

UN.
ECONOMIC
AND
SOCIAL COUNCIL



Distr.
GENERAL *
E/CONF.13/101
Meeting No. 2
28 April 1954
ORIGINAL: ENGLISH
(Paper in English)

WORLD POPULATION CONFERENCE

Rome, 31 August - 10 September 1954

DOCUMENTS
INDEX UNIT MASTER
AUG 11 1954

Summary

Foetal, Peri-Natal and Infant Mortality

by

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Tentative estimates of the magnitude of foetal and infant mortality in the world today, indicate a heavy loss of life during the relatively short period of pregnancy and the first year after birth. At least one out of every five pregnancies is terminated as a foetal death and the net effect of the reproductive wastage amounts to the loss of about one-third of all conceptions.

Infant mortality is rapidly declining in almost all countries of the world as a result of a better control of the medical causes of death. The causation of foetal and peri-natal mortality is, however, of a different nature, not entirely dependent upon progress in the medical sciences. Biological, physiological, social and economic factors appear to be heavily associated with this early wastage of life, although the nature and relative importance of these factors have not as yet been adequately explored.

A reduction of foetal and peri-natal mortality similar to the reduction of infant mortality, which has occurred during the last fifty years, would permit the maintenance of the present rate of growth of the world's population with about one quarter fewer pregnancies.

^{1/} The author of this paper is a member of the Secretariat of the United Nations. The views presented are his own and not necessarily those of the Secretariat.

* General distribution of this document is limited to the introductory summary. Participants who have been invited to take part in the meeting referred to above will receive also the full text of the paper. Other participants in the Conference will receive the full text upon request.

Pour la traduction française voir au verso.

Mortalités foetale, périnatale et infantile

par

Le Dr Vasilios G. Valaoras ^{1/}

Résumé. Une étude expérimentale sur l'importance actuelle de la mortalités de foetale et infantile dans le monde fait ressortir des pertes élevées au cours la période relativement brève de la grossesse et pendant la première année qui suit la naissance. Au moins une grossesse sur cinq se termine par la mort du foetus; l'ensemble de la mortalité foetale et infantile cause la perte d'environ un tiers de toutes les conceptions.

La mortalité infantile fléchit rapidement dans presque tous les pays du monde grâce aux progrès de la médecine. Toutefois les causes de la mortalité foetale et périnatale sont de nature différente. La régression de cette mortalité ne dépend pas seulement du progrès des sciences médicales. On a constaté que des facteurs biologiques, physiologiques, sociaux et économiques sont étroitement associés à cette mortalité prématurée, mais on n'a pas encore fait complètement analysé la nature et l'importance relative de ces facteurs.

Une diminution de la mortalité foetale et périnatale, analogue à celle de la mortalité infantile qui a eu lieu au cours des cinquante dernières années, permettrait de maintenir le taux actuel d'accroissement de la population mondiale avec un nombre de grossesses inférieur d'environ un quart au nombre actuel.

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^x Seule la présente analyse d'introduction fait l'objet d'une distribution générale. Les participants qui ont été invités à assister à la séance mentionnée ci-dessus recevront en outre le texte intégral du document. Les autres participants au Congrès recevront le texte intégral sur leur demande.

Dr. Vasilios G. Valaoras ^{1/}

Each human generation is known to be heavily depleted almost at its inception, during the relatively short period of the nine months of gestation and the first year after birth. The loss of life occurring during this period by far exceeds the mortality of any other segment of human life of equal duration. Unfortunately, no adequate measure of the exact magnitude of this loss for the total or any major part of the world is as yet available. Although there are fairly accurate data on the extent of infant mortality among about one-third of the world's population, for the remaining two-thirds there are, at most, only fragmentary data or well-informed guesses. The measurement of the wastage of foetal life is considerably less satisfactory, even for that segment most commonly referred to as stillbirths.

"Reproductive wastage", which encompasses both foetal and infant mortality, poses at least two major problems for the demographer. The first is to adequately measure this wastage and its effect on total mortality and on fertility. The second is the more exact determination of its causes. Infant mortality is often considered one of the most sensitive indices of the social and economic development of any community. It is quite possible that when foetal mortality becomes more amenable to analysis, it may serve as an equal or even better index, for it appears to be more directly associated with such factors as family budget and nutrition, public health developments and the expert care which may be available to the expectant mother.

