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ACCIDENTS IN CHILDHOOD

Facts as a Basis for Prevention

Report of an Advisory Group

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ADVISORY GROUP ON PREVENTION OF ACCIDENTS IN CHILDHOOD

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ACCIDENTS IN CHILDHOOD

Facts as a Basis for Prevention

Report of an Advisory Group

1. INTRODUCTION

Accident prevention in childhood has found a place on the programme of the WHO Regional Office for Europe for reasons which are not far to seek. In most countries of the European Region, infant and child mortality has been steadily decreasing in recent years and in many places has reached astonishingly low figures. Deaths due to infections and nutritional disturbances have fallen to a level considered unattainable only a few years ago. On the other hand, the death-rate due to accidents remains high and for many types of accidents has increased. Thus, as disease becomes more effectively controlled, accidents are assuming a proportionately greater importance. In some countries they have become the chief cause of death in childhood and adolescence. Among certain groups of children, greater numbers are killed by accidents than by all other causes combined. This unenviable prominence of accidents in child mortality throughout Europe is due, too, to the new and dangerous hazards introduced into many homes and countries by modern technological progress. The spread of electrification, especially in rural areas, the introduction of highly potent insecticides, the increasing numbers of motor cars and bicycles on roads designed for thirteenth to fifteenth century traffic, may be cited as examples.

It is not only as a cause of death that accidents in childhood are important. The number of non-fatal accidents is very much larger—between 100 and 200 times greater and by some estimates even more. This gives some indication of the suffering and loss, and sometimes permanent disablement or disfigurement, that is involved.

Since the large majority of accidents in childhood are without the slightest doubt preventable, several countries have initiated important accident prevention activities, and others, finding the accident problem becoming more and more pressing, are planning similar work.

In view of its importance, several countries have also raised the problem at the international level in WHO, one of whose functions it is to assist in strengthening national health programmes and services of this kind. The

Government of Sweden took the first initiative, in 1955, by bringing the problem to the attention of the WHO Executive Board [1] and the Eighth World Health Assembly,[2] and the Netherlands Government again referred the matter to the Executive Board [3] early in 1956.

Meanwhile, the Regional Office for Europe had submitted a budget proposal to the Regional Committee at its fifth session held in Vienna in 1955, providing for the meeting in 1957 of an advisory group on accident prevention in childhood. The proposal was not only accepted by the Regional Committee, but the meeting of the group was advanced to 1956.

In its approach to the general problem of prevention of accidents in childhood, the Regional Office sought to establish a firm basis for preventive work, so as to ensure that the efforts involved were directed against the major kinds of accidents and to the right age-groups, and that subsequently a proper evaluation of the results could be made.

It was considered that a general form of schedule for the collection of information on accidents, together with suggestions for further statistical treatment of the data, drawn up with due regard to the facilities existing in European countries and to the problems likely to be encountered, might be of value to countries of the Region. Such a guide would, it was thought, enhance international comparability of figures and results, thus providing a stimulus the value of which could hardly be overestimated.

The meeting of the Advisory Group on the Prevention of Accidents in Childhood, which was held in Geneva from 4 to 8 June 1956, represents a pilot activity, intended to explore possibilities for the development of the WHO programme in this field. A number of working papers prepared by consultants and staff members were before the Group, these and further notes introduced by members of the Group constituted the material for discussion.

At an early stage it became clear that the formation of a statistical subgroup would add greatly to the practical value of the Advisory Group's work. The observations of this subgroup are included in section 5 of the report (see page 26).

Problems of definition

Before considering the scope of the data before it, the Group endeavoured to survey the limits of its field of study. In the first place, it agreed that it would be useful to have a working definition of the term " accident ",

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[1] Resolution EB15.R64, *Off. Rec. Wld Hlth Org.*, 1955, **60**, 26

[2] *Off. Rec. Wld Hlth Org.*, 1955, **63**, 257

[3] Resolution EB17.R26, *Off. Rec. Wld Hlth Org.*, 1956, **68**, 8

and selected the following simple description : " An unpremeditated event resulting in a recognizable injury ".

At the same time members recognized that a study of accidents must cover the whole range of experience, from instant death to the narrow escape. In fact, a careful study of " near-accidents" will give information valuable for the development of methods of prevention.

The limitation of the age-group to childhood provoked an interesting discussion. It was suggested, for example, that the essential feature was the fact of growth, and, hence, that all ages up to 20 years should be included. This is consonant with the view taken by the surgeon, because his therapeutic procedures, and especially the restoration of functions, are often dependent upon the subsequent growth of the child. In choosing the site and method of amputation, or the method of restoring the function of a damaged muscle group, the surgeon has to take account of further growth and adopt measures to avoid consequential distortions such as scoliosis. It was pointed out, on the other hand, that confusion would arise, at any rate in certain countries, if the word " child " were employed to cover the whole period from infancy to the twentieth birthday. If an institute were invited to prepare statistical material on the prevention of accidents to children, they would undoubtedly stop at 15 years of age or earlier.

It was finally agreed that the period of growth should be referred to in the conveniently descriptive groups : infancy, childhood, and adolescence. In dealing with these three groups, it was considered of great importance to examine types of accident in general, and more specifically the age-groups in which a particular kind of accident was most liable to occur. By this means preventive measures could be applied more quickly and economically.

Field of study

The Advisory Group next gave consideration to the general background, importance and urgency of the problem and to the need for co-ordinating the great mass of factual information which had been accumulated by various observers at different times and places.

The scope of the Group's work was summed up in the following general terms :

1. The principal field of study relates to methods of fact-finding and of objective analysis of known facts, and to means of co-ordinating the information available.

2. Fact-finding methods imply not only the presentation of facts, but their subsequent evaluation as well ; in this respect, the factual data

must be related to the population at risk. The analysis must take account of other informative data, such as age and sex, geographical comparison, special features of a country, and so on. An objective approach to the programme is necessary if the material is to be co-ordinated in such a way as to give a balanced presentation.

The report contains a number of charts, tables, and accounts of epidemiological studies, which have been included in order to demonstrate more clearly the value of fact-finding as a means of developing accident prevention programmes.

2. EPIDEMIOLOGY OF ACCIDENTS

International grouping of accidents

The *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death*[1] gives a detailed classification for accidents, poisoning, and violence according to the external cause (E Code). It also provides an independent classification according to the nature of the resulting injury (N Code). From the standpoint of prevention the E Code is of primary interest.

