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**AN ANALYSIS OF STILLBIRTH FREQUENCIES AMONG MEMBERS  
OF TWIN PREGNANCIES WITHIN THE TOTAL, THE "WHITE"  
AND THE "COLORED" POPULATIONS OF THE UNITED STATES**

by

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**Introduction**

The census reports of the various countries of the world should be fertile sources of information relative to the sciences of human genetics and human evolution. Unfortunately, they are not so valuable in this respect as they might be. Yet most of them do contain many data which when sorted out and properly analyzed reveal a considerable amount of information which is directly contributory, and much that is indirectly indispensable to a full understanding of the genetics and evolution of man.

About ten years ago the senior author of the present paper initiated a series of analyses which were designed to examine from a genetic and evolutionary point of view the census birth data of the United States for the 15 year interval from 1922 to 1936, inclusive. The results of several of these analyses have already been published (Strandskov 1942 and 1945; Strandskov and Edelen, 1946; Strandskov and Siemens, 1946; Strandskov and Ondina, 1947; and Strandskov and Bisaccia, 1949) The present study is a continuation of this series.

For each of the different analyses which were planned originally it was found possible to consider not only the birth data for the total population of the United States, but also the corresponding data for the two subdivisions which are called by the U. S. Bureau of the Census the "white" and the "colored" populations. The former may be assumed to include only members of the Caucasoid stock. The latter, on the other hand, includes not only all members of Negroid and Mongoloid ancestry, but in addition those members of Caucasoid origin whose skin is heavily pigmented. Although the latter major subdivision represents a heterogeneous group the records indicate that about 95 percent of its members are of Negroid ancestry. Hence, any data which appear in this or in previous papers under the heading of "colored" may be assumed to be fairly representative of the Negro population of the United States for the period under consideration.

All of the previous analyses, as well as the present one, pertain exclusively to the interval from 1922 to 1936 inclusive. This period was selected originally: (1) because the

1922 report was the earliest U. S. Census Report which was sufficiently complete for the analyses planned; (2) because the 1936 report was the last one available at the time that the first study in the series was initiated; and (3) because the 15 year interval from 1922 to 1936 gave distributions of annual data which were fairly satisfactory in length for the type of statistical treatment which was selected as the most appropriate.

By subdividing and recombining the raw census data pertinent to the present analysis a total of 47 different categories of birth was obtained for each of the three populational classifications. Thus a grand total of  $3 \times 47$  or 141 different categories was reached. For each of the 15 years, representing each of the 141 categories, a percentage of stillbirth, or of some other type of birth, was calculated. And for each of the 141 resulting distributions of 15 yearly percentages a mean percentage was obtained. In most instances it is this mean percentage which is published and compared rather than the percentage which might have been calculated directly from each set of 15 year totals. All of the comparisons which were made involve the data for the entire 15 year period taken as a unit. In other words no attempt was made in this or in previous studies to examine trends or to compare intervals within the 15 year interval. When data for a much longer period become available such analyses may be undertaken.

It is of importance to appreciate that the stillbirth data which are reported by the United States Bureau of the Census pertain mostly to stillbirths from about the middle of the uterogestation period up to and including full term. This means that the numerous, very early abortions which are known to occur in all human populations are not included in these analyses, at least not to any appreciable extent.

In order to conserve space in the tables, and to some extent in the text, various terms which are referred to repeatedly are abbreviated. The abbreviations have the following meanings: T = total population, W = "white", C = "colored", Pl = plural, Si = single, Tw = twin, DZ = dizygotic, MZ = monozygotic, SB = stillbirths and LB = livebirths.

#### Data and Methods

The 47 categories of birth which were selected for consideration within each of the three populational classifications are listed in tables 1-8, inclusive. They are numbered consecutively in the left hand columns of these tables in order that a given one might be referred to readily. For each of the different categories considered, only the figures representing the totals for the 15 year intervals are given. This is true because it was considered forbidding to publish all of the very extensive annual figures.

Table 1 gives the numbers and percentages of single and twin pregnancies which were reported for the total, the "white" and, the "colored" populations during the 15 year interval from 1922 to 1936 inclusive. Table 2 gives the numbers and percentages of ♂♂, ♂♀ and ♀♀ sets among the total number of twin pregnancies. It may be seen that the total number which appears in table 2 is slightly smaller than the corresponding one of table 1. This is true because the latter includes only those twin pregnancies for which the sex was reported for both members of each of the pairs, whereas the former includes all of the sets which were reported.

**Table 1 - Single and twin pregnancy frequencies within the total, the "white" and the "colored" populations of the United States for the 15 year interval from 1922 to 1936, inclusive**

Birth Category		T		W		C	
No.	Type	No.	%	No.	%	No.	%
1	Si, Pl	31,508,074	100.00	27,939,615	100.00	3,568,459	100.00
2	Si	31,138,433	98.83	27,621,171	98.86	3,517,262	98.57
3	Tw	365,831	1.16	315,352	1.13	50,479	1.41

**Table 2 - Numbers and percentages of ♂♂, ♂♀ and ♀♀ twin pregnancies among all twin pregnancies within the total, the "white" and the "colored" populations of the United States for the 15 year interval from 1922 to 1936, inclusive**

Birth Category		T		W		C	
No.	Type	No.	%	No.	%	No.	%
4	All Tw	365,680	100.00	315,230	100.00	50,450	100.00
5	♂♂ sets	125,149	34.23	108,772	34.50	16,377	32.46
6	♂♀ »	121,594	33.24	103,673	32.89	17,921	35.52
7	♀♀ »	118,937	32.53	102,785	32.61	16,152	32.02

**Table 3 - Estimated numbers and percentages of dizygotic and monozygotic twin pregnancies among all twin pregnancies within the total, the "white" and the "colored" populations of the United States for the 15 year interval from 1922 to 1936, inclusive**

Birth Category		T		W		C	
No.	Type	No.	%	No.	%	No.	%
8	All Tw	365,680	100.00	315,230	100.00	50,450	100.00
9	DZ	243,427	66.57	207,561	65.84	35,866	71.09
10	MZ	122,253	33.43	107,669	34.16	14,584	28.91

In table 3 appear estimates of the relative frequencies of dizygotic and monozygotic twin pregnancies among all twin pregnancies for which the sex was reported for both members of a set. These estimates were obtained by applying the Weinberg differential method which assumes that sex is completely genetically determined and that the observed number of ♂♀ twin pregnancies represent approximately one-half of all dizygotic pregnancies. Tables 5 to 8, inclusive, present sex ratios or percentages of stillbirths for the various categories of birth.