A. The dimensions of reproductive wastage

1. Infant mortality. Among the areas reporting on infant mortality in 1949 or 1950, with a total population of 787 million people, there were 19.3 million live births and 1.3 million infant deaths. This yields an infant mortality rate of 67 per 1000 live births, a rate which seems unduly low to the demographer. The following table shows the known mortality rates and the population covered, by continents.

It is obvious that the low aggregate infant mortality rate shown in the table is a result of the under-representation of the populations of South America, Africa and

^{1/} The author of this paper is a member of the Secretariat of the United Nations. The views presented are his own and not necessarily those of the Secretariat.

TABLE 1. POPULATION REPORTING AND INFANT MORTALITY, BY CONTINENTS, 1949 OR 1950*

Continents	Population (000)		Per cent reporting	Reported number of live births	Reported number of infant deaths	Infant death rate
	Total	Reporting				
WORLD	2,411,000	786,912	32.6	19,279,367	1,289,883	66.9
Africa	197,000	50,937	25.9	1,202,728	146,831	122.1
America, North & Central	219,000	210,674	96.2	5,702,544	285,344	50.0
America, South	111,000	31,040	28.0	1,082,784	124,422	114.9
Asia & U.S.S.R.	1,478,000	149,692	10.1	4,307,360	292,549	67.9
Europe	393,000	333,564	84.9	6,713,531	433,425	64.6
Oceania	13,000	11,005	84.6	270,420	7,312	27.0

* Based on data in United Nations, Demographic Yearbook, 1951 and 1952. New York, 1951 and 1952.

especially Asia, where mortality rates are considerably higher than among the well-represented populations of North America, Europe and Oceania. The infant death rate for this period among approximately 13 per cent of the population of the former group of continents is 85.5, which is about 50 per cent higher than the rate of 57.2 among approximately 88.8 per cent of the population of the latter group. The crude birth rate in the first group is 28.5, while for the second group it is 22.8.

The frequency distribution of the crude birth rate in 123 countries or territories of the world and of the infant death rate in 105 countries, as given in the 1952 edition of the United Nations Demographic Yearbook, is shown in table 2. Because of the differences in the size of the populations in the countries for which data are available, this distribution can give only a crude indication of the range of fertility and mortality among the countries now reporting on these events.

If the coverage of the table could be extended to include all of the world, the relative number of countries in the higher brackets of both crude birth and infant death rates would be greatly increased. It has long been known that the areas not yet reporting demographic data belong to these higher brackets.

Among one third of the world's population for which vital data are regularly and fairly accurately reported, a crude birth rate of 24.5 and an infant death rate of 66.9 may be found in table 1. Scattered and much less reliable data for different periods, indicate that the combined birth rate and infant death rate

TABLE 2. NUMBER OF COUNTRIES AND/OR TERRITORIES OF THE WORLD BY SIZE OF CRUDE BIRTH RATE AND OF INFANT DEATH RATE IN 1949 OR 1950

Crude Birth Rate	No. of Countries	Infant Death Rate	No. of Countries
Less than 10	1	20 - 29.9	11
10 - 12.9	3	30 - 39.9	11
13 - 15.9	6	40 - 49.9	11
16 - 18.9	11	50 - 59.9	8
19 - 21.9	12	60 - 69.9	14
22 - 24.9	12	70 - 79.9	5
25 - 27.9	11	80 - 89.9	12
28 - 30.9	15	90 - 99.9	8
31 - 33.9	11	100 - 109.9	6
34 - 36.9	7	110 - 119.9	7
37 - 39.9	11	120 - 129.9	6
40 - 42.9	9	130 - 139.9	4
43 - 45.9	8	140 - 149.9	-
46 - 48.9	4	150 - 159.9	2
49 - 51.9	2		

in most of the Latin American countries and some areas in Asia and Africa average about 30 and 100 respectively. These rates are about 22 and 50 per cent greater than those in the reporting countries. On the assumption that the frequency of births and infant deaths among the remainder of the population of the world is greater than these estimates by at least the same proportions, the global picture of fertility and infant mortality are as follows:

