ANALYSIS OF MULTIPLE BIRTH RATES IN JAPAN

V. SEASONAL AND SOCIAL CLASS VARIATIONS IN TWIN BIRTHS

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Summary Seasonal variation in twin births was studied in Japan using data on 12,392 pairs of twins in 1974. The highest twinning rates per 1,000 births for MZ (4.56) and DZ (2.20) twins were seen in April, the lowest rate in September (3.69) for MZ twins and in July (1.71) for DZ twins.

Occupation of the heads of the household did not affect twinning rate in Japan. On the other hand, social class variation was indicated in stillbirth rates of twins for both MZ and DZ twins. The highest stillbirth rate of MZ twins was seen in "Others" (0.2157) and the lowest one in "Agriculture with other works" (0.1179). In DZ twins the highest stillbirth rate was similarly seen in "Others" (0.1529), but the lowest one in "Employee-white collar" (0.0842).

INTRODUCTION

Dizygotic twinning rates are known to vary according to racial and geographical factors as well as maternal age and birth order. Besides, Lilienfeld and Pasa-manick (1955) reported that socioeconomic factor influenced the twinning rate. Present study deals with seasonal and social class variations in overall birth rates and stillbirth rates of twins.

MATERIALS AND METHODS

Source of data is the "Survey on Socio-Economic Aspects of Vital Events-Plural Births in 1975" (Health and Welfare Statistics and Information Department, Ministry of Health and Welfare, Japan). This survey consists of two surveys, A and B. In the present study only Survey A was used, which includes data on 12,392 twin

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pairs derived from certificate records on the live birth and fetal death (after the beginning of the fourth month of fetal life) for all of Japan in 1974. Details of the survey have been reported elsewhere (Imaizumi and Inouye, 1979; Imaizumi, Asaka, and Inouye, 1980). Among items included in Survey A, informations on maternal age, occupation of the heads of the household, sex of twins, live birth or fetal death, spontaneous or induced termination of pregnancy in case of fetal death, month of the year of live birth or fetal death were used in the present analysis.

Numbers of MZ and DZ twin deliveries were estimated by Weinberg's method. In computing the MZ and the DZ twinning rates according to month of conception and occupation of the heads of the household, total number of births taken from the annual volume of "Vital Statistics of Japan in 1974" was used as denominator.

In computing the stillbirth rates separately for MZ and DZ twins, the numbers of twin individuals (live birth or stillbirth) were obtained after the numbers of MZ and DZ twin pairs were estimated for each category of survival states of twins: two live-born, one live-born and one still-born, and two still-born. Then the stillbirth rate of twins was taken among MZ, DZ, and total twin deliveries, where the number of pairs with one live-born and one still-born was divided by 2.

RESULTS

Seasonal variation in twinning rates

Table 1 and Fig. 1 show numbers and rates per 1,000 births of MZ and DZ twins according to month of conception, which was allotted to 38 weeks before expected full term delivery. The highest twinning rates for MZ (4.56) and DZ

Fig. 1. Total, MZ, and DZ twinning rates according to the month of conception, 1974.

Table 1. Monozygotic and dizygotic twin deliveries and twinning rates per 1,000 births according to month of conception, 1974.

Month of conception	MZ twins		DZ twins	
	Number	Twinning rate	Number	Twinning rate
January	657	4.16	316	2.00
February	701	4.26	284	1.73
March	675	3.75	356	1.98
April	740	4.56	356	2.20
May	654	3.84	332	1.95
June	675	3.97	304	1.79
July	655	3.84	292	1.71
August	688	4.17	296	1.79
September	683	3.69	368	1.99
October	734	4.02	360	1.97
November	705	4.05	362	2.08
December	736	4.29	316	1.84
Total	8,303	4.04	3,942	1.92

(2.20) twins were seen in April, whereas the lowest rate was seen in September (3.69) for MZ twins and in July (1.71) for DZ twins.