Table 4 - Estimated numbers and percentages of dizygotic and monozygotic twin pregnancies among all pregnancies for which sex was known within the total, the "white" and the "colored" populations of the United States for the 15 year interval from 1922 to 1936, inclusive

Birth Category		T		W		C	
No.	Type	No.	%	No.	%	No.	%
11	Si, Pl	31,487,413		27,923,410		3,564,003	
12	Tw	365,680	1.16	315,230	1.13	50,450	1.41
13	DZ	243,427	.77	207,561	.74	35,866	1.00
14	MZ	122,253	.39	107,669	.39	14,584	.41

In a number of instances it was desirable to know whether or not an observed sex-ratio deviated significantly from an expected 50 : 50 ratio. These questions were answered by applying the standard formula for a test of the significance of the difference between an observed and an expected ratio.

$$S. E. \text{ ratio} = \sqrt{\frac{p \times q}{N}}$$

$$t = \frac{\Delta}{S. E. \text{ ratio}}$$

The "t" values which were obtained are shown in table 9. Any "t" value as great as or greater than 2 may be assumed to be indicative of a significant deviation from an expected 50 : 50 ratio.

The major questions for which answers were sought pertained mostly to the problem of whether two particular percentage means could justifiably be considered the means of two samples of the same population or whether they should be considered the means of samples of two different populations.

These questions were answered by applying the standard formula for a test of the significance of the difference between two means:

$$t = \frac{\Delta}{\sqrt{\frac{\sum (X_1 - \bar{X}_1)^2 + \sum (X_2 - \bar{X}_2)^2}{N_1 + N_2 - 2} \times \frac{N_1 + N_2}{N_1 N_2}}}$$

Any "t" value as great as or greater than 2 may be assumed to imply a significant difference between the two means compared. The "t" values obtained are shown in tables 10, 11, 12 and 13. The numbers which are listed in the first column of tables 9-13 are arbitrary comparison numbers presented only for ready reference.

## Discussion

Before discussing the stillbirth percentages for the different members of twin pregnancies it seems of interest to comment briefly on the more general birth data which appear in tables 1 to 5, and are presented here primarily for background purposes.

Table 1 shows that the twin pregnancy frequency for the total population of the United States for the period under consideration is 1.16 percent, and that the frequencies for the "white" and the "colored" populations considered separately are 1.13 and 1.41 percent, respectively. Corresponding percentages have been reported for many other populations throughout the world. It is not our intention to list here all of these percentages but we do wish to call attention to the fact that all or nearly all of them fall within rather narrow limits, namely somewhere between 1 and 2 percent (For details see Gedda, 1951). This fact appears to support the conclusion, based on other lines of

Table 5 - Number and percentage of males for various birth categories within the total, the "white" and the "colored" populations of the United States, for the 15 year interval from 1922 to 1936, inclusive

Birth Category		T		W		C	
No.	Type	No.	%	No.	%	No.	%
15	♂ / Si, Pl, LB, SB, ♂♀	16,430,417	51.57	14,575,386	51.60	1,855,031	51.30
16	♂ / Si, Pl, LB, ♂♀	15,774,412	51.36	14,057,976	51.42	1,706,436	50.88
17	♂ / Si, Pl, SB, ♂♀	656,005	57.18	517,410	57.10	138,595	57.50
18	♂ / Si, LB, SB, ♂♀	16,052,842	51.59	14,249,501	51.62	1,803,341	51.34
19	♂ / Si, LB, ♂♀	15,428,262	51.38	13,755,800	51.44	1,672,462	50.90
20	♂ / Si, SB, ♂♀	624,580	57.28	493,701	57.18	130,879	57.64
21	♂ / Tw, LB, SB, ♂♀	371,892	50.85	321,217	50.95	50,675	50.22
22	♂ / Tw, LB, ♂♀	341,371	50.48	298,128	50.63	43,243	49.43
23	♂ / Tw, SB, ♂♀	30,521	55.40	23,089	55.41	7,432	55.36

Table 6 - Number and percentage of stillbirths for various categories of single, and plural pregnancies within the total, the "white" and the "colored" populations of the United States for the 15 year interval from 1922 to 1936, inclusive

Birth Category		T		W		C	
No.	Type	No.	%	No.	%	No.	%
24	♂♀ SB / Si, Pl, ♂♀	1,147,226	3.60	906,206	3.20	241,020	6.66
25	♂♀ SB / Si, Pl, ♂♀	656,005	3.99	517,410	3.55	138,595	7.47
26	♀ SB / Si, Pl, ♂♀	491,221	3.18	388,796	2.84	102,425	5.82
27	♂♀ SB / Si, ♂♀	1,090,471	3.50	863,405	3.13	227,066	6.46
28	♂, SB / Si, ♂♀	624,580	3.89	493,701	3.47	130,879	7.26
29	♀ SB / Si, ♂♀	465,891	3.09	369,704	2.77	96,187	5.63
30	♂♀ SB / Tw, ♂♀	55,094	7.51	41,650	6.60	13,444	13.32
31	♂, SB / Tw, ♂♀	30,521	8.21	23,089	7.16	7,432	14.69
32	♀, SB / Tw, ♀	24,573	6.83	18,561	6.01	6,012	11.95

evidence, that the tendency for the production of twins and higher plural births has some genetic basis. Apparently genes responsible for the production of plural births exist in all human populations and have frequencies which may vary from population to population but never enough to cause twin pregnancy frequencies to fall outside the indicated limits – except perhaps in rare instances.

By the several preceding statements we do not mean to imply that all variations in twin pregnancy frequency are exclusively the result of variations in gene frequency. As a matter of fact evidence indicates that variations in environmental factors may in some instances play the major role. For instance in 1951 Torgersen calculated the twin pregnancy percentage for various intervals within the history of the Norwegian population for the years from 1881 to 1948, inclusive. He found a high of 1.54 for the period from 1929 to 1934, and a low of 1.20 for the war years from 1941 to 1945. These variations

Table 7 - Number and percentage of sets of twin pregnancies in which one or both members are liveborn or stillborn within the total, the "white" and the "colored" populations of the United States for the 15 year interval from 1922 to 1936, inclusive