TABLE 3. LIVE BIRTHS AND INFANT DEATHS. ESTIMATED NUMBERS AND RATES FOR THE POPULATION OF THE WORLD, ABOUT 1950 (Figures in thousands)

Population by type of information available	Population	Number of live births	Crude birth rate	Number of infant deaths	Infant death rate
WORLD	2,411,000	74,141	31.	8,423	114.
1) Currently reporting	786,912	19,279	24.5	1,290	66.9
2) Estimated	731,221	21,937	30.	2,194	100.
3) Assumption	892,867	32,925	37.	4,939	150.

These global rates do not appear to be outside the realm of reality. In fact, both the birth rate and the infant death rate fall within one standard deviation to the right of the already known average rates. Furthermore, these results are consistent with previous estimates of the fertility, mortality and

rate of annual increase of the population of the world. 2/

2. Late foetal mortality. It is considerably more difficult to make a similar type of estimate of the number of late foetal deaths. The Statistical Office of the United Nations has published official data on "stillbirths" for about 80 areas of the world, but the accuracy of much of the data is highly questionable. While in most cases they refer to foetal deaths after the 28th week of gestation, they sometimes include deaths at earlier periods. In a few cases, official stillbirth figures include live-born infants dying before the registration of the birth. The most wide-spread drawback, of course, is that registration of stillbirths is rarely complete, for there are too few incentives for reporting. For all these reasons, it is not surprising to find the extreme variation of the stillbirth ratio (stillbirths per 1000 live births) shown in table 4, which is a frequency distribution of the stillbirth ratio in 80 countries.

TABLE 4. NUMBER OF COUNTRIES BY SIZE OF THE STILLBIRTH RATIO, 1950*

Stillbirth Ratio	Number of Countries	Stillbirth Ratio	Number of Countries
0 - 4.9	3	55 - 59.9	1
5 - 9.9	6	60 - 64.9	2
10 - 14.9	6	. . .	-
15 - 19.9	18	80 - 84.9	1
20 - 24.9	16	. . .	-
25 - 29.9	8	90 - 94.9	1
30 - 34.9	6	. . .	-
35 - 39.9	5	115 - 119.9	1
40 - 44.9	4	120 - 124.9	1
45 - 49.9	1		

* From United Nations, Demographic Yearbook, 1952. New York, 1952. A few of the data are for 1949 or earlier years.

The very low ratios in the table are probably the result of incomplete registration, while the very high ratios may reflect the inclusion of foetal deaths prior to the 28th week of gestation or the misplacement of some early infant deaths. Most of the countries with good registration systems show a ratio of

2/ See United Nations, World population trends 1920-1947. New York, 1949, pp. 9-11.

between 15 and 25 stillbirths per 1000 live births, or even slightly higher.

Since social and economic factors seem to affect both infant and late foetal mortality, it is reasonable to expect a close association between the infant mortality rate and the stillbirth ratio in the various countries. Table 5 shows the relationship in 20 countries with relatively good vital registration.

TABLE 5. THE INFANT DEATH RATE AND THE STILLBIRTH RATIO IN SELECTED COUNTRIES, 1950*

Countries (Group I)	Infant death rate	Stillbirths		Countries (Group II)	Infant death rate	Stillbirths	
		Per 1000 live births	Per 100 infant deaths			Per 1000 live births	Per 100 infant deaths
Total of Group I	31.2	20.1	64.4	Total of Group II	62.3	28.7	46.0
Sweden	20.5	20.3	98.9	Finland	43.5	18.9	43.3
New Zealand	22.7	19.5	85.8	Israel	45.7	17.3	37.9
Netherlands	25.2	19.7	78.1	France	52.0	24.5	46.9
Norway	28.2	16.4	58.2	Belgium	53.4	23.4	43.8
England and Wales	29.9	23.1	77.3	Germany (Fed.Rep.)	55.5	22.3	40.2
Denmark	30.7	18.8	61.3	Italy	63.8	33.3	34.9
Switzerland	31.2	17.1	54.8	Austria	66.1	22.0	33.2
United States(1949)	31.3	19.8	63.3	Puerto-Rico(1949)	68.0	47.5	70.2
Un.S. Africa	35.7	17.2	48.1	Spain	69.8	33.3	47.7
Canada	40.7	19.4	47.8	Portugal	94.1	42.6	37.1

* United Nations, Demographic Yearbook, 1952, New York, 1952.

