of births were from the Great Lake and plain regions, respectively.

Table 2 presents the percentage of the outcome variable by household socioeconomic status (wealth quintile) and by selected child, mother, and household characteristics. Births to women in the richest household wealth quintile are more likely to take place at a health facility and assisted by a skilled birth attendant (66%) and less likely to occur at home and assisted by unskilled birth attendants (10%) or by skilled birth attendants (23%). Only about one quarter of the births in the richer household wealth quintile took place in a health facility and assisted by a skilled birth attendant. Births in the middle, poor, and poorer household wealth quintiles are likely to take place at home and assisted by unskilled birth attendants (60%, 71%, and 79%, respectively). Only 14%, 10%, and 6% births in these quintiles occurred in a health facility and assisted by skilled birth attendants, respectively.

Place of delivery and type of birth attendant are very similar in the births of baby boys and girls. Birth order is consistently negatively associated with delivery at the health facility and

**Table 2.** Distribution of Births Between 2000 and 2005 by Place of Delivery (Health Facility or Home), by Type of Birth Attendant (Skilled or Unskilled), by Household Wealth Quintile, and by Selected Child, Woman, and Household Characteristics, Cambodia 2005.

Characteristics	Delivery at Health Facility by Skilled Birth Attendant	Delivery at Home by Skilled Birth Attendant	Delivery at Home by Unskilled Birth Attendant
<b>Wealth quintile</b>			
Richest (first)	67.3	22.6	9.9
Richer (second)	25.6	36.3	38.1
Middle (third)	14.1	25.5	60.0
Poorer (fourth)	9.9	19.1	70.8
Poorest (fifth)	6.4	14.3	79.0
<b>Child's gender</b>			
Male	20.9	22.5	56.4
Female	22.1	22.0	55.6
<b>Birth order</b>			
1	31.3	22.9	45.7
2-3	22.1	23.8	54.0
4-5	14.7	20.0	64.9
6+	9.8	20.1	69.5
<b>Age of mother at childbirth (years)</b>			
<20	21.7	22.5	55.7
20-34	22.4	22.5	55.0
35-49	18.0	21.3	60.3
<b>Mother's education</b>			
None	9.6	12.5	77.7
Some primary	19.0	23.6	57.2
Some secondary or higher	47.6	31.9	20.5
<b>Occupation</b>			
Professional/sales/service	40.1	27.8	31.7
Agriculture	10.2	19.2	70.3
Household help/housewife/no occupation	30.0	24.2	45.8
Data missing	34.8	29.1	36.1
<b>Urban/rural</b>			
Urban	50.2	20.0	29.9
Rural	16.8	22.7	60.3
<b>Geographic region<sup>a</sup></b>			
Phnom Penh	78.4	7.6	14.0
Plain	20.5	29.2	50.1
Great Lake	14.8	21.7	63.2
Coastal	21.4	25.0	53.6
Plateau/mountain	8.0	12.0	79.7
<b>Total</b>	<b>21.5</b>	<b>22.3</b>	<b>56.0</b>
<b>Number</b>	<b>1674</b>	<b>1736</b>	<b>4362</b>

<sup>a</sup>See Table 1.

assisted by a skilled birth attendant and consistently positively associated with delivery at home and assisted by unskilled birth attendants. The higher the birth order, the less likely the births were to occur at the health facility and assisted by skilled birth attendants and the more likely

they were to take place at home and assisted by unskilled birth attendants (Table 2). Place of delivery and type of birth attendant did not vary substantially by age of the mother at the time of delivery. It is evident that births to mothers with secondary education or higher are more likely to take place at the health facility and assisted by a skilled birth attendant (48%) than births to mothers with no education (10%). More than three quarters of births (78%) to illiterate mothers took place at home and assisted by unskilled birth attendants. More births to mothers who are farmers (70%) took place at home and assisted by unskilled birth attendants than births to other mothers. About half of the total births (50%) in urban areas occurred at a health facility and assisted by a skilled birth attendant, whereas 60% of births in rural areas took place at home and assisted by unskilled birth attendants.

The majority of births (78%) in the capital city of Phnom Penh took place in a health facility and were assisted by a skilled birth attendant, whereas only 8% of deliveries in the plateau and mountain regions were performed in a health facility by a skilled birth attendant. In those regions, most deliveries (80%) were performed at home and assisted by unskilled birth attendants.