Birth Category		T		W		C	
No.	Type	No.	%	No.	%	No.	%
33	♂♂ sets both LB	108,438	86.67	95,625	87.93	12,813	78.24
34	♂♂ sets one SB	9,966	7.95	8,047	7.38	1,919	11.72
35	♂♂ sets both SB	6,745	5.38	5,100	4.69	1,645	10.03
36	♂♀ sets both LB	111,520	91.78	96,491	93.09	15,029	84.14
37	♂♀ sets one SB	6,357	5.17	4,848	4.66	1,509	8.11
38	♂♀ sets ♂ SB	3,348	2.74	2,508	2.41	840	4.51
39	♂♀ sets ♀ SB	3,009	2.43	2,340	2.25	669	3.60
40	♂♀ sets both SB	3,717	3.05	2,334	2.25	1,383	7.75
41	♀♀ sets both LB	105,772	88.95	92,456	89.96	13,316	82.43
42	♀♀ sets one SB	8,483	7.12	6,771	6.58	1,712	10.64
43	♀♀ sets both SB	4,682	3.93	3,558	3.46	1,124	6.93

Table 8 - Number and percentage of stillbirths for members of twin sets within the total, the "white" and the "colored" populations of the United States for the 15 year interval from 1922 to 1936, inclusive

Birth Category		T		W		C	
No.	Type	No.	%	No.	%	No.	%
44	♂♀, SB / all Tw	55,094	7.51	41,650	6.60	13,444	13.24
45	♂, SB / all Tw	30,521	4.16	23,089	3.66	7,432	7.34
46	♀, SB / all Tw	24,573	3.35	18,561	2.94	6,012	5.94
47	♂, SB / ♂♂ sets	23,456	9.36	18,247	8.38	5,209	15.89
48	♂♀, SB / ♂♀ sets	13,791	5.63	9,516	4.58	4,275	11.81
49	♂, SB / ♂♀ sets	7,065	2.88	4,842	2.33	2,223	6.15
50	♀, SB / ♂♀ sets	6,726	2.74	4,674	2.25	2,052	5.66
51	♀, SB / ♀♀ sets	17,847	7.49	13,887	6.75	3,960	12.26

Table 9 - The "t" values which are indicative of the extent to which observed sex ratios within the total, the "white" and the "colored" populations of the U. S. from 1922 to 1936 inclusive, deviate from an expected 50 : 50 ratio

Comp. No.	Birth Category		T		W		C	
	No.	Type	%	«t» value	%	«t» value	%	«t» value
1	15	Si, Pl, LB, SB	51.57	177.09	51.60	170.46	51.30	49.52
2	16	Si, Pl, LB	51.36	150.78	51.42	148.74	50.88	31.55
3	17	Si, Pl, SB	57.18	153.86	57.10	135.11	57.50	73.65
4	18	Si, LB, SB	51.59	176.92	51.62	170.06	51.34	50.07
5	19	Si, LB	51.38	151.26	51.44	149.07	50.90	32.62
6	20	Si, SB	57.28	151.93	57.18	133.45	57.64	72.81
7	21	Tw, LB, SB	50.85	4.59	50.95	15.09	50.22	1.42
8	22	Tw, LB	50.48	7.88	50.63	9.73	49.43	3.35
9	23	Tw, SB	55.40	25.35	55.41	22.08	55.36	12.44

we agree must be attributed almost exclusively to variations in the environment. Even so it appears probable to us that the difference in twin pregnancy frequency which we have observed between the "white" and the "colored" populations of the United States is to some extent the result of a difference in heredity.

In connection with this discussion of the difference in twin pregnancy frequency between the "white" and the "colored" populations of the United States it seems of interest to call attention to an explanation offered a few years ago by a prominent sociologist. He stated that he considered it very probable that the racial difference observed by us was to be attributed primarily to a differential reporting of births. He argued that in regions of the United States where not all births are recorded Negro parents very likely would report a higher percentage of twin than of single births, whereas "white" parents would not be inclined to do so - at least not to the same extent. This explanation seemed reasonable to us at the time that it was offered. However, since then we have obtained data which show that the higher twin pregnancy frequency for the "colored" population than for the "white" is the result almost exclusively of a higher percentage of dizygotic twin births rather than the result of a higher percentage of the monozygotic type alone or of both of the types (See data of table 4). Consequently the sociologist's explanation no longer appears acceptable. In other words it does not seem likely that Negro families would report a higher percentage of the dizygotic type of twin birth without also reporting a higher percentage of the monozygotic type. Had the reverse relationship been found to hold true the explanation would probably have continued to appear acceptable, because it is well known that monozygotic sets are more often the cause of pride and joy on the part of parents than are dizygotic sets and would consequently be apt to be reported in a higher percentage of instances. And it does not appear improbable to us that Negro families would report a higher percentage than would "white" parents.

It will be apparent from the above discussion that we have not presented the sociologist's explanation because it appears to us to be correct. We have presented it because

Table 10 - The "t" values obtained from comparisons of the means of 15 yearly percentages of various twin and other birth categories within the total population of the United States for the 15 year interval from 1922 to 1936, inclusive

Comp. No.	Birth Categories Compared within the Total Population						« t » value
	Category A			Category B			
	No.	Type	%	No.	Type	%	
10	16	♂ / Si, Pl, LB, ♂♀	51.36	17	♂ / Si, Pl, SB, ♂♀	57.18	54.31
11	18	♂ / Si, LB, SB, ♂♀	51.59	21	♂ / Tw, LB, SB, ♂♀	50.85	12.57
12	19	♂ / Si, LB, ♂♀	51.38	20	♂ / Si, SB, ♂♀	57.28	55.46
13	19	♂ / Si, LB, ♂♀	51.38	22	♂ / Tw, LB, ♂♀	50.48	13.83
14	20	♂ / Si, SB, ♂♀	57.28	23	♂ / Tw, SB, ♂♀	55.40	5.28
15	22	♂ / Tw, LB, ♂♀	50.48	23	♂ / Tw, SB, ♂♀	55.40	14.55
16	25	♂, SB / Si, Pl, ♂	3.99	26	♀, SB / Si, Pl, ♀	3.18	13.68
17	27	♂♀, SB / Si, ♂♀	3.50	30	♂♀, SB / Tw, ♂♀	7.51	51.36
18	28	♂, SB / Si, ♂	3.89	29	♀, SB / Si, ♀	3.09	13.74
19	28	♂, SB / Si, ♂	3.89	31	♂, SB / Tw, ♂	8.21	46.22
20	29	♀, SB / Si, ♀	3.09	32	♀, SB / Tw, ♀	6.83	40.35
21	31	♂, SB / Tw ♂	8.21	32	♀, SB / Tw, ♀	6.83	12.03
22	33	♂♂ sets both LB	86.67	36	♂♀ sets both LB	91.78	10.46
23	33	♂♂ sets both LB	86.67	41	♀♀ sets both LB	88.95	9.14
24	35	♂♀ sets both LB	91.78	41	♀♀ sets both LB	88.95	6.18
25	34	♂♂ sets one SB	7.95	35	♂♂ sets both SB	5.38	13.28
26	37	♂♀ sets one SB	5.17	40	♂♀ sets both SB	3.05	4.71
27	42	♀♀ sets one SB	7.12	43	♂♀ sets both SB	3.93	21.15
28	34	♂♂ sets one SB	7.95	37	♂♀ sets one SB	5.17	5.79
29	34	♂♂ sets one SB	7.95	42	♀♀ sets one SB	7.12	3.64
30	37	♂♀ sets one SB	5.17	42	♀♀ sets one SB	7.12	4.18
31	35	♂♂ sets both SB	5.38	40	♂♀ sets both SB	3.05	24.03
32	35	♂♂ sets both SB	5.38	41	♀♀ sets both SB	3.93	15.56
33	40	♂♀ sets both SB	3.05	43	♀♀ sets both SB	3.93	10.34
34	44	♂♀ SB / all Tw	7.51	48	♂♀ SB / ♂♀ sets	5.63	8.14
35	45	♂, SB / all Tw	4.16	46	♀, SB / all Tw	3.35	13.81
36	47	♂, SB / ♂♂ sets	9.36	48	♂♀, SB / ♂♀ sets	5.63	14.44
37	47	♂, SB / ♂♂ sets	9.36	51	♀, SB / ♀♀ sets	7.49	12.42
38	48	♂♀, SB / ♂♀ sets	5.63	51	♀, SB / ♀♀ sets	7.49	7.98
39	49	♂, SB / ♂♀ sets	2.88	50	♀, SB / ♂♀ sets	2.74	0.89