The aggregate stillbirth ratio in these 20 countries, with over 9 million births, is 23.7 per 1000 live births. Some association between the magnitude of the infant death rate and the stillbirth ratio is evidenced by the fact that among the countries in group II, where the infant death rate is twice as high as in group I, the stillbirth ratio is somewhat more than forty per cent higher than in group I. Were stillbirths reported as completely as are infant deaths, the difference in the stillbirth ratio between the two groups might well have been similar to that for the infant death rates. At the same time, the number of stillbirths approaches closely to the number of infant deaths in the countries with the lowest infant mortality rates, while where the infant death rate is higher, the number of stillbirths is, as a rule, less than half the number of infant deaths. Although a great deal of this difference may be real, some of it

may simply be the result of heavier under-registration of stillbirths in countries where the infant death rate is relatively high.

A conservative, and very rough, estimate of the extent of late foetal mortality may be achieved by the assumption that the first segment of the world's population, as shown in table 3, has a stillbirth ratio of 24 (the aggregate ratio of the 20 countries in table 5), the second segment has a ratio of 30 (approximately 25 per cent higher than the first) and the third, a ratio of 36 (approximately 50 per cent higher than the first). The total number of stillbirths in the world, around 1950, would then be approximately 2.3 million per year. This estimate is undoubtedly low, since it amounts to only 27.4 per cent of the previously estimated total number of infant deaths.

3. Early and intermediate foetal death. It is impossible to make a really satisfactory estimate of the extent of early and intermediate foetal death. Although the compulsory reporting of all foetal deaths has occasionally been attempted in some countries, it has never been satisfactorily accomplished. Under-registration has always been heavy, especially for the early pregnancy wastages. Some writers, in fact, claim that two-thirds of the early and one-third of the intermediate foetal deaths are never reported. 3/

Some idea of the distribution of these deaths by duration of gestation can be obtained from table 6, in which data are shown for Lübeck (Germany) and New York City.

From these examples, it appears that the curve of foetal mortality runs from a maximum point at about the middle of the first lunar trimester to a minimum at about the close of the sixth lunar month of pregnancy. Thereafter it rises again slowly, reaching a second high point at the end of the gestation period. Roughly, it appears that two-thirds of all foetal deaths occur during the first four lunar months of gestation, with the remaining deaths almost equally divided among each of the following two lunar trimesters.

For the New York City data quoted, late foetal deaths constituted 16 and 20 per cent of all foetal deaths for the non-white and white populations respectively. Data for all of Germany in 1936 and 1937 4/, when the reporting of all foetal

3/ Baumgartner, Wallace, Landsberg and Pessin, "The inadequacy of routine reporting of fetal deaths", American Journal of Public Health 39 (12): 1549-1552, 1949.

4/ United Nations, Foetal, infant and early childhood mortality (in press)

deaths was compulsory, indicate that stillbirths constituted about 14 per cent of all foetal deaths. Early foetal deaths appear to have been more adequately represented in these data than in those in table 6. If an under-reporting of only 15 per cent of these early deaths is assumed, the relative size of the number of stillbirths is further reduced to about 12.5 per cent of the total number of foetal deaths.