In this system of classification, which comprises 124 categories, the major division lies between transport and non-transport accidents. There are numerous useful categories, according to the type of vehicle involved in the case of transport accidents, or to the various environmental causes and effects in respect of non-transport accidents. Four-digit sub-categories of certain titles further qualify the type of accident. An alphabetical index to the classification, which provides a separate section on external causes of injury, is of help in finding the proper category.

The Group noted that the Detailed List of the International Classification, together with the four-digit subdivisions, offers 781 titles by which to describe an accident—191 for the transport group and 590 for non-transport accidents. This permits a fairly specific description of the accident; e.g., E812.0 indicates a motor-vehicle accident to a pedestrian in which a goods transport vehicle was involved. It does not, however, describe what the "pedestrian" was doing, whether he was walking, or moving on roller skates or skis, for example. Similarly, an injury occurring in the home and caused by a hot substance would not reveal the kind of substance or offer any description of the incident.

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[1] World Health Organization (1948-49) *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death*, Geneva, 2 vols. A new edition of this Manual, incorporating the Seventh Revision of the International Lists of Diseases and Causes of Death, will be published early in 1957.

It is clear that such detailed information cannot be sought in a broad classification of this kind, since its rightful purpose is to group causes of morbidity and mortality into categories suitable for statistical presentation and analysis. Thus the International Classification allows tabulation of groups of accidents for general orientation—the frequency and importance of various external causes. Even tabulations according to the Intermediate List of 150 causes, which provides 10 headings for external causes, are sufficiently specific to indicate the types of accidents which constitute the major public health problems for which preventive measures should be started first. For instance, mortality statistics show that in certain countries drowning figures among the foremost causes of fatal accidents in childhood, and efforts to reduce mortality from accidents would logically be centred on this cause. Investigation of the factors responsible for, or contributing to, fatal drowning accidents would reveal the relative importance of the attendant circumstances and point the way towards correction. Apart from access to water, any of the following factors might be indicated : bathing in dangerous places owing to the lack of controlled pools or beaches ; inability to swim ; shock from diving into cold water ; in cases of submersion, ignorance of life-saving methods to bring the victim back to shore ; lack of adequate assistance or facilities for reviving a near-drowning person ; and so on.

Summary

1. The International Statistical Classification of Diseases, Injuries, and Causes of Death groups causes of morbidity and mortality into categories suitable for statistical presentation and analysis.

2. The Detailed List of this Classification provides 124 three-digit categories for the classification of accidents by external causes.

3. Through the addition of a fourth digit, there are available 781 titles for classifying accidents according to the agent, the mechanics of the accident, and the place of occurrence.

4. The Intermediate List of 150 Causes, which groups external causes of accidents under 10 titles, is found sufficient for general orientation on the frequency of broad groups of accidental causes of morbidity and mortality.

5. The International Classification is capable of supplying an appreciable amount of information on type and mode of accident; it does not, however, allow much insight into the detailed aspects of the accident.

6. Statistics of fatal and non-fatal accidents by external causes, compiled according to the International Classification, by showing the relative importance of the diverse external causes, indicate the types of accidents

which call for detailed epidemiological investigation of attendant circumstances.

Value of the epidemiological approach as a basis for prevention

As in the case of diseases affecting a community, the occurrence of accidents in a given population involves important, but at present ill-understood, relationships between the host, the agent, and the environment. In the opinion of the Advisory Group, the epidemiological method offers a scientific approach to the study of accidents and accident prevention. An explanation of causes can be sought in each case through the interactions of the host—the child at risk ; the agent—the effective cause of the event ; and the environment—the chain of external circumstances culminating in the event. Whereas from the strictly medical point of view the injured child is the primary concern, the epidemiological standpoint requires careful determination not only of the number of events of a certain character which occur in a given category or group of the population, but of the time, the manner, and the place of occurrence, and the relation of these events to the population at risk. The latter point is of particular importance because accident data in the past have not infrequently failed to give this information.

It should be recognized that understanding of the etiology of accidents and of their extent would be enhanced if methods could be devised to record not only the accidents which result in injury severe enough to require medical attention, but also those which cause minor injuries or none at all. The narrowly averted accident deserves to be investigated. This problem could be approached through careful study of an entire child population, in a school or camp, for instance. It might also reveal " carriers " of accidents. It has been suggested that there are certain children who involve others in dangerous play, where they themselves may manage to escape harm but which results in injury to their playmates. A good example of this in the United Kingdom used to be the game of " last across the road ", in which the more athletic boys dashed across the road in front of oncoming traffic and the smaller or weaker ones were caught in the tail of the rush. This dangerous game has been practically eliminated by preventive instruction in schools to make children traffic-conscious. Again, there is the " absent-minded " child who may also be a breeder of accidents. Further study of these personality types, using epidemiological methods, is desirable.

Not only does the epidemiological approach demonstrate the relative importance and urgency of the accident problem, but the process is a means of arousing interest and community action to eliminate specific accident hazards. A study of accidental poisoning in American children,

described in one of the working papers before the Group, resulted in a new type of preventive service. Several valuable facts emerged from this investigation : (1) that selection for intensive study of a single type of accident was fruitful ; (2) that morbidity data revealed an important health problem previously obscured by a comparatively low mortality rate (the study shows that for every recorded fatal poisoning among young children there were approximately 200 cases ill enough for hospital admission) ; (3) that it is possible to get good reporting when the medical profession becomes interested in a problem and when a service is provided ; (4) that home follow-up of reported cases revealed opportunities to discover other home accident hazards and to do preventive work.

In one country it has been possible to use studies made by surgeons and hospital paediatricians to obtain data on the frequency of accidents. This has proved to be one means of case-finding. Some members of the Group laid emphasis on the study of traffic accidents, which are on the increase ; they felt that the co-operation of other agencies and individuals in their countries in the collecting of more accurate information might be more readily obtained if this important problem was selected for study in the first instance.

A valuable example of the use of the epidemiological approach in the study and control of a special accident problem comes from Norway. For some years drowning accidents in that country attracted much public interest, notably where cases of children were drowned in wells. As these deaths were judged to be largely preventable, a special study of the problem was initiated. An examination of the state of wells all over the country, both in rural and urban areas, showed that they were often insufficiently covered or fenced. Disused wells, in particular, could sometimes be described only as virtual death-traps. A country-wide educational programme was started, designed to lead to the safeguarding of wells still in use and the filling in of those no longer needed. State and voluntary health agencies and other bodies with a large membership, were mobilized and the support of press and radio enlisted. Although the original mortality figures in this case were not large, there was a marked reduction in the number of children drowned in wells in 1955, as compared with preceding years. Finally, legislation for the compulsory protection of wells was proposed, and is now under consideration.