### **Multivariate Analysis**

This analysis looks at the association of the place of delivery and type of birth attendant with household socioeconomic status, taking into account the relationship of all other covariates (characteristics) in the model. After controlling for the effects of all other covariates, compared with deliveries performed at a health facility by a skilled attendant, births in the poorest households are nearly 3 times more likely to be assisted at home by a skilled attendant than births in the richest quintile (Table 3; OR = 2.78, 95% CI = 2.07-3.73,  $P = .000$ ). The odds are even significantly much higher of deliveries in the poorest households (OR = 18.17, 95% CI = 13.34-24.75,  $P = .000$ ) being performed at home by an unskilled birth attendant than deliveries in the richest households. Births in the second, third, and fourth household wealth quintiles are also significantly more likely to take place at home assisted by either a skilled birth attendant or an unskilled birth attendant (Table 3).

There is no significant difference regarding the place of delivery and type of birth attendant between the births of baby boys and girls. Births of higher order are significantly more likely to take place at home assisted by skilled or unskilled attendants than first-order births. Births to mothers whose age at childbirth is 20 years or older are less likely to occur at home assisted by a skilled or unskilled attendant than first-order births (Table 3).

Births to mothers with a primary education and to mothers with a secondary education or higher are less likely to take place at home assisted by an unskilled attendant (OR = 0.57, 95% CI = 0.46-0.70,  $P = .000$  and OR = 0.22, 95% CI = 0.17-0.29,  $P = .000$ , respectively) than those to mothers with no education. The likelihood of giving birth at home with the help of an unskilled attendant is higher among women who are farmers than among women who work in the professional, sales, and service sector (OR = 1.90, 95% CI = 1.56-2.23,  $P = .000$ ). The odds of being delivered at home by a skilled attendant are not different by the level of education and by the occupation of the mother.

Delivery at home by a skilled attendant and delivery at home by an unskilled attendant are significantly more likely in rural than in urban areas (OR = 1.54, 95% CI = 1.24-1.91,  $P = .000$  and OR = 1.91, 95% CI = 1.53-2.28,  $P = .000$ , respectively). Also, the odds of delivery at home by a skilled attendant or delivery at home by an unskilled attendant are significantly higher in the other regions than in the capital city (Table 3).

### **Discussion**

The past decades have witnessed marked improvements in health and health care status among the Cambodian population.<sup>22,23</sup> The improvements, however, are not distributed

**Table 3.** Relationship of Delivery at Home and Delivery Assisted by Unskilled Birth Attendant for Births Between 2000 and 2005 and Health Insurance Status of the Mother Controlling for Selected Child, Woman, and Household Characteristics, Cambodia 2005.

Characteristic	Multivariate Multinomial Logistic regressions <sup>a</sup>			
	Delivery at Home by Skilled Birth Attendant		Delivery at Home by Unskilled Birth Attendant	
	OR (95% CI)	P	OR (95% CI)	P
<b>Wealth quintile</b>				
Richest (first)	1.00	—	1.00	—
Richer (second)	2.22 (1.77-2.77)	.000	4.40 (3.38-5.73)	.000
Middle (third)	2.50 (1.93-3.24)	.000	9.18 (6.91-12.20)	.000
Poorer (fourth)	2.47 (1.88-3.24)	.000	12.74 (9.50-17.09)	.000
Poorest (fifth)	2.78 (2.07-3.73)	.000	18.17 (13.34-24.75)	.000
<b>Child's gender</b>				
Male	1.00	—	1.00	—
Female	0.96 (0.83-1.11)	.595	0.96 (0.84-1.11)	.623
<b>Birth order</b>				
1	1.00	—	1.00	—
2-3	1.82 (1.52-2.19)	.000	2.49 (2.07-2.98)	.000
4-5	2.01 (1.57-2.57)	.000	3.40 (2.68-4.29)	.000
6+	3.09 (2.19-4.36)	.000	4.35 (3.15-6.01)	.000
<b>Age of mother at childbirth (years)</b>				
<20	1.00	—	1.00	—
20-34	0.68 (0.53-0.88)	.003	0.50 (0.39-0.65)	.000
35-49	0.46 (0.32-0.65)	.000	0.29 (0.21-0.40)	.000
<b>Mother's education</b>				
None	1.00	—	1.00	—
Some primary	1.08 (0.85-1.37)	.523	0.57 (0.46-0.70)	.000
Some secondary or higher	0.97 (0.74-1.28)	.837	0.22 (0.17-0.29)	.000
<b>Occupation</b>				
Professional/sales/service	1.00	—	1.00	—
Agriculture	1.18 (0.96-1.45)	.112	1.90 (1.56-2.33)	.000
Household help/housewife/no occupation	1.05 (0.86-1.27)	.644	1.22 (1.00-1.49)	.048
<b>Urban/rural</b>				
Urban	1.00	—	1.00	—
Rural	1.54 (1.24-1.91)	.000	1.91 (1.53-2.38)	.000
<b>Geographic region<sup>b</sup></b>				
Phnom Penh	1.00	—	1.00	—
Plain	6.53 (4.63-9.22)	.000	1.80 (1.31-2.47)	.000
Great Lake	7.52 (5.30-10.68)	.000	3.00 (2.17-4.13)	.000
Coastal	6.54 (4.36-9.82)	.000	2.14 (1.47-3.13)	.000
Plateau/mountain	7.32 (4.79-11.19)	.000	6.34 (4.34-9.27)	.000
Number	7756			