TABLE 6. DISTRIBUTION OF FOETAL DEATHS BY LUNAR MONTHS OF GESTATION: LÜBECK, 1927-1932 AND 1936-1941 a/ AND NEW YORK CITY, 1948-1949 b/

Lunar month of gestation	Number				Per cent			
	Lübeck 1927-32 1936-41		New York, 1948-49 White Non-white		Lübeck 1927-32 1936-41		New York, 1948-49 White Non-white	
Total	-	-	22,015	6,392	-	-	-	-
28 weeks and over	-	-	4,007	968	-	-	19.9*	15.7*
Under 28 weeks	4,105	1,709	17,287	5,213	100.0	100.0	100.0	100.0
0-1 lunar month	156	91	130	36	3.8	5.3	0.7	0.7
1-2 lunar months	1,515	574	2,829	517	36.9	33.6	16.4	9.9
2-3 lunar months	1,506	585	7,033	1,735	36.7	34.2	40.7	33.3
3-4 lunar months	516	187	3,427	1,343	12.6	10.9	19.8	25.8
4-5 lunar months	279	109	1,846	751	6.8	6.4	10.7	14.4
5-6 lunar months	115	111	1,183	553	2.8	6.5	6.8	10.6
6-7 lunar months	18	52	839	278	0.4	3.1	4.9	5.3
Duration unknown	1,526	964	421	211	-	-	1.9	3.3

* Per cent of total pregnancies of known duration.

a/ United Nations, Foetal, infant and early childhood mortality (in press). Original data for 1927-32 from Hartwig, J., "Die Fehlgeburten in Lübeck (Stadt) im Jahre 1932." Archiv für Soziale Hygiene und Demographie 8:303-305, 1933-34 and earlier volumes. Data for 1936-41 from Hillman, F., "Die Fehlgeburten in Lübeck im Jahre 1942." Reichs-Gesundheitsblatt 19 (22):189-192, 1944. Reporting was voluntary in 1927-32, compulsory in 1936-41.

b/ Baumgartner, L. and Erhardt, C., "Some observations on the factors in the incidence of prematurity and fetal death." In Engle, E., editor, Pregnancy wastage. New York, 1953.

Using now the previously computed estimate of about 2.3 million stillbirths, and the more or less arbitrary assumption that this represents 12.5 per cent of all foetal deaths, the completed picture of the annual reproductive wastage for the world becomes as follows:

	Number (000)	<u>P e r 1 0 0 0</u>	
		live births	pregnancies
Total pregnancies	94,896	-	1000.0
Early and intermediate foetal deaths .	18,449	248.8	194.4
Late foetal deaths (stillbirths)	2,306	31.1	24.3
All foetal deaths	20,755	279.9	218.7
Live births	74,141	1000.0	781.3
Infant deaths	8,423	113.6	88.8

Even this moderate estimate indicates that one out of every four or five pregnancies in the world today is terminated as a foetal death and that the loss of life during the nine months of gestation and the one year following birth amounts to about one third of all pregnancies.

B. The causes of reproductive wastage

Any attempt to establish the causes of reproductive wastage meets with the same difficulties as the attempt to simply measure this wastage. Information about the causes of early and intermediate foetal mortality is practically non-existent. Some attempts have been made to differentiate late foetal mortality by cause, but a great proportion of it is still to be found under the rubric of "ill-defined or unknown cause". On the other hand, the causes of infant mortality are better known and provide adequate ground for a comprehensive discussion.

For all practical purposes, the immediate causes of reproductive wastage may be divided into three major categories, according to their association with (a) the developmental stage of the human embryo, (b) accidents occurring at birth, or (c) environmental factors affecting the child that has been born alive. The amount of knowledge at present available concerning these three groups of causes is in inverse relationship to the order given above, being considerable for the last and negligible for the first group. In broad age terms, the first group of causes predominates in embryonic mortality, the second in peri-natal mortality, and the third in post neo-natal infant mortality. Customarily, the division between the first and second age group is set at the twenty-eighth week of pregnancy and that between the second and third group at the end of the fourth week or the first month of life after birth.