it might have been correct, and, if it had been, it would have been an explanation which many geneticists, unfamiliar with many of the subtle psychological and cultural differences between populations, might have failed to think of, or if they had thought of it, might not have recognized it as one that had a chance of being the correct one. Furthermore, we present the explanation because, if it had been correct, it probably would have illustrated a racial difference in reported data which would have represented not merely the effect of an environmental difference between races, but also to some extent at least, the indirect effect of a difference in heredity. In other words we are of the opinion that,



Table II - The "t" values obtained from comparisons of the means of 15 yearly percentages of various twin and other birth categories within the "white" population of the United States for the 15 year interval from 1922 to 1936, inclusive

Comp. No.	Birth Categories Compared within the « White » Population						« t » value
	Category A			Category B			
	No.	Type	%	No.	Type	%	
40	16	♂ / Si, Pl, LB, ♂♀	51.42	17	♂ / Si, Pl, SB, ♂♀	57.10	43.23
41	18	♂ / Si, LB, SB, ♂♀	51.62	21	♂ / Tw, LB, SB	50.95	5.28
42	19	♂ / Si, LB, ♂♀	51.44	20	♂ / Si, SB, ♂♀	57.18	52.33
43	19	♂ / Si, LB, ♂♀	51.44	22	♂ / Tw, LB, ♂♀	50.63	12.79
44	20	♂ / Si, SB, ♂♀	57.18	23	♂ / Tw, SB, ♂♀	55.41	4.48
45	22	♂ / Tw, LB, ♂♀	50.63	23	♂ / Tw, SB, ♂♀	55.41	14.55
46	25	♂, SB / Si, Pl, ♂	3.55	26	♀, SB / Si, Pl, ♀	2.84	9.99
47	27	♂♀, SB / Si, ♂♀	3.13	30	♂♀, SB / Si, ♂♀	6.60	58.56
48	28	♂, SB / Si, ♂	3.47	29	♀, SB / Si, ♀	2.77	9.67
49	28	♂, SB / Si, ♂	3.47	31	♂, SB / Tw, ♂	7.16	40.21
50	29	♀, SB / Si, ♀	2.77	32	♀, SB / Tw, ♀	6.01	52.61
51	31	♂, SB / Tw, ♂	7.16	32	♀, SB / Tw, ♀	6.01	14.02
52	33	♂♀ sets both LB	87.93	36	♂♀ sets both LB	93.09	11.27
53	33	♂♀ sets both LB	87.93	41	♂♀ sets both LB	89.96	7.52
54	36	♂♀ sets both LB	93.09	41	♂♀ sets both LB	89.96	7.52
55	34	♂♀ sets one SB	7.38	35	♂♀ sets both SB	4.69	13.22
56	37	♂♀ sets one SB	4.66	40	♂♀ sets both SB	2.25	5.71
57	42	♂♀ sets one SB	6.58	43	♂♀ sets both SB	3.46	19.96
58	34	♂♀ sets one SB	7.38	37	♂♀ sets one SB	4.66	5.97
59	34	♂♀ sets one SB	7.38	42	♂♀ sets one SB	6.58	3.42
60	37	♂♀ sets one SB	4.66	42	♂♀ sets one SB	6.58	4.33
61	35	♂♀ sets both SB	4.69	40	♂♀ sets both SB	2.25	22.58
62	35	♂♀ sets both SB	4.69	43	♂♀ sets both SB	3.46	11.91
63	40	♂♀ sets both SB	2.25	43	♂♀ sets both SB	3.46	15.60
64	44	♂♀ SB / all Tw	6.60	48	♂♀, SB / ♂♀ sets	4.58	10.59
65	45	♂, SB / all Tw	3.66	46	♀, SB / all Tw	2.94	14.70
66	47	♂, SB / ♂ sets	8.38	48	♂♀, SB / ♀ sets	4.58	15.68
67	47	♂, SB / ♂ sets	8.38	51	♀, SB / ♀ sets	6.75	9.74
68	48	♂♀, SB / ♂♀ sets	4.58	51	♀, SB / ♀ sets	6.75	10.80
69	49	♂, SB / ♂♀ sets	2.33	50	♀, SB / ♀ sets	2.25	0.52

if the racial difference in twin pregnancy frequency had been shown to be due to a differential reporting of births, the difference would have been attributable not merely to an environmental difference between the two racial groups but also, in part at least, to a difference in heredity which had expressed itself psychologically or culturally. Instances of indirect effects of genes operating by way of the nervous system are among the most intriguing and important of all human genetic problems and should not be passed by just because they are complex. Most of them are analyzable to some degree.

