

TWINNING FREQUENCIES IN BADEN-WURTTENBERG ACCORDING TO MATERNAL AGE AND PARITY FROM 1955 TO 1972

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The decline of the twinning rate in Germany since 1900 is exclusively due to a fall of the DZ rate. The analysis of the birth data in Baden-Württemberg from 1955 to 1972 shows that the decline of the DZ twinning rate can be explained only to a small extent by the shift of the maternal age-parity distribution towards younger mothers and lower parities. It appears reasonable that the greater part of this decline is caused by the lessening prevalence of the more fecundable, DZ twin-prone women due to the growing influence of family planning. Furthermore, it is imaginable that the probability for multiple ovulation is decreased after cessation of hormonal contraception.

Twinning frequencies in Germany during the past 70 years decrease remarkably, and this has become more pronounced since the middle of the fifties. Fig. 1a demonstrates the decline of the total, the DZ and the MZ twinning rates in Germany from 1901 to 1972. From 1950 until 1972 we used the data of the Federal Republic of Germany and Baden-Württemberg respectively. The estimation of zygosity proportions is based on Weinberg's differential rule. The decline of the total twinning rate is exclusively due to a fall of the DZ rate. Since the DZ twinning rate depends on maternal age and parity, it is possible that the decrease results from changes in the maternal age and parity distribution. By means of the official German statistics, it is not possible to correct the twinning frequencies for this effect, because these statistics do not break down twin births by age of the mother and parity.

We had the opportunity to get the data on all multiple births in Baden-Württemberg from 1955 to 1972 (see Table). This southwest region of Germany had about 7 million inhabitants in 1955 and about 9 in 1972. Fig. 1b shows that the decline of the twinning rates in Baden-Württemberg from 1955 to 1972 is nearly identical to that in Germany as a whole.

In order to elucidate the causes for this decline we have to answer the following question: can the decline of the DZ twinning rate be explained by a reduction of maternal age?

If maternal age would not sufficiently account for this decrease, then we had to put the second question: can the decline of the DZ twinning rate be explained by a reduction of parity within the maternal age classes?

As to the first question, we compared age-specific DZ twinning frequencies of two 5-year periods, namely 1955-59 and 1968-72. In this way, we could circumvent the problem of the growing immigration of foreigners to Germany, who are mostly of mediterranean origin: we could separate German parents from foreign parents only in 1968-72, but in the earlier period the portion of non-German inhabitants in Baden-Württemberg was negligibly small. Therefore, the following considerations only apply to births of German parents.

Fig. 2 shows MZ twinning rates according to age of the mother in the two periods. There seems to be a slight increase of MZ twinning with maternal age, but obviously there is no difference between the two periods. Fig. 3 represents the age-specific DZ twinning frequencies. Obviously, in the maternal age groups above 24 years, DZ twinning rates are essentially lower in 1968-72 than in 1955-59. Therefore the decline of the DZ twinning rate since the fifties cannot be explained by a maternal age effect alone. This is supported by a calculation of index rates: Fig. 4 shows the crude, i.e., the observed,

Table. *Baden-Württemberg: demographic description*

Year	Inhabitants (millions)	Number of births (livebirths & stillbirths)
1955	7.08	120,327
1959	7.43	143,021
1968	8.57	149,451
1972	9.06	113,809



Fig. 1a and b. Incidence of twin births (livebirths and stillbirths) in per mil of all births: a (left) in Germany (1901-39, Deutsches Reich; 1950-70, Federal Republic of Germany; 1971-72, Baden-Württemberg); and b (right) in Baden-Württemberg.

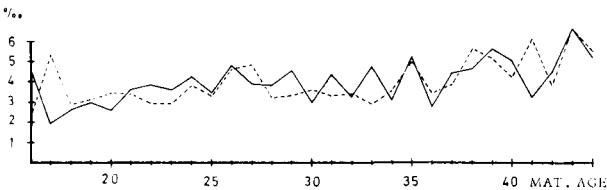


Fig. 2. The MZ twinning frequency per 1000 pregnancies by maternal age in Baden-Württemberg, 1955-59 (—) and 1968-72 (- - -).

