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Trends in maternal mortality in the United States

Yasmin H. Neggers

Department of Human Nutrition, The University of Alabama, Box 870311, Tuscaloosa, AL 35487-0311, United States

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ABSTRACT

Maternal mortality is a major global concern. Although a notable decline in maternal mortality in the United States occurred during the mid-20th century, this progress stalled during the late 20th century. Furthermore, maternal mortality rates have increased during the early 21st century. Around the year 2000 the maternal mortality rate began to rise and has since nearly doubled. Given that at least half of maternal deaths in the U.S. are preventable, the rise in maternal deaths in the U.S. is historic and worrisome. This overview will try to provide a context for understanding the problem of this rise in maternal mortality in the U.S. by briefly discussing how maternal mortality rates are reported from National Vital Statistics data and from a National Surveillance system. Trends and causes of maternal deaths and the difficulty with interpreting these trends will be discussed.

1. Introduction

The decrease in maternal mortality in the last century in high income countries is a significant achievement of modern medicine. In the early 20th century, in high income countries, between 300 and 1000 women per 100,000 of those who gave birth died of the pregnancy. In contrast, at present in most high income countries approximately 1–20 per 100,000 women die due to pregnancy related complications [1,2]. This steep decline in maternal mortality occurred in conjunction with general improvement in the standard of living, and took place during an era in which there were many advances in medical care, such as blood transfusion, antisepsis, improved operative and anesthesia techniques and antibiotic use [3].

More than 99% of the women who die from pregnancy related complications are in low and middle income countries [4]. Therefore, it is assumed that maternal mortality is not a problem in wealthier countries. However, statistics released by the United Nations in 2010 placed the U.S. 50th in the world for maternal mortality, with a maternal mortality ratio (MMR) higher than European countries (Fig. 1), as well as some Asian and Middle Eastern countries [5,6]. Recent findings published in Lancet by the Institute for Health Metrics and Evaluations rank the U.S. 60th in the world, with an MMR below virtually every other developed nation [7]. Table 1 shows a comparison of MMR and annualized rate of change in MMR with 95% estimates of uncertainty intervals: worldwide, developed and developing countries and the United States from 1990 to 2013 as reported by Kessebaum et al. [7]. The annualized rate of change in MMR 1990–2013 was +]1.7% for the U.S., while this overall annualized rate of change was negative worldwide (−1.3%) and for developed (−3.1%) and developing countries (−1.4%) (Fig. 2). Thus, although achievements in maternal care were rapid and dramatic in the U.S., progress in preventing maternal deaths stalled during the late 20th century, and statistics in recent years, particularly in the early years of the 21st century revealed a worrisome trend: the maternal mortality in the U.S. has more than doubled in the in the past few decades. This uptick occurred even as maternal mortality dropped in the less-developed countries around the world. Now women giving birth in China or Saudi Arabia are at a lower risk of dying than in the United States. Two recent global reports have indicated that the U.S. is among the few countries in the world where maternal mortality appears to have increased in the last 25 years [6,8,9]. The reason for this disturbing trend is not clear. It is uncertain whether the degree to which this increase in maternal mortality in the U.S. can be attributed to enhanced identification of maternal deaths or actual increase in risks [8–10]. Also, there are persistent disparities in maternal mortality; particularly the 3–4 fold increased risk of death due to pregnancy complications among African–American women compared to Caucasian women [11,12]. Moreover, the influence of advanced maternal age on pregnancy related mortality trends in the U.S. may be an important contributor [10,13].

The objective of this article is to provide an overview of recent trends in maternal mortality and attempts to provide some context for understanding the problem of maternal mortality in the United States by briefly discussing various methods and definitions