Table 5 presents the percentages of males for the various categories of birth. It may

Table 12 - The "t" values obtained from comparisons of the means of 15 yearly percentages of various twin and other birth categories within the "colored" population of the United States for the 15 year interval from 1922 to 1936, inclusive

Comp. No.	Birth Categories Compared within the "Colored" Population						« t » value
	Category A			Category B			
	No.	Type	%	No.	Type	%	
70	16	♂ / Si, Pl, LB, ♂♀	50.58	17	♂ / Si, Pl, SB, ♂♀	57.50	73.97
71	18	♂ / Si, LB, SB, ♂♀	51.34	21	♂/Tw, LB, SB, ♂♀	50.22	7.21
72	19	♂ / Si, LB, ♂♀	50.90	20	♂ / Si, SB, ♂♀	57.64	73.62
73	19	♂ / Si, LB, ♂♀	50.90	22	♂ / Tw, LB, ♂♀	49.43	9.16
74	20	♂ / Si, SB, ♂♀	57.64	23	♂ / Tw, SB, ♂♀	55.36	3.73
75	20	♂ / Tw, LB, ♂♀	49.43	23	♂ / Tw, SB, ♂♀	55.36	9.16
76	24	♂, SB / Si, Pl, ♂	7.47	26	♀, SB / Si, Pl, ♀	5.82	16.76
77	27	♂♀, SB / Si, ♂♀	6.46	30	♂♀, SB / Tw, ♂♀	13.32	33.83
78	28	♂, SB / Si, ♂	7.26	27	♀, SB / Si, ♀	5.63	11.59
79	28	♂, SB / Si, ♂	7.26	31	♂, SB / Tw, ♂	14.69	26.45
80	29	♀, SB / Si, ♀	5.63	32	♀, SB / Tw, ♀	11.95	29.38
81	31	♂, SB / Tw, ♂	14.69	32	♀, SB / Tw, ♀	11.95	8.48
82	39	♂♂ sets both LB	78.24	36	♂♀ sets both LB	84.14	7.70
83	39	♂♂ sets both LB	78.24	41	♀♀ sets both LB	82.43	6.12
84	36	♂♀ sets both LB	84.14	41	♀♀ sets both LB	82.43	—
85	34	♂♂ sets one SB	11.72	35	♂♂ sets both SB	10.03	3.51
86	37	♂♀ sets one SB	8.11	40	♂♀ sets both SB	7.75	—
87	42	♀♀ sets one SB	10.64	41	♀♀ sets both SB	6.93	11.16
88	34	♂♂ sets one SB	11.72	37	♂♀ sets one SB	8.11	5.50
89	34	♂♂ sets one SB	11.72	42	♀♀ sets one SB	10.64	2.39
90	37	♂♀ sets one SB	8.11	42	♀♀ sets one SB	10.64	4.10
91	35	♂♂ sets both SB	10.03	40	♂♀ sets both SB	7.75	6.11
92	35	♂♂ sets both SB	10.03	41	♀♀ sets both SB	6.93	8.35
93	40	♂♀ sets both SB	7.75	41	♀♀ sets both SB	6.93	3.15
94	44	♂♀, SB / all Tw	13.24	48	♂♀, SB / ♂♀ sets	11.81	4.59
95	45	♂, SB / all Tw	7.34	46	♀, SB / all Tw	5.94	8.15
96	47	♂, SB / ♂♂ sets	15.89	48	♂♀, SB / ♂♀ sets	11.81	8.10
97	47	♂, SB / ♂♂ sets	15.89	51	♀, SB / ♀♀ sets	12.26	7.26
98	48	♂, SB / ♂♀ sets	11.81	51	♀, SB / ♀♀ sets	12.26	1.25
99	49	♂, SB / ♂♀ sets	6.15	50	♀, SB / ♂♀ sets	5.66	2.24

be seen that the percentage for the livebirths within the total population of the United States for the period under consideration is 51.36. As shown by comparison No. 2, table 9 this percentage is a highly significant deviation from an expected 50 percent. What the explanation is for this deviation is not as yet clear. The one that immediately comes to mind is, of course, that more females than males die during the uterogestation period. But as everyone knows most reported stillbirth data do not support this hypothesis. Of course the possibility still remains that more females than males die prior to the uterine age at which the earliest stillbirths are recorded. We do not, however,

Table 13 - The "t" values obtained from comparison of the means of 15 yearly percentages of various twin and other birth categories of the "white" population of the United States with corresponding data of the "colored" population for the 15 year interval from 1922 to 1936, inclusive

Comp. No.	Corresponding Birth Categories within «W» and «C» Populations		% Means Compared		«t» value
	No.	Type	W	C	
100	3	Tw pregnancies / all preg.	1.13	1.41	25.23
101	10	MZ, Tw preg. / all Tw preg.	34.16	28.91	10.12
102	15	♂ / Si, Pl, LB, SB, ♂♀	51.60	51.30	7.76
103	16	♂ / Si, Pl, LB, ♂♀	51.42	50.88	15.73
104	17	♂ / Si, Pl, SB, ♂♀	57.10	57.50	2.80
105	18	♂ / Si, LB, SB, ♂♀	51.62	51.34	7.04
106	19	♂ / Si, LB, ♂♀	51.44	50.90	14.96
107	20	♂ / Si, SB, ♂♀	57.18	57.64	3.44
108	21	♂ / Tw, LB, SB, ♂♀	50.95	50.22	4.52
109	22	♂ / Tw, LB, ♂♀	50.63	49.43	7.09
110	23	♂ / Tw, SB, ♂♀	55.41	55.36	0.13
111	24	♂, SB / Si, Pl, ♂♀	3.21	6.66	31.56
112	25	♂, SB / Si, Pl, ♂	3.55	7.47	55.92
113	26	♀, SB / Si, Pl, ♀	2.84	5.82	65.18
114	27	♂♀, SB / Si, ♂♀	3.13	6.46	29.96
115	28	♂, SB / Si, ♂	3.47	7.26	29.79
116	29	♀, SB / Si, ♀	2.77	5.63	39.09
117	30	♂♀, SB / Tw, ♂♀	6.60	13.32	37.81
118	31	♂, SB / Tw, ♂	7.16	14.69	28.30
119	32	♀, SB / Tw, ♀	6.01	11.95	29.26
120	33	♂♂ sets both LB	87.93	78.24	15.55
121	34	♂♂ sets one SB	7.38	11.72	10.80
122	35	♂♂ sets both SB	4.69	10.03	15.89
123	36	♂♀ sets both LB	93.09	84.14	14.01
124	37	♂♀ sets one SB	4.66	8.11	4.99
125	38	♂♀ sets ♂ SB	2.41	4.51	—
126	39	♂♀ sets ♀ SB	2.25	3.60	—
127	40	♂♀ sets both SB	2.25	7.75	28.31
128	41	♂♀ sets both LB	89.96	82.43	19.40
129	42	♂♀ sets one SB	6.58	10.64	12.86
130	43	♂♀ sets both SB	3.46	6.93	186.03
131	44	♂♀, SB / all Tw	6.60	13.24	37.80
132	45	♂, SB / all Tw	3.66	7.34	24.63
133	46	♀, SB / all Tw	2.94	5.94	30.54
134	47	♂, SB / ♂♂ sets	8.38	15.89	16.39
135	48	♂♀, SB / ♂♀ sets	4.58	11.81	22.46
136	49	♂, SB / ♂♀ sets	2.33	6.15	18.72
137	50	♀, SB / ♂♀ sets	2.25	5.66	22.26
138	51	♀, SB / ♀♀ sets	6.75	12.26	21.07