Another illustration of the use of the epidemiological method is provided by a study of traffic accidents made recently in the United States.[1] The New York State Department of Health attempted to identify drivers who had a tendency to become involved in accidents. The population studied

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[1] Beadenkopf, W. G. et al. (1956) An epidemiological approach to traffic accidents. *Publ. Hlth Rep. (Wash.)*, **71**, 15

was a random sample of a small city and its environs. Every fourth household of each sample block or segment of the community was interviewed. The sample was found representative for drivers in the whole State. In addition to serving as an illustration of the epidemiological method, the study demonstrated unequivocal differences in the amount of driving done by men and women. Almost twice as many men as women drive cars in this New York State community. Exposure to traffic accidents by annual mileage driven is for men approximately six times that for women. Marked age and sex differences were found, in respect of both drivers and the amount of annual driving done.

It is suggested that, given sufficient data, accident rates can be determined for well-defined population groups which would assist considerably in providing direction and impulse for accident-prevention activities.

Magnitude of the problem

Mortality

Proportionate mortality rates indicate that in many countries accidents have assumed the leading role as a cause of death in children over one year old (see Fig. 1).[1] The rapid progress in reducing mortality from the infectious diseases of childhood has brought about this shift of accidents into prominence (see Fig. 2).[1]

Data before the Advisory Group from several European countries indicate that, although the actual death-rates from accidental injury in childhood decrease with age, the relative importance of accidents in the total mortality picture increases. These data, of which examples are given below, demonstrate quite clearly that, for the European region, accident prevention should have a high priority among public health efforts.

Accidents are the leading cause of death in the age-groups of 1-19 years. In these age-groups accidents are responsible for 30-40 % of all deaths (see Fig. 3).[2]

In childhood, mortality from accidents is highest at the pre-school age, lowest among schoolchildren, and again somewhat higher in adolescence (see Fig. 4).[2] In considering prevention, emphasis must thus be placed on the pre-school age.

Since the beginning of this century, mortality from accidents has decreased for the pre-school group, while staying at almost the same level in the school age and adolescent groups. The decrease in pre-school age

[1] Swaroop, S., Albrecht, R. M. & Grab, B. (1956) Deaths from accidents among children. *Bull. Wld Hlth Org.*, **15**, 123

[2] Haas, J. H. de et al. (1956) *Child mortality in the Netherlands*, Assen

FIG. 1. PERCENTAGE OF DEATHS FROM THE FOUR LEADING CAUSES TO TOTAL DEATHS IN THE AGE-GROUP 1-19 YEARS IN TWELVE COUNTRIES, 1951-1953

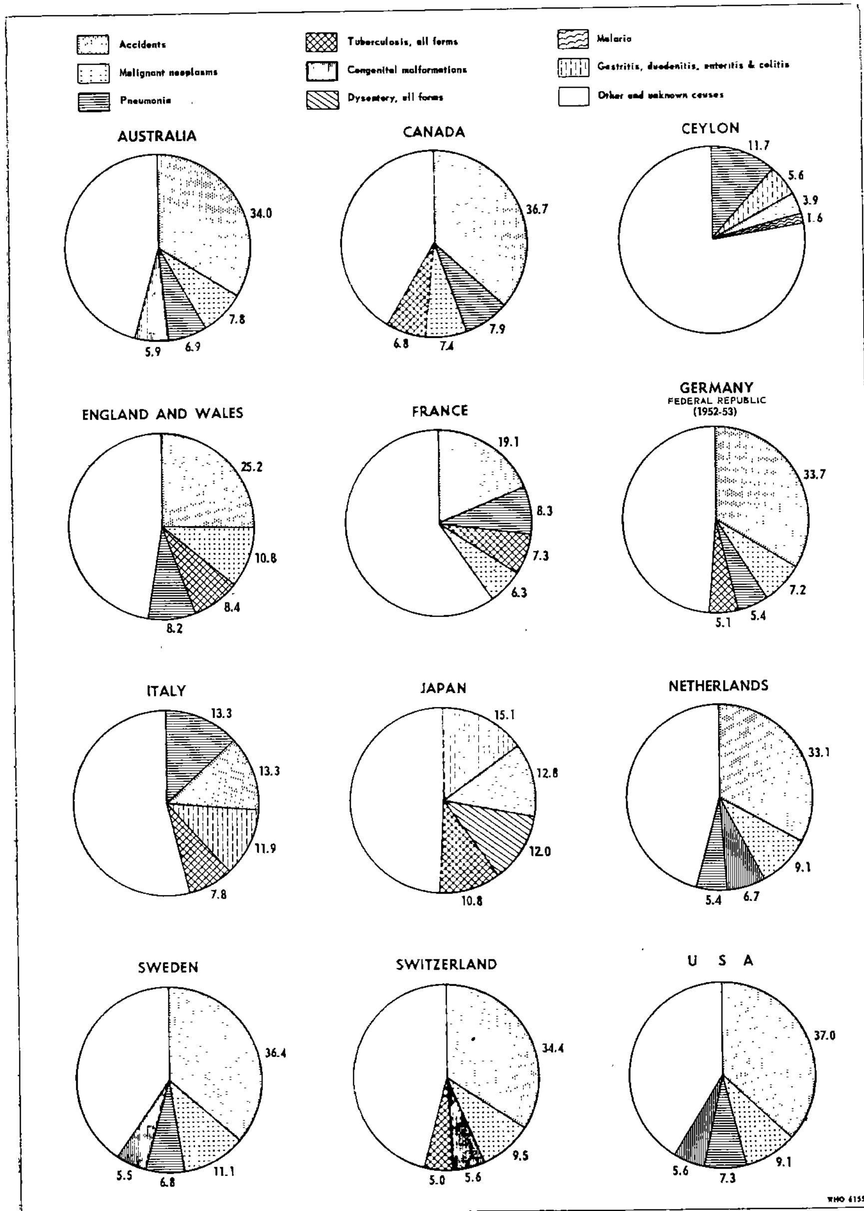
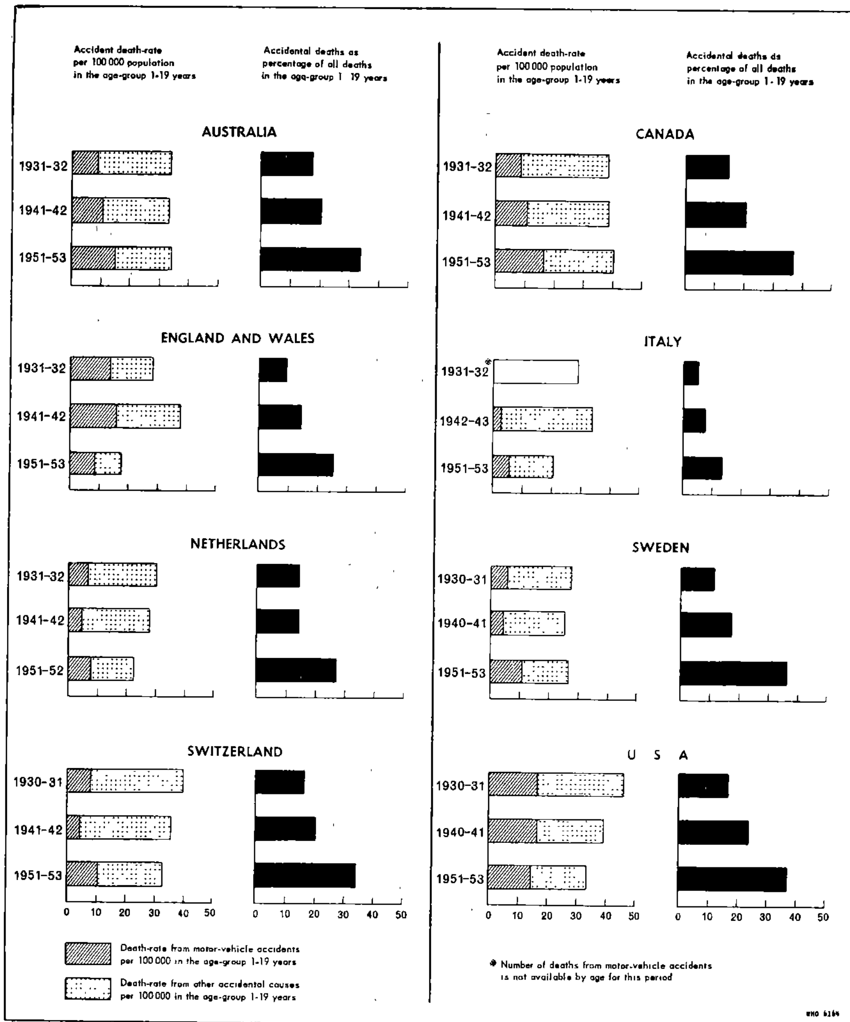