E-mail addresses: yneggers@ches.ua.edu, yneggers07@gmail.com

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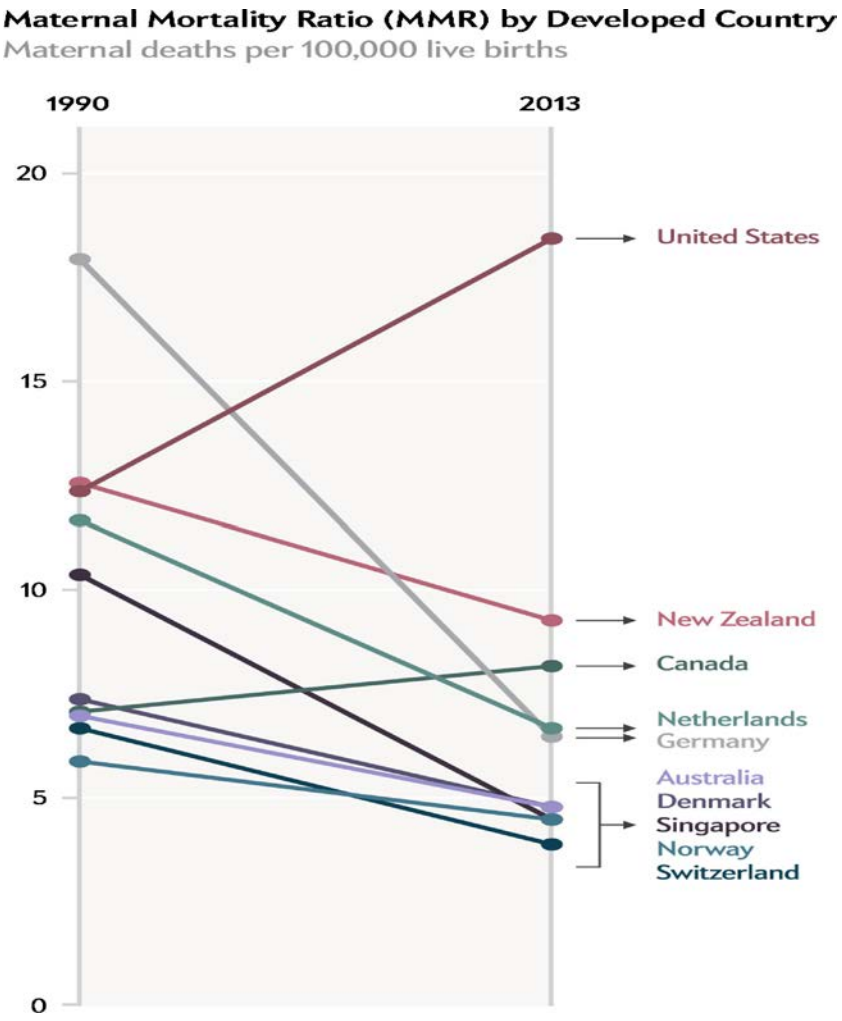

Fig. 1. A comparison of maternal mortality ratio in the United States with those of some developed countries between 1990 and 2003.
*Adapted from Scientific American. June 8th 2015 http://www.scientificamerican.com/article/has-maternal-mortality-really- doubled-in-the-U-S/.

Table 1
*Maternal mortality ratio and annualized rate of change with 95% uncertainty intervals: worldwide, developed and developing countries and the United States: 1990–2013.

	Maternal mortality ratio (per 100 000 live births)			Annualized rate of change in maternal mortality ratio (%)		
	1990	2003	2013	1990–2003	2003–13	1993–2013
Worldwide	283.2 (258.6 to 306.9)	273.4 (251.1 to 296.6)	209.1 (186.3 to 233.9)	−0.3% (−1.1 to 0.6)	−2.7% (−3.9 to −1.5)	−1.3% (.9 to −0.8)
Developed Countries	24.5 (23.0 to 26.1)	16.0 (14.9 to 17.0)	12.1 (10.4 to 13.7)	−3.3% (−3.8 to −2.8)	−2.9% (−4.2 to −1.5)	−3.1% (−3.7 to −2.5)
Developing Countries	317.6 (289.9 to 344.5)	305.4 (280.3 to 331.5)	232.8 (207.3 to 260.6)	−0.3% (−1.2 to 0.6)	−2.7% (−4.0 to −1.5)	−1.4% (.9 to −0.8)
USA	12.4 (11.1 to 13.9)	17.6 (15.7 to 19.5)	18.5 (14.8 to 22.9)	2.7% (1.4 to 3.8)	0.5% (−1.8 to 2.8)	1.7% (.8 to 2.7)

* Adapted from Kassebaum et al. [7].

to identify maternal deaths, and factors associated with maternal mortality.

2. Definitions related to maternal deaths according to the National Center for Health Statistics (NCHS), Pregnancy Mortality Surveillance System (PMSS) and the international classification of disease (ICD-9 and ICD-10)

A review of literature dealing with issues of maternal mortality indicates differences in estimates of maternal morality trends depending on the data source and definition used to identify maternal mortality. Therefore, before discussing the trends in maternal mortality in the U.S., it is important to clarify the terms used to estimate and identify maternal mortality by various agencies, both international (ICD-9 and ICD-10 which are used by WHO, UNICEF, UNFPA, the World Bank and the United Nation population Division) and in the United States (NCHS and PMSS).

2.1. Maternal death

The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes (ICD-10).

2.2. Maternal mortality ratio (MMR)

The number of maternal deaths per 100,000 live births (NCHS and ICD-10)