THE MATTHEW EFFECT IN MATERNAL MORTALITY DECLINE AROUND THE WORLD

Alejandro Aguirre[*] **Fortino Vela-Peón** [**]

April 11, 2013

[*] Centro de Estudios Demográficos, Urbanos y Ambientales, El Colegio de México. aguirre@colmex.mx
[**] Departamento de Producción Económica, Universidad Autónoma Metropolitana Xochimilco, fvela@correo.xoc.uam.mx

Abstract

Among the millennium development goals (MDG) is the one concerning the reduction of maternal mortality by three quarters between 1990 and 2015. This a fundamental issue in gender equality. This paper investigates whether the Matthew Effect occurs or not for maternal mortality decline, with the implication of widening the existing gap between developed and developing countries.

The Matthew Effect is a phenomenon in which inequalities increase. It was initially labeled by Merton (1968) making reference to a biblical phrase: “Unto every one that hath shall be given, and he shall have abundance; but from him that hath not shall be taken away even that which he hath” (Matthew 25:29).

To evaluate this hypothesis we take the experience of 181 countries from all over the world, and apply the Spearman's correlation test to verify empirically if the Matthew Effect occurs or not.

Key Words: Maternal mortality, Millennium Development Goals, Matthew Effect

Introduction

Among the millennium development goals (MDG) is the one concerning the reduction of maternal mortality by three quarters between 1990 and 2015. This a fundamental issue in gender equality. Probably the most outstanding failure in the attainment of MDG is the reduction of maternal mortality. Both international agencies as well as national governments recognize that it is very unlikely for most developing countries that the goals will be achieved. In fact, since the World Summit for Children in 1990 the goal for maternal mortality was too ambitious: the target was to reduce MMR by half between 1990 and 2000, whereas IMR had to be reduced only one third.

This paper investigates whether the Matthew Effect occurs or not for maternal mortality decline, with the implication of widening the existing gap between developed and developing countries. In other words, we want to know whether inequalities in maternal mortality have been increasing between countries. In order to meet the stated objective, we took the Maternal Mortality Ratios (MMR) of 1990 and 2010 from The World Bank website[1]. To test the hypothesis under study we calculate the correlation coefficient Spearman rank to determine whether the MMR inequalities between countries have increased or not.

[1] http://data.worldbank.org/

An overview of MMR around the world

Maternal mortality presents a great deal of contrast both in levels and in their evolution inter and intra countries. Unlike what happens with Infant Mortality Rate (IMR), with maternal mortality it is possible to observe countries that for a given year, the indicator shows high values, while for other years these values decrease and then increase again. This volatility occurs often in small populations due to the fact that maternal mortality is a relatively rare event. In the last years there has been a major effort to obtain mortality estimates to monitor the evolution of maternal mortality to assess the progress towards MDG5 (Hill et. al. 2007; Graham, 2008; Wilmoth, 2010 & 2010a; WHO, 2012; AbouZahr, 2011; World Bank, 2012).

At the end of the twentieth century, the panorama of maternal mortality in the world showed great differences between countries. Thus, according to figures from the World Bank (2012), in 1990 there were 16 countries (mainly in Africa) with MMR above 1000 maternal deaths per hundred thousand live births: Lao People´s Democratic Republic, Afghanistan, Sierra Leone, Equatorial Guinea, Angola, Guinea, Liberia, Niger, Malawi, Burundi, Mali, Nigeria, Guinea-Bissau, Sudan, Bhutan and Timor-Leste. For the same year the countries with lower MMR (less than 10 deaths per hundred thousand) were: Norway, Montenegro, Iceland, Croatia, Switzerland, Finland, Spain, Ireland, Luxembourg, Canada, Sweden, Greece and Singapore.

There has been some progress in maternal mortality reduction around the world. By 2010 only one country, Chad, still had an MMR above 1000 per 100 000 live births, while 25 countries were below 10: Montenegro, Lithuania, Malta, Portugal, Belgium, Bosnia and Herzegovina, Switzerland, France, Israel, Germany, , Qatar, : Norway, Australia, Spain, Slovakia, Ireland, Netherlands, Iceland, Japan, Poland, China´s Republic, Finland, Sweden and Belarus.

Given these large differentials, the question raises on whether they will continue to expand or decrease.

The Matthew Effect in Maternal Mortality

The Matthew Effect is a phenomenon in which inequalities increase. It was initially labeled by Merton (1968) making reference to a biblical phrase*: "Unto every one that hath shall be given, and he shall have abundance; but from him that hath not shall be taken away even that which he hath*" (Matthew 25:29).