FIG. 2. TREND IN ACCIDENT DEATH-RATE AND IN PROPORTIONAL MORTALITY FROM ACCIDENTS IN THE AGE-GROUP 1-19 YEARS IN EIGHT COUNTRIES, SINCE 1930 OR 1931



accident mortality took place in spite of a growing traffic accident toll, as a result of diminishing deaths from drowning and burns and scalds. In school age and adolescence, the increasing traffic accident mortality cancelled out the decrease in deaths from other accidental causes.

In a working paper on children's deaths from accidents throughout the world, it was indicated that accidents constitute an important problem also for countries outside Europe. For example, the accident death-rate

FIG. 3. PERCENTAGE OF DEATHS FROM THE FIVE LEADING CAUSES TO TOTAL DEATHS BY AGE-GROUPS, UP TO 19 YEARS, IN THE NETHERLANDS, 1954

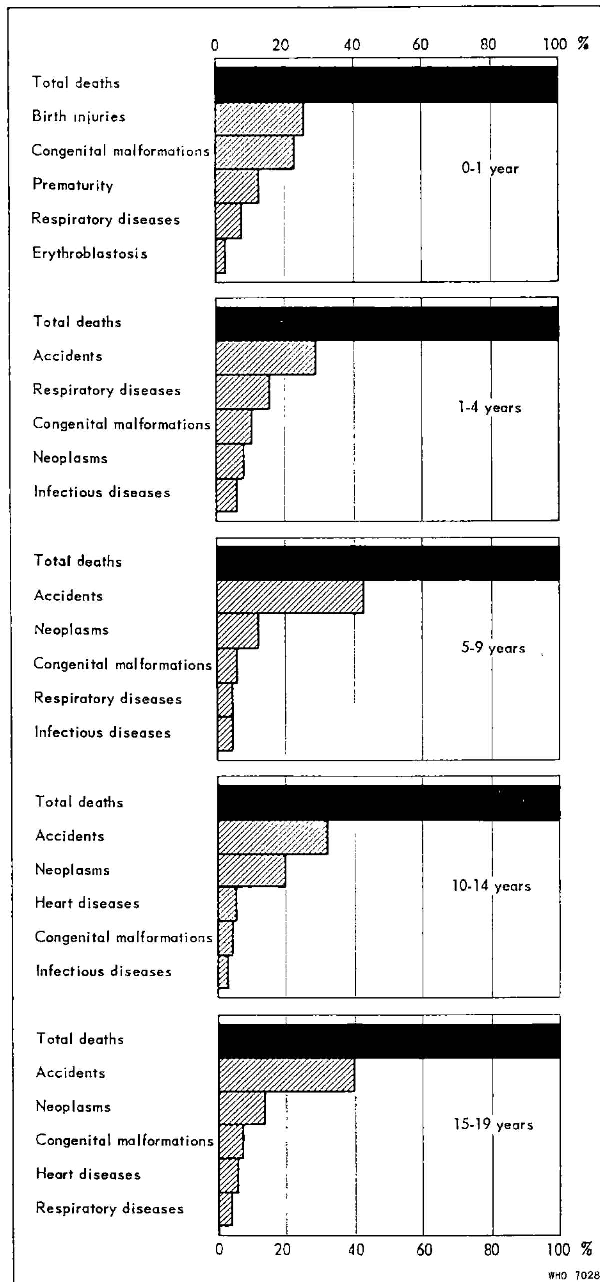
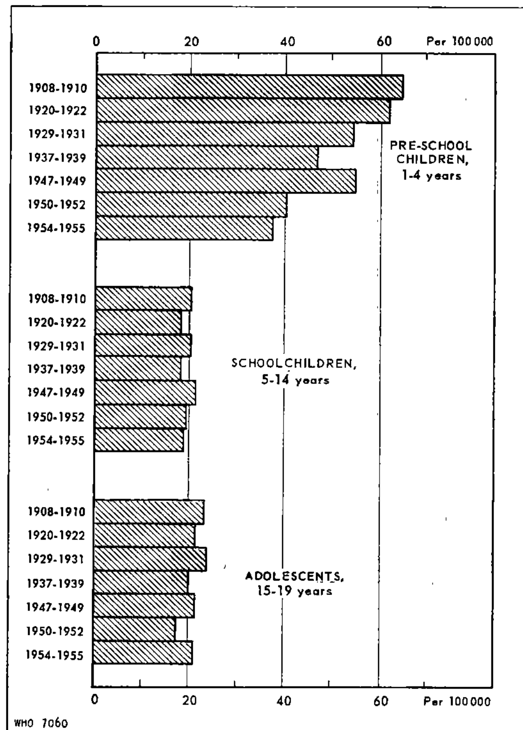