consider it probable that this occurs. We are more inclined to think that the high percentage of males, reported for livebirths and stillbirths combined, reflects a high conception sex ratio in favor of males. In a paper published in 1949 Strandskov and Bisaccia estimated that the conception sex ratio for the total population of the United State for the period from 1922 to 1936, inclusive, was as high as 52 percent in favor of males.

Of interest is a comparison of the sex ratios of the two major populational subdivisions. The percentage of male for the livebirths within the "white" population is 51.42 and the corresponding percentage for the "colored" is 50.88. The difference between the two percentages is a highly significant one. (See comparison No. 103, table 13). The explanation for this difference, as shown by the data of table 5 is not to be found in a higher percentage of males among the reported stillbirths for the "colored" population. We think, however, that it may be due in part to a higher percentage of male deaths within the "colored" population prior to the age at which stillbirths are reported. We also think that it may be due in part to a lower conception sex ratio for the "colored" population which has some genetic basis.

The very high percentage of males among stillbirths in these as well as in all other human populations, is probably the result of several different sets of factors. It appears probable that it may be due: (1) in part to the effects of lethal or semi-lethal sex-linked recessive genes, (2) in part to a greater general susceptibility on the part of males to unfavorable environmental conditions within the uterus; and (3) in part to a greater physical development on the part of males which results in an increase in birth hazards.

Among the more interesting data obtained in these studies is the significantly lower percentage of males for livebirths among members of twin pregnancies (50.48), than for livebirths among members of single pregnancies (51.38). The explanation for this difference which immediately comes to mind is, of course, that relatively more males than females die during the uterogestation period among members of twin than among members of single pregnancies. As is shown by the data of table 5 this relationship does not hold true for reported stillbirths, but the possibility remains, of course, that it holds true for early ages. The probability of the occurrence of this possibility is increased by the fact that twin pregnancies include monozygotic sets, many of which very likely die as a consequence of the monozygotic twinning process. And it does not seem improbable that more male than female sets would fail to survive the process. Another possible explanation for the lower percentage of males for twin than for single livebirths is that more female than male determined zygotes or embryos initiate or are induced to undergo the monozygotic twinning process. This possibility does not, however, appear to us to be a very probable one. If either of the last two explanations should be shown to be correct, the low percentage of males should, of course, be found primarily among monozygotic twin sets. Existing data do not permit us to learn whether or not this is true.

Table 6 shows that the percentage of stillbirth for members of single pregnancies, within the total population, is 3.50, whereas it is 7.51 for members of twin pregnancies. In other words the data indicate that it is twice as hazardous to be a member of a twin pregnancy as it is to be a member of a single. A general explanation for this fact undoub-

tedly is that the human species is at the present time adapted to produce a single member per pregnancy. It must, however, also be remembered that twin pregnancies include monozygotic sets, some of which would have little or no chance to survive even though the species were primarily adapted to produce two members per pregnancy.

The adaptedness at the present time of the human species to the production of a single member per pregnancy raises several interesting questions: (1) By what process has the existing uniparous characteristic of the human species come into existence? (2) When was the trend in this direction initiated? (3) What is the trend at the present time? (4) What will be the characteristic of the human species, relative to number of members per pregnancy, a thousand or a million years hence?

It is not our intention in this paper to enter into a detailed discussion of the probable answers to the above questions, but we do wish to comment briefly on each one. It does seem probable to us: (1) that the uniparous condition characteristic of the human species at the present time has been evolved as a consequence of the operation of the usual evolutionary forces from an ancestral multiparous condition of many millions of years ago; (2) that the existing uniparous condition was closely approximated about a million years ago when the human species made its appearance; (3) that the trend in the direction of a completely uniparous condition has been checked the last hundred years or more by advances in medicine and in other cultural aspects of life; and (4) that the time may come, if it has not already arrived, when the trend in number of members per pregnancy will be reversed. It even seems probable that as a result of new advances in medicine relatively more and more members of twin and higher plural births will survive and reproduce. If this should prove to be true the net effect should, of course, be a gradual increase in the percentage of members of the human species who have a tendency to produce twin and higher plural births, and may mean that the time may arrive – perhaps a million or more years from now, when a twin rather a single pregnancy will be the rule.

We may turn now more specifically to a consideration of the differences in stillbirth percentages for the different sets of twins classified on the basis of sex combination. Table 7 shows: (1) that among ♂♂ sets within the total population one member is stillborn in 7.95 percent of all sets and both members in 5.38 percent; (2) that among ♂♀ sets one member is stillborn in 5.17 percent of all sets and both members in 3.05 percent; and (3) that among ♀♀ sets one member is stillborn in 7.12 percent of all sets and both members in 3.93 percent.

It is apparent from the above figures that within all three types of twin sets, classified on the basis of sex combination, the percentage of sets in which one member is stillborn is larger than the percentage of sets in which both members are stillborn. It is equally apparent that the number of sets in which both members are stillborn is larger than the one expected on the assumption that the deaths of the two members are independent events. In other words it is clear that the deaths of the two members of a twin set in which both are stillborn are not in every instance independent events. That they are not is, of course, not surprising when one stops to realize that the two members of a twin set are, during uterogestation, subjected approximately to the same environment. If one members is exposed to an unfavorable environment the other is very likely to be

subjected to the same unfavorable environment. Furthermore it must be remembered that twin sets do include monozygotic pairs in some of which the two members are so intimately associated that if one member dies the other is as a consequence doomed to die within a very short period of time.

The above stillbirth figures for twin sets also show that the percentage of sets in which both members are stillborn is higher for either of the same sex sets ( $\sigma\sigma$  5.38 and  $\text{♀♀}$  3.93) than is the percentage for the opposite sex sets ( $\sigma\text{♀}$  3.05). This difference undoubtedly is due primarily to the fact that the same sex sets include monozygotic pairs. The possibility also exists that if a given environmental factor is responsible for the death of one member of a set of twins the other member of the set is more likely to die from the effects of the same environmental factor if it is of the same sex than if it is of the opposite sex. If the latter explanation should be true, dizygotic as well as monozygotic same sex sets should, of course, show a higher percentage of stillbirth.