The official classification of the causes of stillbirths (and by implication of all foetal deaths) 5/ contains ten groups of causes, the most important

5/ World Health Organization, Manual of the International Statistical Classification of Diseases, Injuries and Causes of Death. Sixth revision of the International List of Diseases and Causes of Death, Adopted 1948. Geneva, 1948.

of which are related to (a) morbid conditions and accidents of mother (such as chronic and acute diseases in mother, absorption of toxic substances from mother, accidents and other causes in mother), (b) diseases and conditions of pregnancy and childbirth (such as ectopic gestation, hemorrhages, toxæmias of pregnancy, infections, and difficulties of labour), (c) placenta and cord complications, birth injury, etc., and (d) congenital malformations and diseases of the foetus. All of these groups, and especially the last one, contain a substantial number of ill-defined or unknown causes of death, which, for convenience have been combined in a fifth group in the following analysis.

One of the most illuminating analyses of foetal deaths has been produced by the New York City Department of Health. ^{6/} It covers 14,182 foetal deaths in New York City in 1949. Table 7 shows the distribution of these deaths by cause and period of gestation.

TABLE 7. PER CENT DISTRIBUTION OF FOETAL DEATHS BY CAUSE OF DEATH AND PERIOD OF GESTATION, NEW YORK CITY, 1949

Cause of death <u>[* partially included]</u>	Total	Weeks of gestation		
		Less than 20	20-28	29 and over
Total	100.0	72.1	9.7	18.2
1. Chronic and accute diseases in mother (Y30, Y31)	7.3	5.7	0.5	1.1
2. Pregnancy and childbirth, difficult labour etc. in mother (Y32, Y33, Y34, Y35*)	19.5	14.4	1.5	3.6
3. Placenta and cord condition, birth injury (Y36, Y37)	8.6	1.7	1.6	5.3
4. Congenital malformation, diseases of foetus etc. (Y38*)	2.0	0.1	0.1	1.8
5. Ill defined and unknown causes of all forms	62.6	50.2	6.0	6.4

Perhaps the most important fact of this distribution is that about two thirds of all foetal deaths reported are of no recognizable cause, the greatest number of these occurring in early foetal life. Among those to which causes are ascribed, the complications of pregnancy and childbirth (groups 2 and 3) are responsible for

^{6/} Baumgartner, L. and Erhardt, C., op. cit.

almost three fourth of all foetal deaths. The contribution of morbid conditions of the mother as a cause of foetal death is rather small, and appears to decline rapidly after the first few months of gestation. The reverse is true of congenital malformation and diseases of the foetus. The most important single cause is hemorrhage, with or without placenta and cord complications.

Similar results for stillbirths have been obtained elsewhere, as shown in the following distribution of stillbirths by cause of death for a few selected countries, taken from data collected by the World Health Organization.

TABLE 8. PER CENT DISTRIBUTION OF STILLBIRTHS BY CAUSE OF DEATH, SELECTED COUNTRIES, 1940-1947*

Cause of death	Chile 1942- 46	Mexico 1943- 45	Italy 1940	Nether- lands 1940	Scotland 1943-47
All causes	100.0	100.0	100.0	100.0	100.0
1. Diseases in mother	10.3	22.6	9.8	7.4	3.3
2. Difficulties of labor, toxæmias etc.	15.1	15.8	35.9	33.3	31.2
3. Placenta and cord conditions, birth injury etc.	2.4	3.4	9.2	14.7	14.9
4. Congenital malformation, diseases in foetus etc.	0.3	3.2	7.1	11.5	18.1
5. Ill defined and unknown causes . . .	71.9	55.0	38.0	33.1	32.5

* United Nations, Foetal, infant and early childhood mortality (in press).

In spite of the known shortcomings in the diagnosis, a marked change in the distribution of causes of stillbirths as between the less and the more highly developed countries can be seen. As would be expected, there are considerably fewer ill-defined and unknown causes among the latter group of countries, but there are as well considerably fewer deaths ascribed to disease in the mother, which may be the result of more adequate pre-natal care. Conversely, congenital malformation and diseases of the foetus acquire, correspondingly, a greater relative significance in the more highly developed countries.

The causes of death during the first year of life may be generally divided into those arising during the ante-natal period or during the birth process itself and those fostered by the environment of the infant after it is born. The first group contains most of the items which cause foetal mortality. Its effects are concentrated in

the first few weeks after birth. Because of this similarity in the causes of stillbirths and neo-natal deaths, the two are often examined together as "peri-natal" mortality.