FIG. 4. ACCIDENT DEATH-RATES BY AGE-GROUPS, AT 1-19 YEARS, IN THE NETHERLANDS, 1908-1955



for girls in one non-European country is the highest rate of all for girls in the countries studied, and the rate for boys exceeded that of several European countries (see Table I).[1] Examination of the causes shows considerable variations from country to country and by age and sex. This emphasizes the need for more detailed investigation of mortality data.

In the United States and Canada, about one quarter of all the deaths that occur annually among pre-school children and one third of those at the elementary school ages result from mishaps of one kind or another. Accidents kill more than twice as many pre-school children as measles, scarlet fever, whooping cough, diphtheria, dysentery, tuberculosis, and poliomyelitis combined.

In considering the importance of accidents as a health problem, the fact that children or adolescents are relatively the most hard hit sections of the population is of considerable economic significance. This has been demonstrated by statistical studies of " total life " or " working life " lost through death from different so-called leading causes of death. Through this technique the effect of accidental death on a nation's productivity can be more readily appreciated.

Morbidity

As section 1 shows, mortality data do not in themselves give a complete indication of frequency or of social and economic consequences of

[1] Swaroop, S., Albrecht, R. M. & Grab, B. (1956) Deaths from accidents among children. *Bull. Wld Hlth Org.*, **15**, 123

TABLE I. SPECIFIC DEATH-RATES PER 100 000 POPULATION IN THE AGE-GROUP 1-19 YEARS FOR VARIOUS TYPES OF ACCIDENTAL DEATHS BY SEX IN TWELVE COUNTRIES, 1951-53

Code number	Type of accident (Intermediate List, 1948)	Australia		Canada		Ceylon		England and Wales		France		Germany, Fed. Republic *	
		M	F	M	F	M	F	M	F	M	F	M	F
AE138	Motor vehicle accidents	21.5	7.4	21.9	11.3	1.9	0.9	11.8	4.7	6.8	3.1	15.1	5.9
AE139	Other transport accidents	3.9	0.9	4.1	0.8	0.9	0.1	1.9	0.4	0.8	0.3	4.2	1.5
AE140	Accidental poisoning	1.5	1.2	1.1	1.0	1.0	0.8	0.6	0.5	0.7	0.8	0.9	0.7
AE141	Accidental falls	1.5	0.6	1.9	0.7	3.6	0.4	1.6	0.5	1.1	0.4	2.7	0.8
AE142	Accident caused by machinery	0.5	0.2	1.7	0.3	0.0	0.0	0.2	0.0	0.1	0.0	0.5	0.0
AE143	Accident caused by fire and explosion of combustible material	1.1	1.7	4.6	3.9	3.0	8.8	0.7	1.6	0.2	0.1	1.0	0.4
AE144	Accident caused by hot substance, corrosive liquid, steam, and radiation	1.4	0.9	0.8	0.5	0.7	0.8	0.5	0.4	2.1	1.8	3.5	2.1
AE145	Accident caused by firearm	2.4	0.3	2.0	0.3	0.4	0.0	0.4	0.0	0.6	0.2	0.4	0.0
AE146	Accidental drowning and submersion	10.5	2.9	14.4	2.8	11.2	9.6	5.0	1.0	7.4	2.7	9.8	2.6
AE147	All other accidental causes	5.0	1.9	4.6	1.5	7.6	4.6	2.8	0.9	9.0	3.4	7.6	1.8
AE138–AE147	All accidents and poisonings	49.4	18.0	57.1	23.1	30.3	26.1	25.6	10.1	28.8	12.7	45.7	15.8
	Ratio of male to female death-rate	2.7		2.5		1.2		2.5		2.3		2.9	

Code number	Type of accident (Intermediate List, 1948)	Italy		Japan		Netherlands		Sweden		Switzerland		USA	
		M	F	M	F	M	F	M	F	M	F	M	F
AE138	Motor vehicle accidents	8.7	2.5	5.8	2.8	11.0	5.0	15.4	5.8	14.2	6.9	20.1	9.1
AE139	Other transport accidents	2.0	0.5	4.3	1.7	3.3	1.7	4.4	0.8	3.2	1.6	2.3	0.6
AE140	Accidental poisoning	0.7	0.4	0.7	0.4	0.6	0.4	0.3	0.4	0.8	0.5	1.3	1.0
AE141	Accidental falls	3.5	1.1	2.5	0.7	1.7	0.6	1.3	0.4	5.9	1.6	1.7	0.7
AE142	Accident caused by machinery	0.2	0.0	0.4	0.1	0.4	0.1	0.5	—	0.4	0.2	1.2	0.2
AE143	Accident caused by fire and explosion of combustible material	0.5	0.6	1.5	1.2	0.4	0.2	0.9	0.8	0.9	0.3	3.3	4.0
AE144	Accident caused by hot substance, corrosive liquid, steam, and radiation	3.0	3.0	1.4	1.3	0.9	0.7	0.5	0.3	2.3	2.5	0.5	0.5
AE145	Accident caused by firearm	0.7	0.2	0.2	0.0	0.1	—	0.4	—	0.5	0.2	2.9	0.5
AE146	Accidental drowning and submersion	6.3	1.9	22.2	11.6	11.9	3.6	12.8	2.6	10.7	2.8	8.2	1.9
AE147	All other accidental causes	3.9	1.6	5.6	2.9	8.0	5.8	3.3	0.9	6.8	3.1	4.3	1.8
AE138–AE147	All accidents and poisonings	29.6	11.8	44.6	22.7	38.4	18.2	39.8	12.0	45.5	19.7	45.8	20.1
	Ratio of male to female death-rate	2.5		2.0		2.1		3.3		2.3		2.3	

* For the years 1952–53 only

accidents. Just as only a small part of an iceberg is visible, so death-rates reveal only a small fraction of the child accident problem. Before one can even begin to comprehend the immense task of accident prevention in childhood, account must be taken of all the relatively trivial injuries such as bruises, cuts, burns, broken bones, and non-fatal poisonings, adding to these the countless times when children escape injury by the skin of their teeth.