Seasonal variation of stillbirth rate of twins

Table 2 shows the numbers and rates of stillbirths of MZ and DZ twins according to month of birth. In MZ twins the highest stillbirth rate was seen in June (0.1579) and the lowest rate in December (0.1093). In DZ twins the corresponding values were 0.1273 in May and 0.0757 in December, respectively.

Variation of twinning rate among social classes

Table 3 shows the number of twin deliveries according to the categories of survival states of twins, sex of twins, and the occupation of the heads of the household, which was classified into six classes according to the classification in the certificate records: I (Agriculture only), II (Agriculture with other works), III (Self employed), IV (Employee-white collar), V (Employee-blue collar) and VI (Others). Numbers and twinning rate of MZ and DZ twins, are computed from Table 3 (Table 4). The MZ twinning rates are similar in all classes of the occupation of the heads of the household, whereas the highest DZ twinning rate was seen in class I (2.13 per 1,000 births) and the lowest rate in class V (1.75 per 1,000 births).

Variation of stillbirth rate of twins among social classes

Table 5 and Fig. 2 show stillbirth rates for MZ and DZ twins according to

Table 2. Number and rate of monozygotic and dizygotic twin stillbirths according to month of birth, 1974.

Month of birth	Monozygotic twins					Dizygotic twins				
	2 LB	1 LB, 1 FD	2 FD	Number of FD	Stillbirth rate	2 LB	1 LB, 1 FD	2 FD	Number of FD	Stillbirth rate
January	578	42	71	92	0.1331	308	16	28	36	0.1023
February	588	46	73	96	0.1358	290	10	24	29	0.0895
March	545	30	66	81	0.1264	306	18	26	35	0.1000
April	557	36	76	94	0.1405	266	16	30	38	0.1218
May	563	42	73	94	0.1386	272	18	32	41	0.1273
June	560	32	92	108	0.1579	282	14	18	25	0.0796
July	619	38	74	93	0.1272	308	16	30	38	0.1073
August	610	39	83	102.5	0.1400	296	16	18	26	0.0788
September	581	28	64	78	0.1159	302	22	34	45	0.1257
October	601	44	79	101	0.1395	280	18	22	31	0.0969
November	564	33	85	101.5	0.1488	274	8	20	24	0.0795
December	591	49	51	75.5	0.1093	274	14	16	23	0.0757
Total	6,957	459	887	1,116.5	0.1345	3,458	186	298	391	0.0992

Fig. 2. Stillbirth rates of MZ and DZ twins according to the occupation of the heads of the household, 1974. For classification see text.

the occupation of the heads of the household. The highest stillbirth rate of MZ twins was seen in class VI (0.2157) and the lowest one in class II (0.1179). In DZ twins the highest stillbirth rate was similarly seen in class VI (0.1529), but the lowest one in class IV (0.0842). With regard to total stillbirth rate of twins, the highest rate was seen in class VI (0.2048) and the lowest one in class IV (0.1208).

As also shown in Table 5, the rate of induced termination of pregnancy in twins varies from 0.0114 (class IV) to 0.0405 (class VI). In spontaneous termination of pregnancy the rate varies from 0.1047 (class II) to 0.1643 (class VI). The departure from homogeneity was significant at the 0.1% level for both rates.

DISCUSSION

Seasonal variation in twin births was studied in Scotland, England and Wales, New York, Finland, Hungary and Southern Moravia (see James, 1976). In this report he stated that there is a significant seasonality in two samples, but in five samples no significant seasonality was seen. Czeizel (1974) reported significant excess of multiple births in spring in Hungary, and James (1976) reported highly significant excess of multiple birth in the second half of the year in England and Wales. In Finland, Timonen and Carpen (1968) also reported excess twin births in spring, but he did not mention about statistical level. Kamimura (1976) studied seasonal variation in twin births in Niigata City, and concluded that high conception

Table 3. Number of twin deliveries according to survival states of twins, sex of twins, and occupation of the heads of the household, 1974.