When comparisons are extended to sets of twins in which only one member of a set is stillborn it is found that the percentage of stillbirth for same sex sets ( $\sigma\sigma$  7.95 and  $\text{♀♀}$  7.12) is also significantly higher than is the corresponding percentage for opposite sex sets ( $\sigma\text{♀}$  5.17). Why this relationship should hold true for sets in which only one member is stillborn is not obvious. It may be true that its explanation also involves the inclusion of monozygotic pairs among same sex sets. It is known that among monozygotic pairs one member may in some instances be more handicapped than the other as the result of an unequal twinning process or of some other unequal set of conditions.

In the preceding paragraphs we have presented and discussed some of the major differences which we have observed in stillbirth percentages for members of single and twin pregnancies within the total, the "white" and the "colored" populations of the United States for the interval from 1922 to 1936 inclusive. Many more differences are shown in the accompanying tables, but we shall not discuss these specifically. Many of them merely fortify the conclusions already drawn. Others are suggestive of new and independent conclusions but are not sufficiently detailed or specific to warrant consideration until supporting facts are obtained.

#### Summary

1. Data are presented relative to twin pregnancies within the total, the "white" and the "colored" populations of the United States for the 15 year interval from 1922 to 1936, inclusive.
2. Attention is called to the fact that twin pregnancy frequencies in all human populations fall within rather narrow limits, and it is suggested that this fact supports the conclusion based on other lines of evidence that human twinning has some genetic basis.
3. It is shown that the twin pregnancy frequency for the "colored" population is significantly higher than is the corresponding percentage for the "white". It is concluded that this difference is due, in part at least, to a difference in heredity.
4. It is estimated that 33.43 percent of all twin pregnancies within the total population are of the monozygotic type and that within the "white" and the "colored" populations considered separately the corresponding percentages are 34.16 and 28.91, respectively.

5. Calculations show that the higher percentage of twin pregnancy frequency within the "colored" population than within the "white" is exclusively the result of a higher percentage of the dizygotic type of pregnancy.
6. It is shown that livebirths among twins have a significantly lower percentage of males than do livebirths among members of single pregnancies. This is attributed primarily to a higher percentage of male deaths in twin than in single pregnancies during early uterine stages.
7. It is shown that the percentage of stillbirth for twin pregnancies is twice as high as is the percentage for members of single pregnancies. Even so it is suggested that there may be at present or in the future a trend started in the direction of an increase in the percentage of plural births within the human species.
8. It is shown that the percentage of sets of twins in which both members are stillborn is higher than the one expected on the assumption that the deaths of the two members are independent events.
9. The percentage of sets of twins in which both members are stillborn is found to be significantly higher for same sex sets than for opposite sex sets. This is attributed primarily to the inclusion of monozygotic sets among the former.
10. It is also shown that the percentage of sets of twins in which only one member is stillborn is significantly higher for same sex sets than for opposite sex sets. This is attributed primarily to the inclusion among the former of monozygotic sets in which one member is handicapped as a result of an unequal twinning process or of some related phenomenon.
11. Many additional differences relative to twin pregnancies are shown in the accompanying tables, but are not discussed either because they are relatively insignificant or because they require supporting data.

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## SOMMARIO

1) Vengono presentati i dati relativi alle gravidanze gemellari per le popolazioni « totale », « bianca » e di « colore » degli Stati Uniti per l'intervallo di 15 anni dal 1922 al 1936 compreso.

2) Si richiama l'attenzione sul fatto che le frequenze delle gravidanze gemellari in tutte le popolazioni umane rientrano in limiti piuttosto ristretti, e si suggerisce che questo fatto conferma la conclusione basata su altre considerazioni che la gemellanza umana ha qualche base genetica.

3) Viene dimostrato che la frequenza delle gravidanze gemellari per la popolazione di colore è significativamente più alta che non la percentuale corrispondente per quella bianca. Se ne conclude che questa differenza è dovuta, almeno in parte, ad una differenza di eredità.

4) Viene valutato che il 33,43% di tutte le gravidanze gemellari nella popolazione totale sono del tipo monozigotico e che nelle popolazioni bianca e di colore, considerate separatamente, le percentuali corrispondenti sono rispettivamente 34,16 e 28,91.

## SOMMAIRE

1) Sont présentées les indications relatives aux grossesses gemellaires concernant les populations « totale », « blanche » et de « couleur » des Etats-Unis en un laps de temps de 15 ans, de 1922 à 1936 inclus.

2) On appelle l'attention sur le fait que la fréquence des grossesses gemellaires dans toutes les populations humaines est contenue dans des limites plutôt restreintes, et l'on suggère que ce fait confirme la conclusion basée sur d'autres considérations, à savoir que la gemellarité humaine a quelques bases génétiques.

3) On démontre que la fréquence des grossesses gemellaires chez la population de couleur

5) I calcoli dimostrano che la più alta percentuale di frequenze di gravidanze gemellari nella popolazione di colore rispetto a quella bianca è esclusivamente il risultato di una più alta percentuale del tipo dizigotico.

6) Viene dimostrato che i nati vivi fra i gemelli comprendono la più bassa percentuale di maschi che non i nati vivi tra i membri delle gravidanze singole.

Ciò è attribuito anzitutto ad una più alta percentuale di morti maschili nelle gravidanze gemellari che non in quelle singole nei primi stadi intrauterini.

7) Si dimostra che la percentuale di nati morti nelle gravidanze gemellari è due volte più alta della percentuale dei membri di gravidanze singole. Pur con ciò, viene avanzata l'ipotesi che potrebbe verificarsi attualmente o nel futuro l'inizio di una tendenza nella direzione di un aumento della percentuale di nascite plurime nella specie umana.

8) Viene dimostrato che la percentuale di gruppi gemellari di cui entrambi i membri sono nati morti è più alta di quella preve-

duta in base alla supposizione che le morti dei due membri siano eventi indipendenti.

9) La percentuale di gruppi gemellari in cui entrambi i membri sono nati morti viene trovata significativamente maggiore per i gruppi dello stesso sesso che non per quelli di sesso opposto. Ciò viene anzitutto attribuito all'inclusione nei primi dei gruppi monozigoti.