There are many practical, financial, and technical difficulties involved at present in assembling significant morbidity data. In some countries surveys have been made which give a certain measure of the magnitude of the problem, but the varying definitions and methods used make comparison impossible. For example, in the United States, a house-to-house study, made by the Public Health Service in one health district in 1938-43, disclosed that children under five are subject to an accident rate of 207 per 1000 of the population, compared with an over-all rate of 125.[1]

Some measure of the frequency of accidents to children is obtained from the British survey of 1000 children born in the Newcastle area in the year 1947. According to the records, 61 children in this group suffered a total of 66 accidents in their first year of life.[2] Rowntree, in another study on children under two years of age, found that this group was subject to an accident rate of 80 per 1000.[3]

In California, where a survey of morbidity is being conducted throughout the State, the accident rate for children from birth to four years of age was found to be 1199 per 1000 per annum and for those between 5 and 14 years, 954, as compared with a rate for all ages of 772.[4] The survey collected information on all accidents in the household during a four-week period at the time of the survey visit. The rate in respect of all disabling accidents at all ages was 150.8 per 1000 of the population per annum.

In general, statistics concerning motor-vehicle accidents lack a satisfactory and accurate reporting basis for inter-country comparison. One basis frequently used is the number of persons killed per 10 000 motor vehicles registered. Such figures are useless unless account is taken of

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[1] Collins, S. D., Phillips, F. R. & Oliver D. S. (1953) *Accident frequency, place of occurrence and relation to chronic disease*, Washington, D.C. (US Public Health Service, Public Health Monograph No. 14)

[2] Spence, J. et al. (1954) *A thousand families in Newcastle-upon-Tyne*, London

[3] Rowntree, G. (1950) Accidents among children under two years of age in Great Britain. *J. Hyg. (Lond.)*, **48**, 323

[4] California State Department of Public Health (1955) *Home Safety Project : annual report*, Berkeley, Calif.

the frequency of use, the length and type of roads, the proportion of bicycles to motor vehicles, and other such pertinent facts.

The extreme variations in the studies mentioned above illustrate the difficulties to be faced from the standpoint of comparability of accident statistics. Apart from this defect, more information on non-fatal injuries and accidents is also essential for planning accident-prevention programmes. In several countries valuable research involving the observation of groups of children from birth onwards is now going on. Particular study of the ones who have suffered accidents should provide useful data, not only because of the relative completeness of the investigations, but also because both pre- and post-accident examinations will have been made.

3. INFORMATION ON MORTALITY

Importance of early availability of data and of fuller information

From the working papers and observations of members of the Group it is clear that the main causes of fatal accidents differ somewhat from country to country and by age and sex. This tends to emphasize the need for assembling more data on these matters for purposes of inter-country comparison. Nevertheless, the mortality data at present available in most, if not all countries, even though incomplete, offer sufficient information of value for preventive work. Thus, if it is known that traffic accident deaths are concentrated more heavily at certain times of day, in certain localities, or under certain road conditions, this will enable safety precautions to be intensified.

Despite the difficulties involved, it is important that mortality data be made more quickly available, as they lose much of their value for programme development and community education when out of date. For example, from the preventive standpoint, the information on deaths from drowning should be published during the summer months. In the case of special problems and of major accident mortality causes, even if nation-wide mortality data cannot be prepared in a short enough time, limited surveys or sampling techniques could be of great value for public education.

The view was expressed that, while it is comparatively easy in most countries to obtain road-accident statistics from police files, it may be going beyond the normal possibilities of a national statistics service to provide other figures very rapidly.

To sum up, the Group feels that detailed statistics can wait for a limited period, but from the standpoint of prevention there is real value in the

routine production of current figures which, though perhaps inaccurate in detail, show week by week or month by month the numbers and causes of accidents.

Problems associated with fact-finding

Work is going on in some countries to improve the reporting of fatalities resulting from traffic accidents. In France it has been possible, with the co-operation of the police, to obtain more rapid and complete reporting of road-accident deaths. Prior to the present arrangement, statistics on road fatalities based on physicians' death certificates indicated about 4000 deaths annually. With reports supplied by the police it has been possible to arrive at a figure of approximately 8000 deaths annually. This is considered to be more nearly representative of the actual situation.

Discussion revealed a difficulty experienced in several countries, namely, that of obtaining adequate information from physicians on the cause of death where this is the result of an accident, because such information is not a legal requirement. In a number of countries, too, difficulties in obtaining exact information arise when there is a considerable time-lag between the accident and the fatal issue.

In Belgium, efforts have been made to obtain better drafting of the death certificate. When accidental death is in question the physician is in a good position to describe the lesions and clinical features, but he often has little idea of the circumstances of the accident and no ready means of obtaining information on these. This is why so many unknown causes of accidental death are reported. In deaths due to burns or drowning, the description of lesions and the report on external causes, which are normally filled in by physicians, generally coincide accurately.

In England, deaths resulting from accidents are reported to the coroner, and the cause of death is ascertained by inquest, following autopsy where necessary. In addition to the ordinary statement of cause of death, a questionnaire is completed which provides additional details that would otherwise be unrecorded. The place where the accident occurred, the circumstances, and main lesions are recorded. Thus, full information is obtained on every accident resulting in a death, not one of which can escape the coroner system. Police statistics on fatal road accidents differ only slightly in form from those compiled by coroners' courts.

Methods of grouping factual information on accidents

Detailed grouping should take cognizance of the purpose of the statistics. Division into " fatal " and " non-fatal " is essential, as also are particulars of the agent, and location or environment; i.e., the place where the

accident happened. The characteristics of a population are important, too. Male mortality is much higher than female and varies with each age-group. Figures should be studied for different age- and sex-groups separately.

By age

Analysis of deaths by the age-groups under one year, 1-4, 5-9, 10-14 years has revealed useful information. For example, the problem of accidental asphyxiation or strangulation is almost exclusively confined to children under one year. Accidental poisoning is most common in the 1-4 years' group. Drowning accidents are also concentrated in definite age-groups, and analysis reveals that the hazards are quite different for different ages.

