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Short Report

SECULAR TRENDS IN TWINNING RATES

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Summary. Based on national data from civil birth registration systems, this paper provides an overview of trends in the twinning birth rates in fifteen developed countries. Patterns and differentials in such rates across populations are described, and trends over time are given. The evolution of the twinning rate in industrialized countries over the last century follows broadly the same pattern. One exception is the period around World War I, with a peak in the twinning rate being observed during the war, or just after it, although this was not registered in all countries. Since the mid-1970s twinning rates have increased in many developed countries in response to a growing use of fertility-stimulating treatments such as *in vitro* fertilization.

The present report provides an overview of secular changes in twinning rates in fifteen developed countries. Data were drawn from the civil birth registration systems of the National Statistical Offices according to their availability. The twinning rate is the proportion of twin deliveries in the total number of deliveries, expressed per 1000 deliveries. It was computed for each given year using the total number of confinements as the denominator and the annual number of twin confinements as the numerator. The source data include liveborn children only, which means that a stillbirth is not recorded and that a twin birth is counted as a singleton birth if only one child was liveborn.

Similar downward and upward trends of twinning rates were observed in most developed countries in the last century, even though total levels varied between countries. In the first half of the twentieth century the incidence of twin deliveries did not vary significantly, with a visible plateau generally being kept until 1960. In the 1960s, the proportion of twin deliveries declined down to a minimum in the 1970s or 1980s. The rate then began to climb up again and, by the second half of the 1980s, it had risen back to the level of the first half of the century, resulting in a U-shaped curve in most developed countries.

In Europe there is a progressive decrease in the incidence of twinning rates from North to South. By European standards the twinning rate is low among the Latins, medium among the Slavs and relatively high among the Germanic people, particularly

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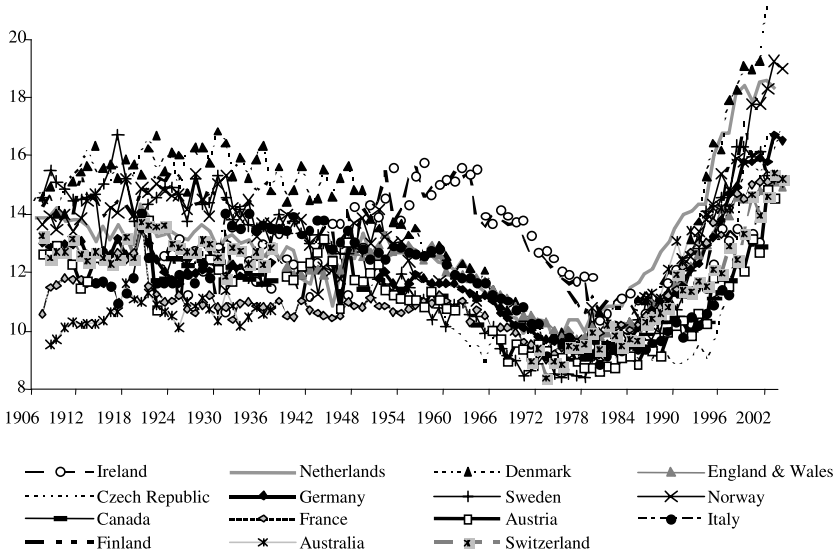


Fig.1. Twinning rates per 1000 births, 1906–2003.

among the Nordic people, including the Finns. Eriksson & Fellman (1967, 1973), who have extensively analysed early twinning trends in the Nordic countries, found particularly high rates in isolated population groups where a high level of intermarriage was recorded.

The Republic of Ireland provides an interesting scenario characterized by very significant levels of twinning rates that are tightly related to the fact that, since the nineteeth century, this country has been unique in Europe in terms of population structure and dynamics. Sustained emigration, high celibacy (and law nuptiality) and high marital fertility formed a specific demographic system that has remained, although altering slowly until the middle of the twentieth century. Especially with regard to fertility patterns, the case of Ireland appears particularly interesting and relevant. Marital fertility was very high at the beginning of the 1900s (five children per couple), resulting in the considerable Irish family size, but does not rule out the use of birth control. This began among the higher social groups and seems to have percolated slowly to lower social levels. Even though Ireland shared in the general fertility decline of the period between 1960 and 1970, marital fertility still remains at a higher level than elsewhere in Europe. However, although fertility is slightly higher than in other parts of Europe, the differences have become smaller.

The World War I period represents an interesting scenario in the evolution of the twinning birth rates in developed countries. In particular, twinning peaks of different intensities can be observed immediately after the Armistice, in 1919, in Italy, France and Germany. Several hypotheses have been suggested to explain this phenomenon: (1) after deprivation women may have a higher polyovulation rate and better general conditions to carry through a multiple pregnancy; (2) women with a short waiting time to conception may be more prone to produce dizygotic twins; consequently, early conceptions after separation may be more likely to be twins.