10) Viene anche mostrato che la percentuale di gruppi gemellari in cui un membro è nato morto è significativamente maggiore per i gruppi dello stesso sesso che per quelli di sesso opposto. Ciò viene anzitutto attribuito all'inclusione fra i primi di gruppi monozigotici nei quali un membro è svantaggiato come risultato di un processo di geminazione in-eguale o di qualche fenomeno simile.

11) Molte differenze addizionali relative alle gravidanze gemellari sono evidenti nelle tavole allegate, ma non sono discusse o perchè sono relativamente insignificanti o perchè richiedono altri dati a sostegno.

est de beaucoup plus élevée que le pourcentage correspondant pour la population blanche. On peut en conclure que cette différence est due, tout au moins en partie, à une différence d'hérédité.

4) On évalue que 33,43% de toutes les grossesses gemellaires chez la population totale sont du type monozigotique et que, chez les populations blanche et de couleur, considérées séparément, les pourcentages correspondants sont respectivement 34,16 et 28,91.

5) Les calculs laissent apparaître que le plus haut pourcentage de fréquence de grossesses gemellaires chez la population de couleur par rapport à la popula-

tion blanche, est exclusivement le résultat d'un plus haut pourcentage du type dizygothique.

6) On démontre que parmi les jumeaux, les nés vivants comprennent un pourcentage de garçons moins élevé que les nés vivants parmi les membres provenant de grossesses simples. Ce phénomène est attribué avant tout à un pourcentage plus élevé de garçons morts au cours de grossesses gemellaires — alors que ce même pourcentage est moins élevé dans les grossesses simples — dans les premiers stades intrautérins.

7) On démontre que le pourcentage de morts-nés dans les grossesses gemellaires est deux fois plus élevé que le pourcen-



tage relatif aux membres provenant de grossesses simples. Néanmoins, on avance l'hypothèse qu'à l'heure actuelle ou dans un proche avenir on pourrait constater l'apparition d'une tendance dans la direction d'une augmentation du pourcentage de naissances multiples dans l'espèce humaine.

8) On démontre que le pourcentage de groupes gémeaux dont les deux membres sont mort-nés, est plus élevé que le pourcentage prévu en vertu de suppositions que les décès des deux membres soient des événements indépendants.

#### ZUSAMMENFASSUNG

1) Das vorliegende Material bezieht sich auf Zwillingsschwangerschaften in der gesamten, der weissen und der nicht-weissen Bevölkerung der Vereinigten Staaten zwischen 1922 und 1936 inclusive.

2) Es wurde darauf hingewiesen, dass alle Zwillingsschwangerschaften ihrer Häufigkeit nach innerhalb ziemlich enge Grenzen fallen, und es wurde nahegelegt, dass diese Tatsache die von anderen Beweisen abgeleitete Schlussfolgerung bestärkt, dass die Entstehung von Zwillingen eine genetische Grundlage besitzt.

3) Es wurde gezeigt, dass die Häufigkeit von Zwillingsschwangerschaften in der nicht-weissen Bevölkerung bedeutsam höhere Werte erreicht als in der weissen Bevölkerung. Es wurde geschlossen, dass dieser Unterschied wenigstens zum Teil auf Verschiedenheiten in den Erbanlagen zurückgeht.

4) Schätzungsweise wurde festgestellt, dass 33.43% aller Zwillingsschwangerschaften in der Gesamtbevölkerung monozygo-

9) Le pourcentage de groupes gémeaux où les deux membres sont morts-nés est considérablement supérieur pour les groupes d'un même sexe. Il n'en est pas de même pour les groupes de sexe différent. Ceci est attribué avant tout à l'inclusion, chez les premiers, de groupes monozygothés.

10) Est également démontré que le pourcentage de groupes gémeaux dont un membre est mort-né, est considérablement supérieur pour les groupes d'un même sexe, à l'encontre de ceux de sexe différent. Ce fait est at-

tisch sind; die entsprechenden Werte für die weissen und nicht-weissen Teile der Bevölkerung gesondert betrachtet sind 34.16, beziehungsweise 28.91%.

5) Berechnungen haben ergeben, dass die relativ grössere Häufigkeit von Zwillingsschwangerschaften in der nicht-weissen Bevölkerung im Vergleich zu der weissen Bevölkerung ausschliesslich auf den höheren Perzentsatz von dizygotischen Fällen bei den ersteren zurückzuführen ist.

6) Es wurde dargetan, dass unter denn Lebendgeburten von Zwillingen der Perzentsatz von Knaben wesentlich niedriger ist als unter Einzelgeburten. Diese Tatsache wurde in erster Linie der verhältnismässig höherer Sterblichkeit von männlichen Keimen in frühen Entwicklungsstadien von Zwillingsschwangerschaften im Vergleich zu Einzelwangerschaften zugeschrieben.

7) Es wurde gezeigt, dass der Perzentsatz von Totgeburten für Zwillingekeime zweimal so hoch ist als für Einzelkeime. Trotzdem bestehen Andeutungen, dass in der Gegenwart oder in der Zukunft eine allmähliche Zunahme der Häufigkeit von Mehrgebur-

tribué avant tout à l'inclusion, parmi les premiers, de groupes monozygothiques chez lesquels un membre est désavantagé par suite d'un processus de gemination inégal ou de tout autre phénomène similaire.

11) Nombreuses différences additionnelles relatives aux grossesses gémeaux sont évidentes dans les annexes ci-jointes; elles ne sont toutefois pas discutées soit parce-qu'elles sont relativement insignifiantes, soit parce-qu'elles requièrent d'autres indications à l'appui.

ten in der Menschenrasse eintreten wird.

8) Es wurde gezeigt, dass die Häufigkeit von Fällen, in denen beide Parten eines Zwillingspaares Totgeburten sind, höher ist als man zu erwarten hätte, wenn zwischen dem Tode der beiden Partner kein Zusammenhang bestünde.

9) Der Perzentsatz von totgeborenen Zwillingspaaren ist bedeutsam höher für Paare des gleichen Geschlechtes als für solche verschiedenen Geschlechtes. Diese Beobachtung kann damit erklärt werden, dass die erstere Gruppe die monozygotischen Paare einschliesst.

10) Ebenso konnte gezeigt werden, dass der Perzentsatz von Zwillingspaaren, in denen nur der eine Partner totgeboren ist, für gleichgeschlechtliche Paare bedeutsam höher ist als für verschiedengeschlechtliche Paare. Dies wurde darauf zurückgeführt, dass im ersteren Falle monozygotische Paare miteingeschlossen sind, in denen der eine Partner zufolge ungleicher Halbierung oder ähnlicher Umstände benachteiligt war.