To evaluate this hypothesis we take the experience of around 181 countries from all over the world, applying one statistical test to verify empirically if the Matthew Effect occurs or not.

Specifically, we applied the Spearman's correlation test. We use data on maternal mortality ratios (MMR) for 1990 and 2010. These data come from the World Bank (2012). Although there can be different level of quality of the MMR we utilized the available data and considered these as reliable. The first step we took consisted on

ranking the countries according to their MMR in 1990. Then we compared with the ratios in 2010. In order to test the Matthew Effect hypothesis we calculated relative differences (RD) between the ratios in these two moments in time, namely:

$$RD = \frac{MMR_{1990} - MMR_{2010}}{MMR_{1990}} * 100$$

We also ranked these relative differences. Finally we applied the Spearman test with the ranks of MMR in 1990 against the ranks of RD.

Discussion

The results show no significant correlation between the ranks. This means that the Matthew Effect does not exist in the set of countries included in this paper. We found that the sign of the correlation coefficient between the ranks of the MMR in 1990 and the ranks of the RD was positive, i. e. opposite to expected. This means that countries with a low baseline for the MMR not necessarily have higher advances in MMR reductions. In fact, as Figure 1 shows, it does not exist a clear relationship between the ranks.

The Matthew Effect does not occur for maternal mortality for the world, neither for the regions considered: Africa, the Americas, Europe, Asia, or Oceania. The Matthew Effect in fact only occurs if the increase of inequalities is very strong. If the

Matthew Effect had occurred, values of ρ would have been negative. This was not the case in none of the five regions. Positive values for ρ mean a reduction of inequality. In fact, the greater the ρ, the better the evolution towards the reduction of inequality. However, this reduction in inequality is still insufficient for certain groups of countries to reach MDG5.

Although there was not Matthew Effect, the exercise produced an indicator of the performance of the regions in their evolution of inequality. This figure, ρ, indicates that the progress in the reduction of inequality is poor in Africa, followed in that order by the Americas, Europe and Asia.

The main parameter of the test is given by the level of significance (p-value) which indicates if the null hypothesis can be rejected or not. A piece of supplementary information when testing Spearman correlation ranks is the value of the ρ. As we know, in general, this coefficient works in the range from -1 to 1. A value equal -1 indicate a perfect inverse relationship between variables involved. Conversely, a value equal 1 indicates a perfect direct relationship. A value zero means that no exist relationship.

In our case, if ρ takes negative values indicate that higher MMR initial is associated with lower RD. In other words, increase inequality. The opposite occurs with positive values, namely, the inequality decreases. Particularly, for the sample of

181 countries, there is a widely dispersed cloud of points and the value of ρ is only 0.2915. If ρ is considered by regions, Africa is located below the value of the world (0.1976), which means that in the African continent the reduction of inequality is weaker than for the whole word. For the Americas r was 0.4238, in Europe 0.5310 and Asia 0.6625. This means that there is a downward trend in inequality in comparison with the observed worldwide, and that this is higher in Asia, followed by Europe and the Americas.

References

AbouZahr, Carla (2011). “New estimates of maternal mortality and how to interpret them: choice or confusion?”, *Reproductive Health Matters*, 19(37), 117–128

Aguirre, Alejandro (2009). “La mortalidad infantil y la mortalidad materna en el siglo XXI”, *Papeles de Población*, Vol. 61, Num. 5., 75-99.

Aguirre, Alejandro (1999). *Mortalidad materna en México*, Centro de Investigación y Estudios Avanzados de la Población, Universidad Autónoma del Estado de México, Toluca.

Graham, Wendy J. and Lauren B. Foster (2008). “Measuring progress in reducing maternal mortality”, *Best Practice & Research Clinical Obstetrics and Gynaecology*, Vol. 22, No. 3, 425–445.

Hill, Kenneth et al. (2007). “Estimates of maternal mortality worldwide between 1990 and 2005: an assessment of available data”, *Lancet*, October 13, Vol. 370, 1311-1319.

Hogan, Margaret C. *et. al.* (2010). “Maternal mortality for 181 countries, 1980-2008: a systematic analysis of progress towards Millennium Development Goal 5”, *The Lancet*, Volume 375, Issue 9726, 1609-1623.