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Around the war, similar trends have been reported in most developed countries, but not in all of them. For instance, in France, Italy and Germany there was a visible peak in twinning rates in 1919, while countries that were not engaged in the war, such as Denmark, Sweden, Norway and the Netherlands, did not experience this phenomenon. They seem to attest more important – although different intensity – increases in twin births for the period 1920–23 (Pison & D'Addato, 2006).

In many developed countries it seems that a decline in twinning rates – in most cases a substantial decline – started at about the same time in the late 1950s. The temporal trend, which began to decrease in the early 1950s, displayed a reversal of tendency in the late 1970s, although an inter-population variability was still reported. Several complementary factors may have played a role in the general phenomenon of declining twinning rates observed from around 1950 until the late 1970s:

- the decrease in mean maternal age at delivery and the reduction in the number of children have been considered to be at least partly responsible for the downward trend (Eriksson & Fellman, 1973; Blondel & Kaminski, 2002);
- under the double assumption that mothers of twins are more fecund than other women, and that such women constitute a sub-population that is inherently twin-prone, the observed decline in twinning rates may be related to the voluntary limitation of deliveries of these highly fecund, twin-prone women;
- a history of oral contraceptive use has been suggested to contribute to the decline in twinning by acting directly to reduce the probability of double ovulation (Braken, 1979);
- socio-environmental factors, including increasing urbanization, may be acting to produce the observed changes: this has prompted the suggestion that an urban, sedentary life-style may increase the probability of spontaneous abortion in women expecting twins (Parisi & Caperna, 1981). On the other hand, it is hypothesized that mothers in rural regions may have a stronger genetic disposition for twinning and better physical conditions to complete a gestation with multiple embryos (Eriksson *et al.*, 1995);
- the decline in twinning rates may also be influenced by a decrease in the probability of conception: speculations on the cause of decreased sperm concentration include exposure to pesticides and stilboestrol, and a growth hormone widely used in livestock (James, 1972).

Since the mid-1970s, rising twinning rates have been reported in most developed countries and, especially during the last two decades, a sudden increase in multiple births has been observed. The rising multiple birth rates have been attributed to the higher proportion of mothers treated with ovulation-inducing hormones and partially attributed to *in vitro* fertilization (IVF) practice, such as in Japan (Imaizumi, 2003), England and Wales (Murphy *et al.*, 1998), Italy (Terzera, 2002), the Netherlands (Tas, 1994), and Denmark and Sweden (Eriksson *et al.*, 1995).

In the last thirty years of the twentieth century, among European Western countries including Australia, with a few exceptions, the highest twinning rates were observed in Ireland, and in Finland until 1984. Afterwards, the Netherlands and Denmark reported the highest values. In the Netherlands the twinning rate remained nearly constant between 1970 and 1980 (9·9–10·8), but then dramatically increased

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rising 64% in 25 years, from 9·9 per 1000 in 1970 to 16·3 per 1000 in 1995: the delay in achieving pregnancy and the use of fertility-promoting therapies have profoundly affected the prevalence of multiple pregnancies in this country. As for Denmark, where a high twinning rate can also be observed after 1984, the first child from *in vitro* fertilization was born at the beginning of the 1980s. It was only after the mid-1980s, however, that this treatment became common practice and there has been a definite increase in its use in recent years. To reduce the increase in multiple pregnancies caused by fertility-enhancing treatment, in 1991 the Danish National Board of Health recommended that only two, and never more than three, embryos should be transferred per treatment cycle. Nevertheless, it seems that the multiple birth rates did not decrease.

On the other hand, the lowest Western European twinning rate was registered in Sweden between 1970 and 1977, and in Austria between 1978 and 1988. In Austria the IVF method is allowed not only in married couples, but also in non-married couples. However, twinning rates in Austria were rather lower than in other Western countries.

After the introduction of assisted reproductive techniques such as IVF natural twinning rates have been changing depending on how popular these techniques have been in each country. Namely, the variations of these rates among countries are not only due to biological factors, but also due to assisted reproductive techniques. In the Czech Republic, for example, the twinning rate remained constant from 1972 until 1994 (8·7–9·6) and rapidly increased to 16·9 in 2003. This suggests that the Czech Republic had not been affected by fertility drugs and assisted reproductive techniques until recently.

In the last few years, the beginning of a weak decline in the proportion of twin deliveries can be observed in some countries, such as the Netherlands, Germany, Norway, Finland, Switzerland, England and Wales. This seems to be a very challenging issue and, in the close future, it will be interesting to see if this decline continues and if it involves more and more developed countries.

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