Global Incidence of Preterm Birth

James M. Tielsch
Department of Global Health, Milken Institute School of Public Health at The George Washington University, Washington, DC, USA

Abstract
Estimating the incidence of preterm birth depends on accurate assessment of gestational age and pregnancy outcomes. In many countries, such data are not routinely collected, making global estimates difficult. A recent systematic approach to this problem has estimated a worldwide incidence of 11.1 per 100 live births in 2010. Significant variation in rates by country and region of the world was noted, but this variation is smaller than observed for a number of other important reproductive outcomes. Rates range from approximately 5% in some northern European countries to over 15% in some countries in sub-Saharan Africa and Asia. Time trends suggest that preterm birth incidence is increasing, but much of this change may reflect changes in medically induced early delivery practices as improvements in survival of preterm infants has improved. Whether there have been major changes in spontaneous preterm birth is unknown. New approaches to classifying etiologic heterogeneity have been proposed and offer the promise of developing specific interventions to address the range of underlying causes of this important health problem.

Introduction
Despite the significant progress over the past 20 years in maternal and child survival, adverse outcomes of pregnancy have been relatively resistant to change. Among these outcomes, the most resistant has been preterm birth. Preterm birth accounts for over one third of neonatal deaths, and in many countries is the leading cause [1]. Serious morbidity and disability are important consequences of being ‘born too soon’ with important impacts on the lung and brain [2]. These functional sequelae often result in lifelong impairments [2, 3]. While
progress has been made in reducing preterm rates in high-income countries, at least one half of this decline can be attributed to reductions in medially induced deliveries and not to changes in the underlying processes that result in preterm birth [4].

**Measurement of Gestational Age and Definitions of Preterm**

Key to definition and measurement of preterm is an accurate assessment of gestational age at the time of delivery. The most commonly used measurement tool is the first day of a woman’s last menstrual period (LMP). A normal, or term pregnancy, is one that lasts for 280 days following the LMP. Note that this assumes that fertilization occurs concurrently with ovulation, 2 weeks following LMP. Defining gestational age based on LMP depends on a variety of factors that result in compromises to accuracy. These factors include variations in length and regularity of normal menstrual cycles, fertilization and implantation occurring a variable number of days following ovulation, amenorrhea caused by breastfeeding, illness, or physical stress, and a women’s recall. As might be expected, when a woman is asked about her LMP has an effect on accuracy; the earlier in pregnancy, the more accurate this measurement will be. Waiting until delivery will result in less accurate measures. On average, data suggest LMP is accurate to within about 2 weeks [5].

As a result of these concerns with using LMP, a number of other approaches are used as well. Measurement of fundal height can provide information that is objective but slightly lower in accuracy compared to LMP. As with all anthropometric measurements of gestational age, the accuracy of fundal height measurement depends on when it is measured in pregnancy. The later in pregnancy the measurement is taken, the more likely factors such as uterine anatomy and intrauterine growth restriction will limit accuracy. Best estimates of accuracy for this measure are within approximately 3 weeks [5].

Clinical assessment of the newborn at the time of delivery is often used in settings where there are skilled attendants at delivery. There are a variety of these clinical scales including the Dubowitz, Capurro, Ballard and Parkin scales. They all include an external assessment of selected characteristics and some add neurological assessment as well. Accuracy is within approximately 2 weeks [5].

The current gold standard for measurement of gestational age is based on early ultrasound with specific fetal anthropometric measurements. These include fetal crown-rump length, biparietal diameter, and femur length. The most accurate period for ultrasound-based gestational age estimation is prior to 20
weeks in order to avoid the confounding associated with variations in intrauterine growth of the fetus. Ultrasound requires a trained operator and reader and is accurate to within approximately 5 days if done in the first trimester [5].

‘Best obstetrical estimate’ is commonly used in high-resource settings and requires both LMP and early ultrasound. Algorithms are used to estimate gestational age based on the best available information, but there are a variety of algorithms in use, and this approach is unstandardized. Accuracy varies depending on the type of information and the algorithm, but is somewhere between the accuracy of LMP and early ultrasound assessments [5].

As might be expected, there is wide variation in the available information, and therefore accuracy, regarding gestational age at birth across countries. The vast majority of low-income countries do not have routine ultrasound information available nor are vital record systems in place or complete enough to record such information for the majority of births. As a result, the current best attempt to estimate preterm rates by country was forced to use region-specific mathematical models for 171 of the 184 countries in their analysis [6]. Therefore, all worldwide estimates and many national and regional estimates of preterm birth rates and numbers should be used with caution.

The traditional definition of preterm birth is a live-born infant born at less than 37 completed weeks of gestation [7]. The lower end of preterm is variously defined based on livability of the newborn, with most countries using 22 weeks. Some high-income countries set this bound as low as 16 weeks. As the magnitude and severity of the consequences of preterm birth increase significantly at lower gestational ages, the preterm range has been categorized into 4 groups; late preterm (34 to <37 weeks), moderate preterm (32 to <34 weeks), very preterm (28 to <32 weeks), and extremely preterm (<28 weeks).