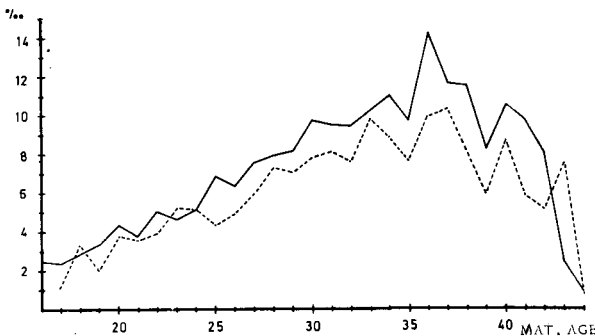


Fig. 3. The DZ twinning frequency per 1000 pregnancies by maternal age in Baden-Württemberg, 1955-59 (—) and 1968-72 (- - -).

DZ twinning rate from 1955 to 1972 compared with an index rate. This index rate has been obtained by applying the age-specific twinning frequencies of the 1955-59 pooled maternal population to each year of the whole period. Although the index rate shows a small decrease, too, the decline of the crude rate is much more pronounced, and produces a growing difference between the two curves. As to the second question, concerning effects of changing parity distribution, we first tested if within the maternal age classes there was an effect of birth order on the DZ twinning rate at all. For this analysis, we could only use the years 1968-1972; for the earlier years, we had no access to the complete birth data and therefore could not get the parity of all mothers. Fig. 5 shows DZ twinning rates in dependence of maternal age and parity. Obviously, there is a pronounced effect of parity on the DZ twinning frequencies, which proved to be highly significant. Therefore, a reduction of births with higher parities within the maternal age groups could theoretically be the cause for the decline of the DZ twinning rate. To answer the question whether there is such a reduction, we calculated age-dependent mean parities from 1968 to 1972. Fig. 6 shows a slight, but consistent decline of mean parities within each maternal age class, which is highly significant except in the highest age class. It was the question, however, if this decrease of mean parity could fully explain the decline of DZ twinning. Therefore, we again calculated index rates. Fig. 7 shows the crude DZ twinning rate compared with an index rate. This index rate has been obtained by applying age- and parity-specific DZ twinning frequencies calculated in the whole period to each of the five years. The index rate shows a certain decline, but this effect is much smaller than in the crude rate. The difference between the slopes of the two curves is highly significant.

The change in the maternal-age distribution alone from 1968 to 1972 can only account for about 4% of the observed decline of the DZ twinning rate. This portion increases only to about 12%, when also the changes of parity distribution are accounted for. Thus, the greater part of the decline of the DZ twinning rate has to be explained by other reasons.

A comparable decline in the DZ twinning rate has been observed in at least nine western countries (James 1972). It has not been possible, however, to analyze the influence of factors such as maternal age and parity. Only recently, J. M. Elwood (1973) published more detailed data on the decline of the twinning rate in Canada. He concluded that most, but not all of the fall of the twinning rate could be explained by maternal age and parity changes. Elwood, however, could not differentiate DZ and MZ twins since 1952, because the Vital Statistics gave no information on the sex types of multiple births.

What can be the causes for the decline of the DZ twinning rate after correcting for age and parity? The idea of a higher fecundability of mothers of DZ twins, which has been brought forward by Allen and Schachter (1971), appears to be reasonable. Without general use of birth control, the twin-prone highly fecundable women are more frequent among mothers than among all women. When family planning is more and more practised, then the prevalence of these women decreases and therefore the DZ twinning rate drops.

The steep decline of the DZ twinning rate in the past ten years however, urges us to consider additional factors which could lower DZ twinning rates. Since the beginning of the use of oral contraceptives in the early sixties, a growing list of reports on secondary amenorrhoea after intake of oral contraceptives has been published (e.g., Kunz and Keller 1974). Such a temporary infertility after stopping of hormonal contraception points to the capability of these drugs to reduce fertility in general.