Abbreviations: OR, odds ratio; CI, confidence interval.

<sup>a</sup>Base category is "Delivery at health facility by skilled birth attendant."<sup>b</sup>See Table 1.

equally among the economic strata of the population. The gaps in utilization of health care between the rich and the poor—in this case, delivery at a health facility assisted by skilled birth attendants—remain. Literature discussing the inequality in health status between urban

and rural populations, between the rich and the poor, and between the educated and the uneducated in developing countries is common.<sup>24</sup> A multicountry analysis using 48 demographic and health survey data was done by Montagu et al.<sup>25</sup> Even though the analysis did not control for other socioeconomic factors, it provided empirical descriptive evidence confirming that most poor women deliver at home. The results from this study, however, show that the inequality expands further to the predisposing factors determining the population health status: access to and utilization of health care. This study found evidence of significant differences in delivery at a health facility assisted by skilled birth attendants between advantaged and disadvantaged groups of women in Cambodia. The lack of association between socioeconomic status and place of delivery may be explained by the fact that wealthy women choose to deliver at home with the assistance of paid, skilled professionals. Further study is required to examine this hypothesis.

Improving access to and utilization of health care services is still widely accepted as an important way to improve population health and remove inequalities in health care access and utilization.<sup>26,27</sup> Socioeconomic differences in access to and utilization of health care services may aggravate existing health inequalities. Thus, understanding the extent of inequalities in access and utilization is essential to understanding the broader spectrum of health equity.<sup>28</sup>

Moreover, better access to and utilization of health services is itself an important health determinant. Over the years, improved access to health care services for the poor and disadvantaged segments of the population helped reduce inequities in health, notably differences in childhood mortality, in developing countries.<sup>29</sup> Furthermore, regardless of the effect of household wealth quintile, delivery at home by unskilled birth attendants is classically predominant among women without an education, who are farmers, or who live in the rural areas or outside the capital city.

Delivery at home by an unskilled birth attendant is associated with a higher risk of complications during delivery and a higher risk of newborn and maternal mortality. At present, more women understand the benefits of delivering their babies at a health facility than in the past. Nevertheless, many still choose to deliver at home because of socioeconomic difficulties. Improving population insurance coverage for essential services such as prenatal care, delivery, and postnatal and newborn care, using community pooled funds or equity funds to curb the costs, may enable more women to deliver at a health facility. A national health education and promotion program should be designed targeting higher risk groups of women to improve their knowledge on safe motherhood, including but not limited to safe delivery at a health facility and assisted by a skilled birth attendant.

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### **References**

1. National Institute of Public Health and Research, National Institute of Statistics, and Macro International. *Cambodia Demographic and Health Survey 2005*. Calverton, MD: National Institute of Public Health and Research, National Institute of Statistics, and Macro International; 2006.
2. World Health Organization. *Skilled Birth Attendants*. WHO fact sheet. Geneva, Switzerland: World Health Organization; 2008.
3. Yanagisawa S, Oum S, Wakai S. Determinants of skilled birth attendance in rural Cambodia. *Trop Med Int Health*.2006;11:238-251.

