The Human Multiple Births Database (HMBD)

An international database on twin and other multiple births

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Abstract

The twinning rate has increased dramatically over the last four decades in many countries. This increase constitutes a public health challenge because multiple babies are more fragile than singleton ones and are exposed to higher infant mortality risks. Thus, following the trends and the spatial variations of twin and other multiple deliveries is valuable and relevant to public health. The Human Multiple Births Database (HMBD) facilitates access to statistics on the annual number of deliveries by multiplicity (singletons, twins, triplets, quadruplets and more) and the annual twinning and multiple rates by country. As of October 2021, the database comprises 20 countries with reliable vital statistics. The data series go back in time as far as possible, depending on the availability of statistics; they start in the 19th century for some countries, until the most recent year available. In the short term, the database will comprise approximately 30 countries. In the long term, we aim to extend its geographical coverage, as the quality of vital statistics improves in other regions of the world. The HMBD is designed for anyone interested in the topic of twin and other multiple births. All data, metadata and other material are freely available at https://www.twinbirths.org

Keywords: multiple births, twin births, twinning rate, demographic data, database

Introduction

The twinning rate (defined as the annual number of twin deliveries divided by the total number of deliveries registered in a country, per 1,000) has increased dramatically over the last four decades in nearly all countries for which we have vital statistics information [1-4]. For example, it has increased in the United States from 9.5 twin deliveries per 1,000 deliveries in 1975 to 16.7 in 2015 [5]. Over the same period, it has practically doubled in many developed countries, e.g. from 9.9 to 16.1 in England and Wales, from 9.2 to 18.4 in Germany, from 9.3 to 17.5 in France, from 9.6 to 16.7 in Denmark, and from 5.9 to 9.9 in Japan (data based on national vital statistics).

This significant increase constitutes an important public health challenge because multiple babies are more fragile than singleton ones. Compared to singletons, they tend to have lower birth weight, more complications at birth, and are more often born premature, which are all associated with many long-term health implications [6-8]. Stillbirth and infant mortality rates are also much higher among twins and other multiple children [9-12]. Multiple-child pregnancies can have negative impacts on the parents as well. For instance, these pregnancies are associated with higher risk of gestational diabetes,

pre-eclampsia, post-partum depression, and increased divorce risk [13-16]. A better understanding of the variations and trends in twinning (and other multiple) rates is therefore urgently needed.

The Human Multiple Births Database (HMBD) facilitates access to aggregate, demographic data on the births of twins and other multiple children. The database provides annual data-series at the national level on the number of deliveries by multiplicity (singletons, twins, triplets, quadruplets and more); the annual twinning and multiple rates are also provided.

The HMBD is the continuation of a database on multiple births created by Gilles Pison, with the collaboration of Agata D'Addato [4], as well as Christiaan Monden and Jeroen Smits [1-2]. Formerly available upon request, this dataset has been updated, extended back in time, harmonized, and made freely available online as the HMBD, available at: https://www.twinbirths.org

This website gives open access to the full dataset, country-specific input data and metadata files, country-specific R-codes, interactive and user-friendly web applications that facilitate a rapid visualisation of the database (for example, the HMBD Data explorer), a glossary of relevant terms regarding demographic data on multiple births, explanations of key points, and a list of references where further, more disaggregated data on multiple births can be found.

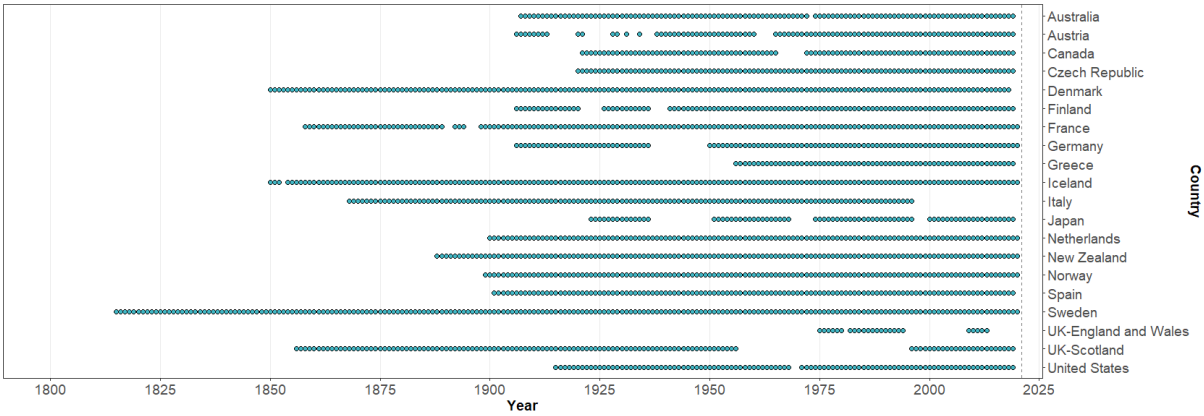
The HMBD is not only for researchers but also for anyone interested in multiple deliveries (e.g. NGOs and associations of parents of multiple children). The HMBD is funded by the French National Research Agency (*Agence nationale de la recherche*, contract ANR - 18-CE36-0007-01). The members of the operations team are affiliated with the French Museum of Natural History and the French Institute for Demographic Studies (INED).