Thus it is imaginable, that the probability for double-ovulation is decreased after ending of hormonal contraception. Therefore it might be possible that the decline of DZ twinning during the past 10-12 years might not only result from birth control alone, but also from a direct influence on ovulation after cessation of the "pill" intake.

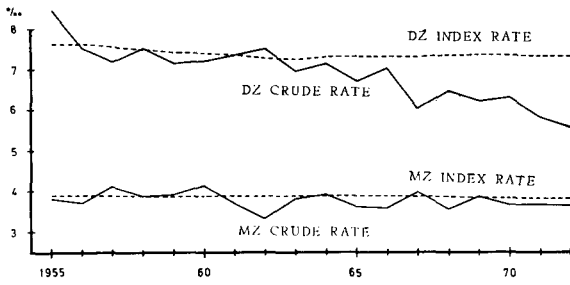


Fig. 4. Crude MZ + DZ twinning rates in Baden-Württemberg, 1955-1972, compared with index rates. (Index rate = twinning rate if age-specific rates of 1955-59 are applied to each year of the whole period.)

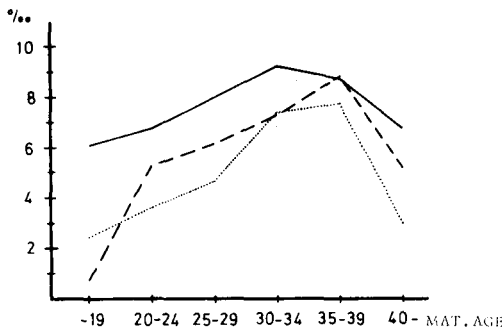


Fig. 5. The DZ twinning frequency per 1000 pregnancies by age and parity in Baden-Württemberg, 1968-72. (. . . . = 1st birth; - - - - = 2nd birth; — = 3rd birth and over.)

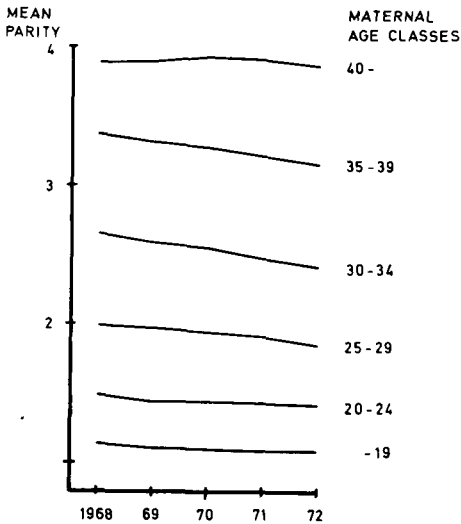


Fig. 6. Decline of mean parity of mothers of all legitimate births (livebirths and stillbirths) in Baden-Württemberg, 1968-72.

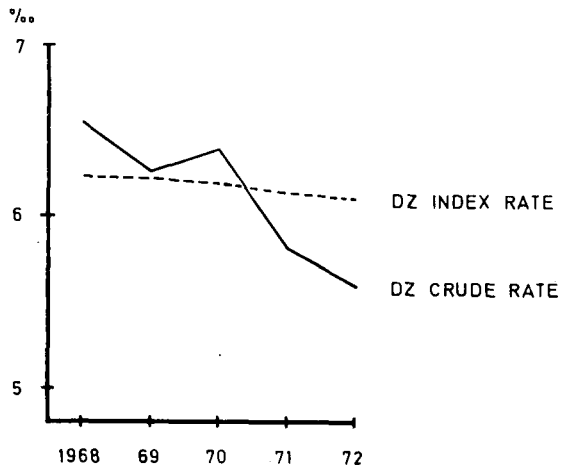


Fig. 7. Crude DZ twinning rate in Baden-Württemberg, 1968-72, compared with index rate. (Index rate = twinning rate if age-specific and parity-specific rates of the whole period are applied to each year (only legitimate births).)

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