	Sex of twins*	Occupation of heads of the household						Total
		I. Agriculture only	II. Agriculture with other works	III. Self employed	IV. Employee (white collar)	V. Employee (blue collar)	VI. Others	
2 liver births	MM	161	288	555	1,607	1,406	312	4,329
	FF	141	288	519	1,679	1,411	297	4,335
	MF	70	115	213	669	529	132	1,728
1 live birth	MM	11	32	37	109	85	26	300
1 fetal death	FF	10	18	21	86	99	18	252
	MF	4	7	14	32	34	2	93
	Unknown	1	2	2	3	8	2	18
2 fetal deaths	MM	25	31	88	182	163	87	576
	FF	16	23	57	161	146	52	455
	MF	7	11	20	47	40	23	148
	Unknown	6	6	9	54	36	11	122
Total		452	821	1,535	4,629	3,957	962	12,356

* M, male; F, female.

Table 4. Monozygotic and dizygotic twinning rates according to the occupation of the heads of the household, 1974.

Occupation of the head of household	Total number of live births and fetal deaths	Monozygotic twins		Dizygotic twins		Total twins
		Number	Twinning rate per 1,000 births	Number	Twinning rate per 1,000 births	
I. Agriculture only	76,239	283	3.71	162	2.13	5.84
II. Agriculture with other works	139,104	547	3.93	266	1.91	5.84
III. Self employed	266,267	1,030	3.87	494	1.86	5.72
IV. Employee (white collar)	799,192	3,076	3.85	1,496	1.87	5.72
V. Employee (blue collar)	690,463	2,707	3.92	1,206	1.75	5.67
VI. Others	165,979	635	3.83	314	1.89	5.72
Total	2,137,244	8,278	3.87	3,938	1.84	5.72

Table 5. Stillbirth rates of monozygotic and dizygotic twins according to occupation of heads of the household, 1974.

Stillbirth rate	Occupation of the head of household					
	I. Agriculture only	II. Agriculture with other works	III. Self employed	IV. Employee (white collar)	V. Employee (blue collar)	VI. Others
MZ	0.1502	0.1179	0.1427	0.1227	0.1271	0.2157
DZ	0.1111	0.1090	0.1093	0.0842	0.0945	0.1529
Total (MZ + DZ + UK)	0.1482	0.1224	0.1375	0.1208	0.1259	0.2048
Induced	0.0288	0.0177	0.0121	0.0114	0.0148	0.0405
Spontaneous	0.1194	0.1047	0.1254	0.1094	0.1111	0.1643
						0.1162

rates of twins were seen in the seasons of mild climate, spring and autumn, and low rates in hot and cold seasons. In the present study, a seasonal variation was indicated for MZ and DZ twins in overall Japan, and the highest conception rate of twins was found in April for both MZ and DZ twins. The DZ twinning rates are 1.86, 2.04, 1.77 and 2.01 per 1,000 births for winter (December to February), spring (March to May), summer (June to August) and autumn (September to November), respectively. It seems thus likely that twinning rates vary according to the season of conception at least in DZ twins.

In the United States, both white and Negro mothers in higher socioeconomic classes had more twin births (Myrianthopoulos, 1970). On the contrary, Lin and Chen (1968) reported a high twinning rate in lower socioeconomic classes, but their data consisted of only 129 sets of multiple births. According to MacGillivray (1970), greater decline of twinning rates in upper classes was found in Aberdeen, Scotland during the period from 1949 to 1968. The decline associated with social class was not confirmed in Italy (James, 1975). In the present study, occupation of the heads of the household did not affect twinning rates. In the present study, stillbirth rates of twins were indicated to vary according to social class. According to Imaizumi and Inouye (1979), stillbirth rate of twins was higher in maternal age groups less than 20 years and 35 year or more for MZ and DZ twins. In the present study, mean maternal ages in occupational classes I through VI are 26.53, 26.47, 27.71, 27.24, 26.92, and 27.06 years, respectively, and differences among six classes do not seem to affect stillbirth rates of twins.

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