Jones, Andrew M. and Ángel López Nicolás (2006). “Allowing for heterogeneity in the decomposition of measures of inequality in health", *The Journal of Economic Inequality*, Volume 4, Number 3, 347-365,

Loudon, Irvine (2000). “Maternal mortality in the past and its relevance to developing countries today”, *The American Journal of Clinical Nutrion*;72 (suppl):241S–246S

Lozano, Rafael et. al. (2011). “Progress towards Millennium Development Goals 4 and 5 on maternal and child mortality: an updated systematic analysis”, *The Lancet*, Volume 378, Issue 9797, 1139 - 1165, 24.

Merton Robert K. (1968). “The Matthew effect in science”, *Science*, Vol. 159, Num. 810, pp. 56-63.

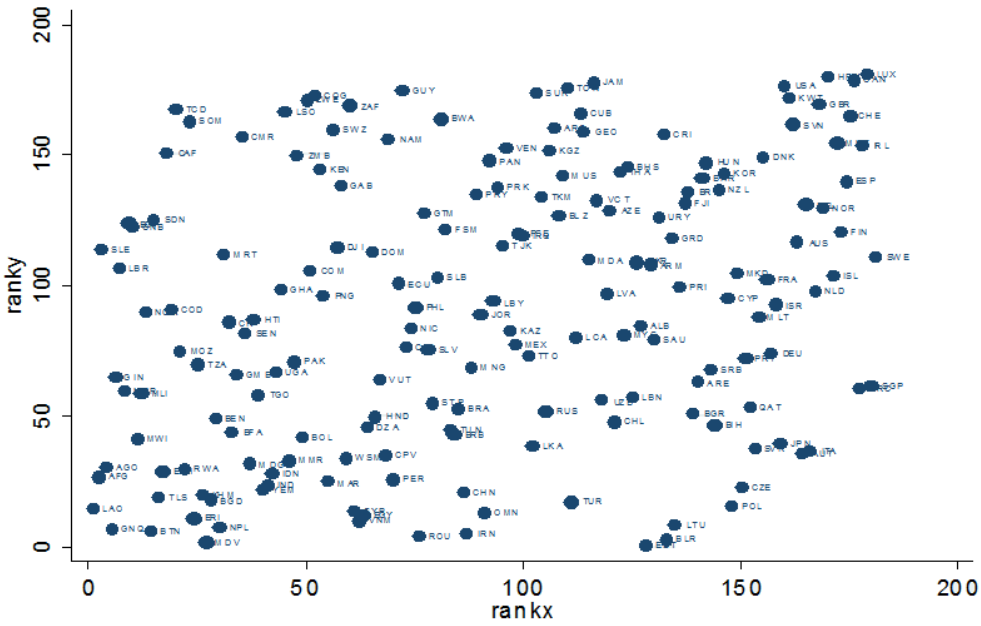
Sebitloane, H.M. and R.E. Mhlanga (2008). "Changing patterns of maternal mortality (HIV/AIDS related) in poor countries", *Best Practice & Research Clinical Obstetrics and Gynaecology*, Vol. 22, No. 3, 489-499.

World Bank (2012). Trends in maternal mortality:1990 to 2010 (WHO, UNICEF, UNFPA and The World Bank estimates), USA.
(http://www.unfpa.org/webdav/site/global/shared/documents/publications/2012/Trends_in_maternal_mortality_A4-1.pdf revised November 2012).

Wilmonth, John *et. al.* (2010). "Maternal deaths drop by one-third from 1990 to 2008: a United Nations analysis", *Bulletin of the World Health Organization*, 88:718-718A.
.
Wilmoth, John *et. al.* (2010a). "Levels and trends of maternal mortality in the world: The development of new estimates by the United Nations" *Technical report* (submitted to the WHO, UNICEF, UNFPA, and the World Bank).
(http://www.who.int/reproductivehealth/publications/monitoring/MMR_technical_report.pdf revised on November, 2012).

World Bank (2012). *Monitoring MDG 5: Interpreting Maternal Mortality Estimates*, HNPNotes.
(http://siteresources.worldbank.org/ May51512web.pdf revisied on November, 2012).