4. World Health Organization. *Proportion of Births Attended by a Skilled Health Worker: 2008 Updates*. WHO fact sheet. Geneva, Switzerland: World Health Organization; 2008.
5. Madhivanan P, Kumar BN, Adamson P, Krupp K. Traditional birth attendants lack basic information on HIV and safe delivery practices in rural Mysore, India. *BMC Public Health*.2010;10:570.
6. Darmstadt GL, Hussein MH, Winch PJ, Haws RA, Gipson R, Santosham M. Practices of rural Egyptian birth attendants during the antenatal, intrapartum and early neonatal periods. *J Health Popul Nutr*:2008;26:36-45.
7. Lukumar P, Pathmeswaran A. Factors associated with home deliveries in Thampalakamam, Trincomalee. *Ceylon Med J*.2006;51:59-62.
8. Islam MA, Chowdhury RI, Akhtar HH. Complications during pregnancy, delivery and postnatal stages and place of delivery in rural Bangladesh. *Health Care Women Int*.2006;27:807-821.
9. Bigdeli M, Annear PL. Barriers to access and the purchasing function of health equity funds: lessons from Cambodia. *Bull World Health Organ*.2009;87:560-564.
10. Hogan MC, Foreman KJ, Naghavi M, et al. Maternal mortality for 181 countries, 1980-2008: a systematic analysis of progress towards Millennium Development Goal 5. *Lancet*.2010;375:1609-1623.
11. World Health Organization. *The World Health Report 2005. Make Every Mother and Child Count*. Geneva, Switzerland; 2005.
12. Johnson KC, Daviss BA. Outcomes of planned home births with certified professional midwives: large prospective study in North America. *BMJ*.2005;330:1416. doi:10.1136/bmj.330.7505.1416.
13. Janssen PA, Lee SK, Ryan EM, et al. Outcomes of planned home births versus planned hospital births after regulation of midwifery in British Columbia. *CMAJ*.2002;166:315-323.
14. Goodburn EA, Chowdhury M, Gazi R, Marshal T, Graham W. Training traditional birth attendants in clean delivery does not prevent postpartum infection. *Health Policy Plan*.2000;15:394-399.
15. Lazić Z, Takač I. Outcomes and risk factors for unplanned delivery at home and before arrival to the hospital. *Wien Klin Wochenschr*.2011;123:11-14. Erratum in *Wien Klin Wochenschr*. 2011;123:132.
16. Ministry of Health of Cambodia. *Cambodia Strategic Framework for Health Financing 2008-2015*. Phnom Penh, Cambodia: Ministry of Health; 2008.
17. World Health Organization, Western Pacific Region. *Country Health Profile*. [http://www.wpro.who.int/NR/rdonlyres/6DB56617-928C-4156-AF34-5B3EC6CD3E75/0/CHIPS\\_2006\\_Part1.pdf](http://www.wpro.who.int/NR/rdonlyres/6DB56617-928C-4156-AF34-5B3EC6CD3E75/0/CHIPS_2006_Part1.pdf). Accessed January 29, 2011.
18. Rutstein SO, Johnson K. *The DHS Wealth Index*. DHS Comparative Report No. 6. Calverton, MD: ORC Macro; 2004.
19. Hong R, Mishra V, Michael J. Economic disparity and child survival in Cambodia. *Asia Pac J Public Health*.2007;19:37-44.
20. Ahn BC, Engelhardt K, Joung H. Income-related health inequalities in Korea. *Asia Pac J Public Health*.2010;22:32-41.
21. Stata Corporation. *STATA Release 10.2*. College Station, TX: Stata Press; 2010.
22. Hong R, Chhea V. Changes in HIV-related knowledge, behaviors, and sexual practices among Cambodian women from 2000 to 2005. *J Womens Health (Larchmt)*.2009;18(8):1281-1285.
23. Hong R, Chhea V. Trend and inequality in immunization dropout among young children in Cambodia. *Matern Child Health J*.2010;14:446-452.
24. Barros FC, Victora CG, Scherpbier R, Gwatkin D. Socioeconomic inequities in the health and nutrition of children in low/middle income countries. *Rev Saude Publica*.2010;44:1-16.
25. Montagu D, Yamey G, Visconti A, Harding A, Yoong J. Where do poor women in developing countries give birth? A multi-country analysis of demographic and health survey data. *PLoS One*.2011;6:e17155.
26. World Health Organization. *World Health Report 2000. Health Systems: Improving Performance*. Geneva, Switzerland: World Health Organization; 2000.
27. Mackenbach JP. *Health Inequalities: Europe in Profile*. Rotterdam, Netherlands: Erasmus MC; 2005. [http://ec.europa.eu/health/ph\\_determinants/socio\\_economics/documents/ev\\_060302\\_rd06\\_en.pdf](http://ec.europa.eu/health/ph_determinants/socio_economics/documents/ev_060302_rd06_en.pdf). Accessed January 29, 2011.

28. Allin S, Masseria C, Thomson S, Mossialos E. *Health Status and Living Conditions in an Enlarged Europe: Final Report*. London, UK: LSE/European Observatory on the Social Situation; 2005.
29. Dahlgren G, Whitehead M. *Levelling Up (Part 2)*. Copenhagen, Denmark: WHO Regional Office for Europe; 2006.