Infancy. In the period of infancy proper (under one year), the physical weakness of the young child exposes it to such injuries as mechanical suffocation, unduly serious effects of falls from cot or pram, and choking by food or objects taken into the mouth. However, the child of under one year (approximately) is in a relatively protected position and for purposes of statistical information this age-group should be maintained as a separate entity.

Pre-school age. By this time the child has become active and goes out to face hazards, instead of just taking them as they come. According to a variety of experience, it has been found that about two-fifths of the fatal accidents in the 1-4 years' range take place in and around the home. In one study it was found that motor-vehicle accidents accounted for about 37% of all fatal accidents, and a high proportion of these took place near the home.[1]

In this group, burns and conflagrations together rank first as the cause of fatal home accidents. In the earlier period (1-2 years), when the child is as yet unstable in balance, a large percentage of deaths are caused by children upsetting or falling into hot liquids; not a few are trapped in burning buildings. At the later period (3-4 years), love of exploration plays a larger part, leading to injury from playing with matches, through setting fire to clothes at an inadequately guarded fire, or by probing into electrical fittings.

Children of school age. During the school period, children—and especially boys—become more adventurous. Bicycle accidents and other traffic mishaps become frequent, yet this age has the lowest fatal injury

[1] Wheatley, G. M. (1956) *Prevention of accidents in childhood*. In : Levine, S. Z., ed., *Advances in pediatrics*, Chicago, Ill., Vol. VIII, p. 195

rates. Accidents farther from home become more common as the child's field of activity widens.

Adolescents. The adolescent period also deserves special consideration. Hazards from outdoor sports—notably skiing in some countries—and games are prominent. The motor cycle and the automobile accentuate traffic risks.

To summarize the discussion on age groupings, attention is drawn to the fact that a revision of the regulations governing the publication of statistics has just been adopted by the Ninth World Health Assembly.[1] The most detailed of the age groupings for use in publishing statistics of causes of death, as amended, is : under one year ; single years to 4 years inclusive ; five-year groups from 5 to 84 years ; 85 years and over. Some countries use the age groupings : under one year, 1-4, 5-14, 15-24 years, and so on. The United Nations uses the following : under one year, 1-4 years, five-year groups from 5 years upwards. (See section 5, page 27.) The Group agreed that the age breakdown established by WHO would separate out those age-groups that are most exposed to risks from certain hazards such as, for example, suffocation in infancy ; drowning in wells and shallow pools at two and three years of age ; bicycle accidents from five to nine years of age.

By sex

Analysis by sex as well as age reveals important differences. The aggregate accident mortality in the European region shows that the rates for boys are double or triple those for girls at most ages. The least difference is observed at the younger ages. There is a marked preponderance among boys and male adolescents of injuries associated with outdoor activities, and among girls of burning accidents caused through the wearing of light flammable clothing.

By cause

Motor vehicles are responsible for the largest share of accident deaths in most European countries (see Fig. 5)[2].

The increasing significance of traffic accidents as a cause of accidental deaths is a striking fact that is well illustrated by Fig. 6 (personal communication from B. J. van den Berg).

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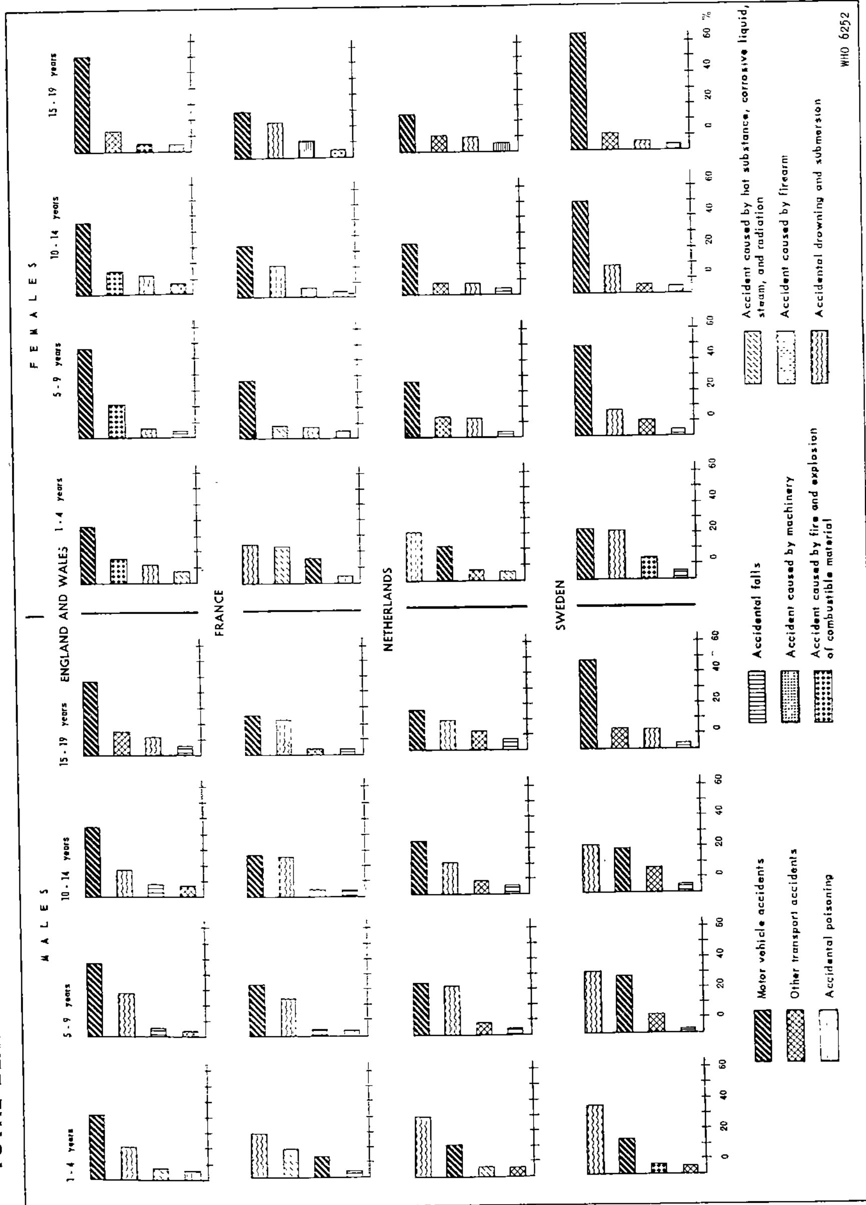
[1] Resolution WHA9.29, adopting Additional Regulations of 21 May 1956 amending the Nomenclature Regulations, 1948. *Off. Rec. Wld Hlth Org.*, 1956, **71**, 28, 424