A summary of the causes of infant mortality in selected countries in recent years is given in table 9.

TABLE 9. INFANT MORTALITY RATES AND PER CENT DISTRIBUTION OF INFANT DEATHS BY MAJOR GROUPS OF CAUSES, SELECTED COUNTRIES, 1949-1951*

Country	Year	Infant death rate	Per cent distribution of causes of death			
			Congenital Malformations, Birth injuries, Asphyxia, Immaturity, other diseases of the new born	Infections and parasitic diseases, influenza, pneumonia, intestinal disorders and enteritis	All other ill causes defined including accidents	Ill and unknown causes of death
New Zealand	1950	22.7	80.4	11.3	8.0	0.3
Sweden	1949	23.3	73.7	18.2	7.8	0.3
Netherlands	1951	26.6	74.7	11.3	6.9	7.1
England & Wales	1950	29.9	66.3	24.2	9.1	0.4
Denmark	1950	30.7	64.3	24.2	9.3	2.2
Switzerland	1950	31.2	66.3	21.3	11.2	1.2
Unit. States	1949	31.3	70.5	17.8	8.3	3.4
U. of S. Africa	1950	35.7	54.7	37.3	6.5	1.5
Scotland	1951	37.4	64.4	24.1	8.1	3.4
Canada	1950	40.7	62.2	23.7	10.5	3.6
France	1950	52.0	51.9	27.0	10.2	10.9
Germany F.R.	1950	55.5	63.2	25.7	9.8	1.3
Japan	1950	60.1	49.0	38.2	9.6	3.2
Italy	1950	63.8	44.2	48.5	7.0	0.3
Puerto-Rico	1949	68.0	37.2	47.2	5.8	9.8
Spain	1950	69.8	27.2	52.8	17.7	2.3
Portugal	1951	89.1	32.7	52.5	6.7	8.1
Colombia	1950	123.9	10.9	45.3	10.0	33.8

* United Nations, Demographic Yearbook, 1952. New York, 1952.

In spite of differences in practise (eight of the countries in this table give causes of death classified in accordance with the old 1938 revision of the International List) and variations in accuracy, table 9 illustrates the result of the reduction of infant mortality achieved during the present century by the control of the "environmental" causes. In countries where the infant death rate is still relatively high, this group of causes (including tuberculosis, whooping cough, pneumonia, and enteritis) still predominates. In the countries in which the death rate is lower, the larger component of mortality is the group of "developmental" causes

(including congenital malformation, immaturity, and birth injury). Control of the environmental factors has led to an average decline of about 75 per cent in the rates of post-neo-natal infant mortality in the western world in the past fifty years. This has been achieved primarily through extensive preventive immunization, improvements in the care and feeding of infants, and the spread of sanitary measures, which have accompanied the concomitant improvements in the social and economic levels of the family and the community at large.

If a similar decline in neo-natal and foetal wastage could be achieved, the population of the world could easily be maintained at its present rate of growth by a 25 per cent reduction in pregnancies. The more recent but less spectacular decline in neo-natal mortality, however, and the even slower decline in stillbirths, indicate once again that the "developmental" causes of early death still remain to be successfully controlled.

Research in the United States, the United Kingdom and the Scandinavian countries indicates that the ultimate reduction of foetal and neo-natal mortality will depend somewhat less on medical research alone and somewhat more on the control of the conditions under which conception, pregnancy and birth take place. The direct causes of early foetal mortality (blood factors, anatomical abnormalities, ectopic gestation, and other physiological weaknesses) and of later foetal and neo-natal mortality (immaturity, congenital malformations, and birth accidents) seem to be dependent upon underlying general conditions. These conditions may be physiological facts, such as the age of the mother, parity and rapidity of breeding, the incidence of multiple births etc, or they may be such social and economic factors as illegitimacy, levels of education, availability of expert medical care, nutrition of the mother and her activities during pregnancy, or family income.

Much of the relationship between this multiplicity of factors and the size of reproductive wastage still remains to be explored, but it is already obvious that much research and the combined efforts of many organs of society will be needed for the successful reduction of this impressive wastage of early life.