Recently, a classification system has been proposed that reflects the etiologic heterogeneity of preterm birth in which five components are considered [8]:

- Maternal conditions present prior to delivery
- Fetal conditions present prior to delivery
- Pathologies of the placenta
- Signs of parturition initiation
- The pathway to delivery.

Part of this new classification paradigm redefines the upper bound of preterm birth at <39 weeks [9] justifying this expansion based on increased risks for these infants relative to those born 39–41 weeks [10, 11] (fig. 1). It also calls for setting the lower bound at 16 weeks and including all births, both live- and still-born. This would increase current estimates by about 28% with the size of the increase varying by setting.
Incidence

Variations in measurement of gestational age and completeness and quality of data sources make estimates of the global incidence of preterm birth difficult. The most comprehensive approach to this challenge has been done recently by Blencowe et al. [6] who estimated national, regional, and global preterm birth rates for 2010. Given the lack of national data in many countries, they used information from a variety of sources including vital records systems, registries, national surveys, a systematic literature review of special studies, and unpublished data from the Child Health Epidemiology Reference Group. High-quality, reliable data were available from a small minority of countries, forcing the investigators to model most of the country estimates based on limited country-specific data of preterm rates, associated risk factors for preterm, and more reliable information from other countries in their region. Similar modeling approaches were used to calculate subcategories of preterm birth.

Globally, Blencowe et al. [6] estimated a preterm birth rate of 11.1% for 2010 resulting in almost 15 million preterm births worldwide. Estimates varied by region with a low of 7.4% in central and eastern Asia to a high of 13.3% in southern Asia. Countries defined as 'developed' in this analysis did not have the lowest rates (8.6%) and were equivalent to the rate in the Latin America and Caribbean region. Variations by country were larger with the highest rate estimated in Malawi at 18% and the lowest rates found in northern European countries at around 5% (fig. 2).

While there was significant variation by region and country, the variability of preterm rates is significantly smaller than seen for other important reproductive

Fig. 1. Adjusted odds of death by gestational age, US 1995–2001. Adapted from Zhang and Kramer [10].
outcomes such as small for gestational age [12] and the pattern of rates does not fit neatly into preconceived expectations based on socioeconomic status. For example, rates in some developed countries were higher than in some of the poorer countries in a variety of regions. This likely reflects a mix of data quality issues and/or different etiologies of preterm birth with variations in practice patterns related to medical induction of delivery – a prominent source of this variation.

Blencowe et al. [6] also estimated changes in preterm rates between 1990 and 2010 for a selected set of countries (their developed country group and the Latin America and Caribbean regions). This analysis demonstrated an increase from 7.5 to 8.6% over this period. The percentage increase ranged between 9.1 and 25.8% by region (table 1). Of the 65 countries included in this time trend analysis, only 17 had stable or declining rates, all others had increases of greater than 0.5% per annum. However, the cause of these time-related patterns is unclear. In the US, preterm rates increased to 12.8% in 2006, but have since declined significantly as criteria for medically induced early delivery have changed [13, 14] (fig. 3).

**Table 1. Preterm birth rates in selected regions, 1990–2010**

<table>
<thead>
<tr>
<th>Region</th>
<th>Preterm birth rate (per 100)</th>
<th>Relative change from 1990 to 2010, %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1990</td>
<td>2010</td>
</tr>
<tr>
<td>Developed countries</td>
<td>7.2</td>
<td>8.6</td>
</tr>
<tr>
<td>Latin America</td>
<td>7.7</td>
<td>8.4</td>
</tr>
<tr>
<td>Caribbean</td>
<td>8.9</td>
<td>11.2</td>
</tr>
</tbody>
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Data from Blencowe et al. [6].

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Fig. 2. Estimated rates of preterm birth by country, 2010. Reprinted from Blencowe et al. [6] with permission from Elsevier.
The lack of comprehensive vital records systems in many countries and difficulties in measuring gestational age make estimating rates of preterm birth a challenging undertaking. Despite these challenges, it is clear that preterm birth remains a highly frequent condition around the world, one with significant vital and developmental consequences, and one that has been relatively resistant to interventions. In fact, in many countries rates of preterm birth have increased significantly over the past 20 years. While there is significant variation from country to country, this variability is less dramatic than seen for other important reproductive outcomes, suggesting that the interventions used for these other reproductive outcomes are not likely to impact a significant proportion of preterm births.

Preterm birth is not a single condition and is one of the only major health conditions that are classified by when it occurs instead of how it occurs. Improvements in this critical outcome will depend on designing strategies that directly address this heterogeneity. In addition, approaches to classification and definition of the group of pregnancies that should be considered as preterm are being developed, which may offer new strategies to address this global issue.

**Disclosure Statement**

The author declares that no financial or other conflict of interest exists in relation to the contents of the chapter.
References