Figure 1.
Scatterplot between rank of MMR vs rank of relative difference 1990-2010 in MMR for 181 countries

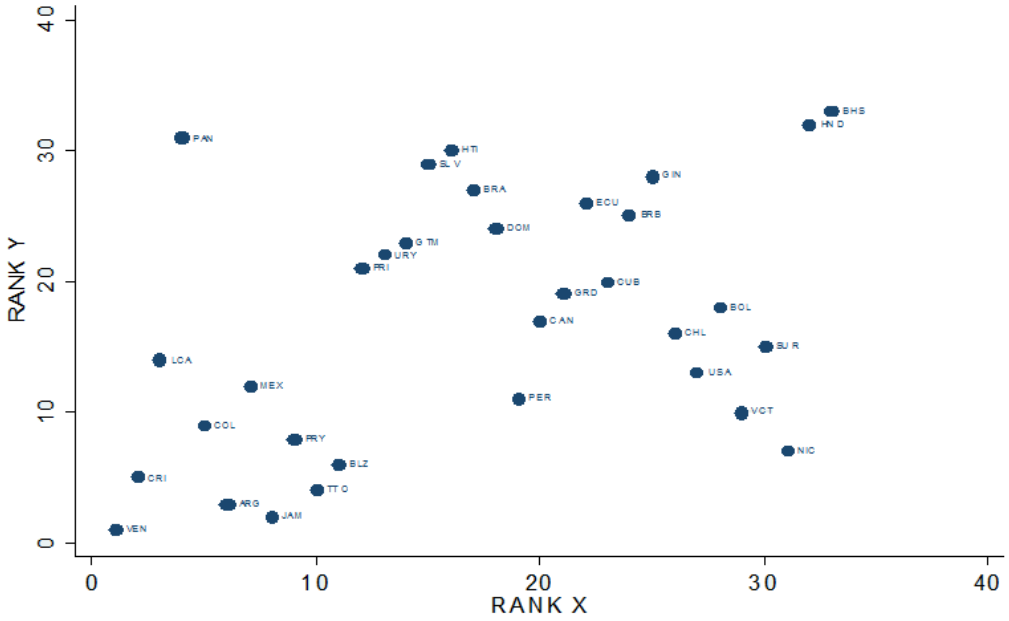


Source: Elaborated with data from the World Bank (2012).

Figure 2.
Scatterplot between rank of MMR vs rank of relative difference 1990-2010 in MMR for Africa (52 countries)

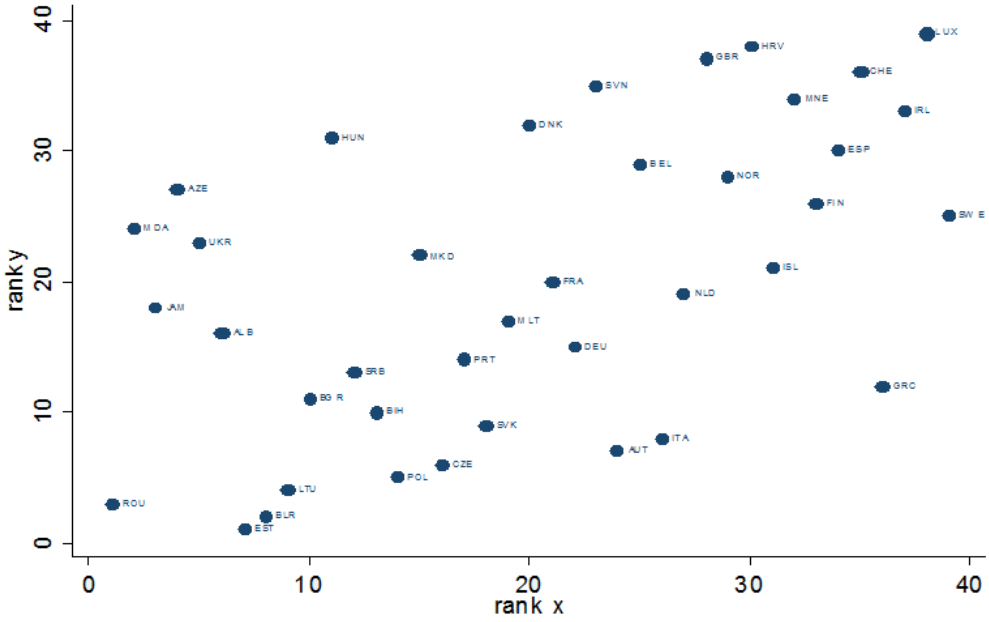
Source: Elaborated with data from the World Bank (2012).