Data collected: coverage and content

The input data for the HMBD come from the vital statistics of each country included. The data cover total national populations (unless otherwise indicated in the metadata). The main criteria for including a country in the HMBD are that its civil registration is complete (or nearly complete) and that vital statistics are regularly published, with births specified by multiplicity. As of October 2021, the online database comprises 20 national populations (Figure 1). For each country, the period covered extends from the earliest until the most recent year, using available annual vital statistics on births. In the short term, the database will comprise approximately 30 countries. In the long term, we aim to extend its geographical coverage, given the improvement of vital statistics in other regions of the world.

The HMBD provides aggregate, annual counts and rates of deliveries by multiplicity, i.e. single and multiple deliveries, specifying, whenever possible, the number of children among the latter (twin deliveries, triplet deliveries, etc.). Twin deliveries are by far the most frequent among multiple deliveries; deliveries of triplets or more children represent only a small fraction of the latter (for example, in France in 2010–2015, 97.9% of all multiple deliveries were those involving twins; the proportion of multiple deliveries of triplets and quadruplets and more was respectively 2.0% and 0.1%). Consequently, the HMBD focuses on twin deliveries, although it does provide information on other multiple deliveries whenever available.

Figure 1. Coverage of the HMBD according to the availability of twinning rates, by country



Source: the Human Multiple Births Database - HMDB (2021). Institut national d'études démographiques - INED (distributor).
Data extracted from: https://www.twinbirths.org/en/data-metadata/ (accessed: 19/10/2021).
The dashed vertical line next to the country names inside the plotting area is on the year 2021.
The twinning rate is the number of twin deliveries registered in a given country and year, divided by the total number of deliveries, per 1,000.
For UK-England and Wales and Italy, the multiple rate is also available from 1938 onwards and from 2002 onwards, respectively.
The multiple rate is the number of all multiple deliveries divided by the total number of deliveries, per 1,000.

For each country, the database offers the most complete possible annual series of the variables shown in Table 1. Data on multiple deliveries by certain characteristics (such as the sex-composition of the newborns, the age of the mother, etc.) may also be available for some countries over specific periods. As these details are rare, they are not included in the annual series provided in the HMBD. Nevertheless, a list of sources where such information can be found is provided on the HMDB website.

Table 1. Variables included in the Human Multiple Births Database (HMBD)

Variable name	Description
Country	Country name
Source	Source name (abbreviation or code)
Year	Year of reference of the data
Stillbirths	Indicates whether stillborn children are counted or not
Singletons	Number of single deliveries
Twin_deliveries	Number of twin deliveries
Triplet_deliveries*	Number of triplet deliveries
Quadruplet_plus_deliveries*	Number of deliveries involving four or more children
Multiple_deliveries	Total number of multiple deliveries
Multiple_children	Number of children born from multiple deliveries (twins, triplets, etc.)
Total_deliveries	Total deliveries (numbers of single and multiple deliveries combined)
Twinning_rate	Number of twin deliveries / total deliveries, per 1000.
Multiple_rate	Number of multiple deliveries / total deliveries, per 1000.

* In a few cases, **Triplet_deliveries** also include the number of quadruplets+. See https://www.twinbirths.org/en/data-metadata/

To provide the same information for all countries in the database, the input data available for each country and period are verified, corrected, and used to calculate (if necessary) the missing variables. R-codes were developed to process the data. Given the heterogeneity of the input data across countries and over time, there is a specific R-code for each country. All the country-specific input data files and R-codes can be downloaded at https://www.twinbirths.org/en/data-metadata/

However, some factors may slightly compromise data comparability, especially the treatment of stillbirths in the statistics. For example, for a given country, stillbirths may be included in data for recent years, but not in the historical data. In cases of twin births involving only one live birth, the delivery may be counted as a single delivery or as a twin delivery, depending on the definitions and the reporting practices in each country. If both children are stillborn, the delivery may or may not be counted. Moreover, the definition of what counts as a stillbirth may vary over time within the same country, or between countries. All these issues are fully documented in the country-specific metadata documents, which contain relevant notes and definitions regarding the treatment of the stillbirths in the statistics, a crucial issue because stillbirths are more common in pregnancies involving multiple children. Additionally, in the database, the variable *Stillbirths* indicates whether these are included in the data for a given country and year. Other factors that may affect data coverage (e.g. territorial changes and other country-specific historical processes) are also explained in the metadata.

Main research results and current projects using the HMBD

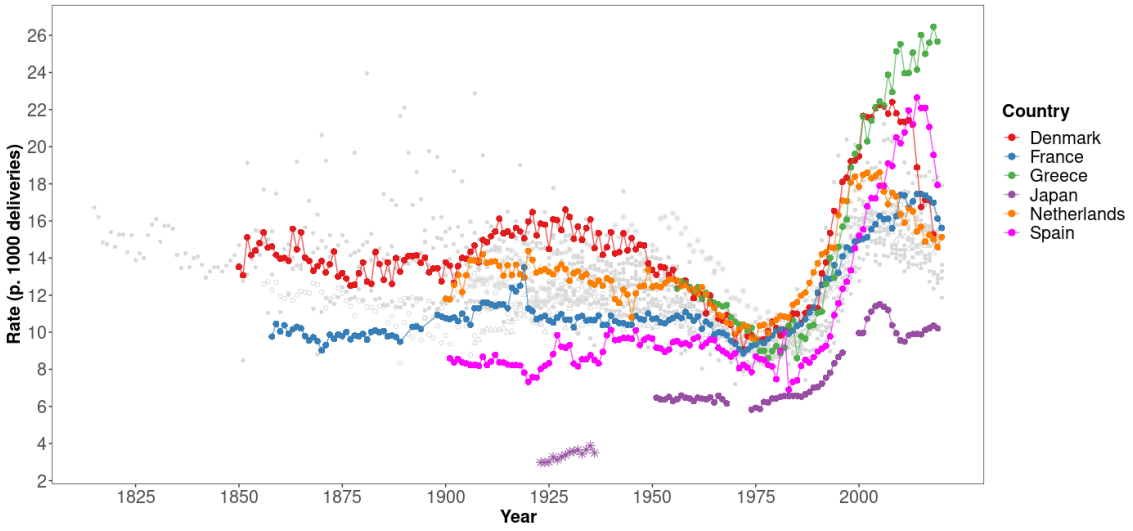
Using the HMBD complemented with data from other sources, Monden et al. [1] found that since the 1980s, the global twinning rate has increased by a third, from 9.1 to 12.0 twin deliveries per 1,000 deliveries. In 2010–2015, the number of twin deliveries was higher than ever, both at the world level and for all global regions (except South America). While the global deliveries have increased by only 8%, the number of twin deliveries has increased by 42%.

Using a precursor of the HMBD, Pison et al. (2015) [2] showed an unprecedented and rapid increase in the twinning rate from the mid-1970s in various developed countries. Figure 2 shows this pattern, using the updated data from the HMBD. Two factors are mainly responsible for this increase: the delay in childbearing and the rise in medically assisted reproduction (MAR). MAR, which has increased substantially since the 1970s [17], explains between 22% and 87% of the total change over the period 1970–2005, depending on the country [2].

The increase in twinning rates due to MAR has raised concerns among governments and medical authorities, which has led to a change in MAR regulations and practices in most developed countries. For instance, the mean number of embryos transferred has been reduced [17]. These changes are probably responsible for the finding that in 2015, in about a quarter of the countries studied, the twinning rates reached a plateau in the early 2000s and decreased afterwards [3]. This recent development can be observed using the updated data of the HMBD (Figure 2).

Ongoing specific data analysis projects using the HMBD include documenting recent levels and trends in twinning rates in different countries and attempting to disentangle the effects of various factors in the twinning rate by examining two specific questions: (a) *Age/parity/fertility control.* Does parity really influence twinning, or is it just an artefact? If so, what mechanism is responsible for the increase in twinning with higher birth orders? and (b) *Delayed childbearing / medically assisted reproduction.* What share of the recent increase in twinning rates in developed countries is due to each factor? Is this twin boom ending?

Figure 2. Twinning rates in selected countries



Source: Human Multiple Births Database (2021). French Institute for Demographic Studies - INED (distributor).
Notes: The grey dots illustrate all the values of the selected variable available in the HMBD (i.e. for all countries included in the database).
The different dot shapes indicate whether the stillbirths are included in the data for a given country.
The coloured lines join the data points for the selected countries if the time lag between years with available data does not exceed 5 years or if the data source between consecutive years (time lag < 5 years) is the same.

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