Figure 3.
Scatterplot between rank of MMR vs rank of relative difference 1990-2010 in MMR for the Americas (33 countries)



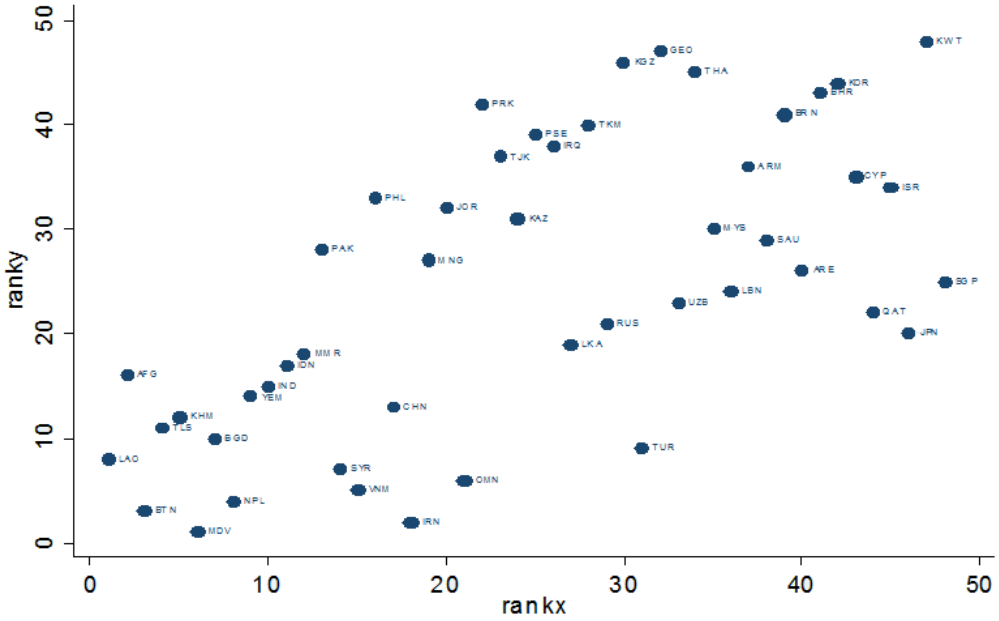
Source: Elaborated with data from the World Bank (2012).

Figure 4.
Scatterplot between rank of MMR vs rank of relative difference 1990-2010 in MMR for Europe (39 countries)



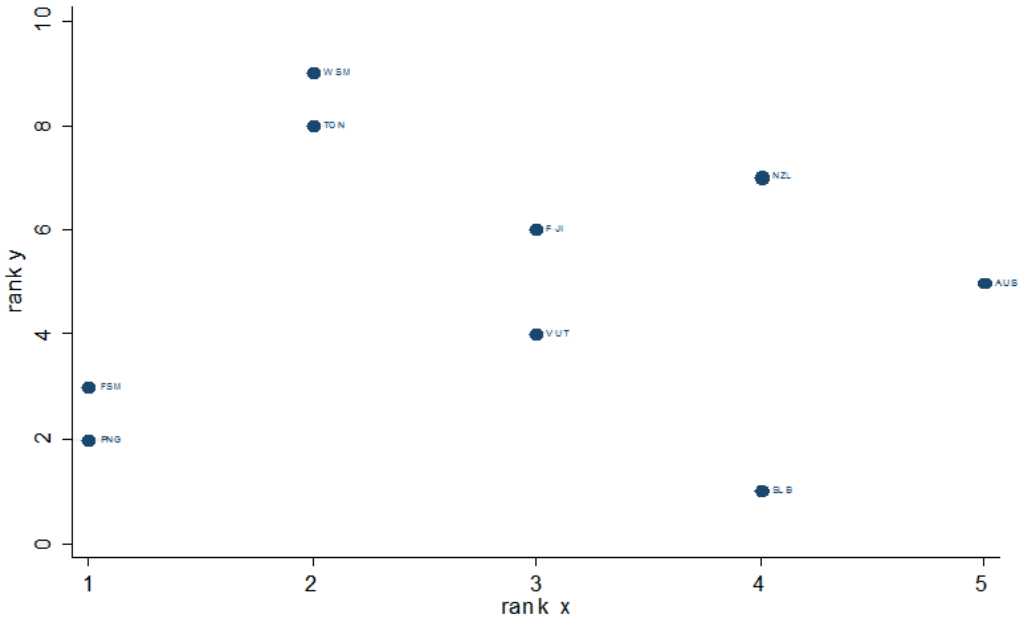
Source: Elaborated with data from the World Bank (2012).

Figure 5.
Scatterplot between rank of MMR vs rank of relative difference 1990-2010 in MMR for Asia (48 countries)



Source: Elaborated with data from the World Bank (2012).

Figure 6.
Scatterplot between rank of MMR vs rank of relative difference 1990-2010 in MMR for Oceania (9 countries)



Source: Elaborated with data from the World Bank (2012).