[2] Swaroop, S., Albrecht, R. M. & Grab, B. (1956) Deaths from accidents among children. *Bull. Wld Hlth Org.*, 15, 123

FIG. 5. PERCENTAGE OF DEATHS FROM THE FOUR LEADING CAUSES OF ACCIDENTAL DEATHS TO TOTAL DEATHS FROM ACCIDENTS AT 1-19 YEARS, BY AGE AND SEX, IN FOUR COUNTRIES, 1951-1953



Other factors

Another example of information helpful for preventive measures that is obtainable from more detailed analysis of mortality statistics is shown in

FIG. 6. RELATIVE IMPORTANCE OF MAJOR CAUSES OF ACCIDENTAL DEATHS AMONG SCHOOLCHILDREN (5-14 YEARS) IN THE NETHERLANDS, 1920/22 AND 1954

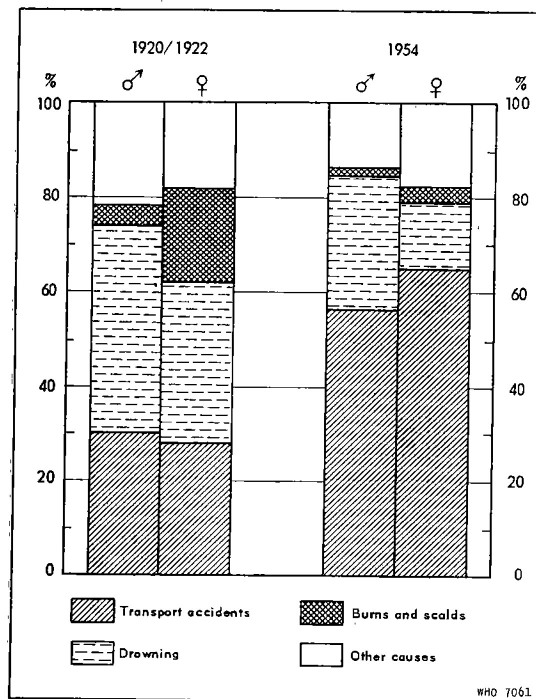


Fig. 7 (personal communication from B. J. van den Berg). For children 1-14 years of age, a seasonal influence is evident on transport accident mortality as well as on other forms of accidental death. In the summer, mortality from accidents in childhood reaches its peak. The circumstances in which many children spend their holidays are obviously too dangerous. This knowledge can contribute to well-directed preventive measures.

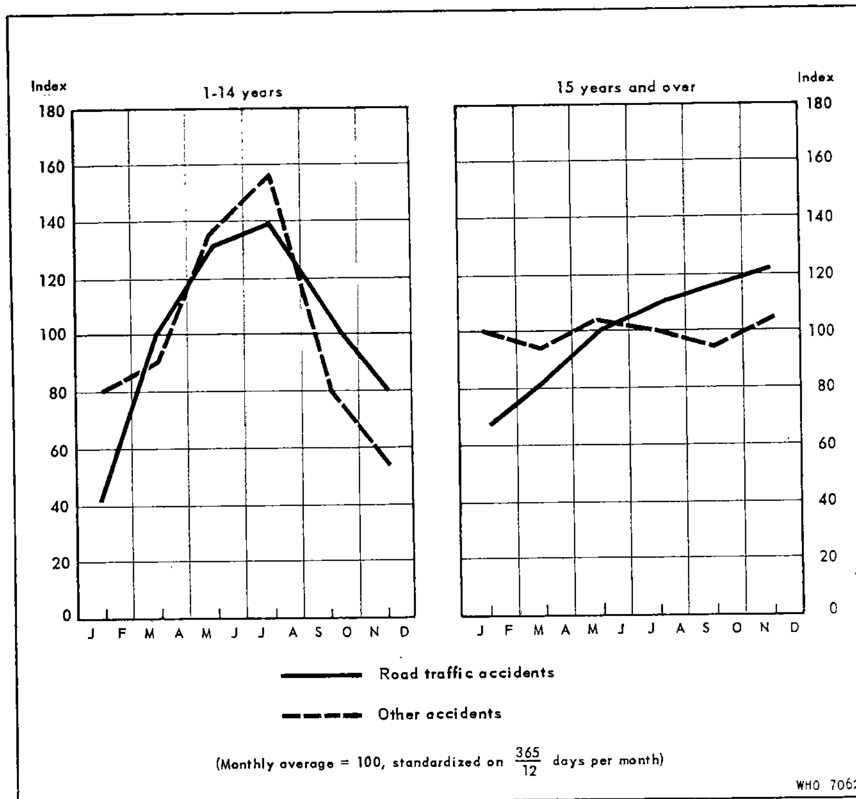
Summary

In the light of such studies as are cited above, the Group thought it desirable that accident statistics should provide more details of age, sex, and cause. The view was expressed that some countries would have difficulty in achieving this objective, and several members felt that it would be easier to secure more detailed data on one or two types of fatal accident, such as, for instance, motor-vehicle accidents and drowning.

It is the opinion of the Group that all statistical studies on accidents should include data on both fatal and non-fatal accidents. WHO has hitherto been furnished with mortality figures only for countries as a whole. Further investigations are necessary at the local as well as the international level. However, some conclusions stand out clearly and the Group wishes to emphasize the following points :

1. Deaths resulting from accidents are gaining in importance among children today because deaths from other causes have been reduced.

FIG. 7. SEASONAL TREND OF DEATHS FROM TRAFFIC AND OTHER ACCIDENTS IN THE NETHERLANDS, 1954-1955



2. Accident mortality depends on the peculiarities of the situation in which the population is living. It is noted that, in some countries, although the number of motor vehicles in use is rising, the accident rate is not increasing in like proportion.

3. The main groups of fatal accidents in children are those caused by : (*a*) motor vehicles ; (*b*) drowning ; and (*c*) fire and burns. The proportion varies from one country to another.

4. There is a limit to the uses to which mortality figures can be put at the international level. Much more can be obtained from such data at the local level, through studies involving more efficient classification and intensive study of limited material.

4. INFORMATION ON MORBIDITY

Need for morbidity data to complement mortality statistics

Morbidity statistics are not generally available (except in respect of road accidents in some countries) ; accordingly, to obtain them would call for special arrangements. The question therefore arises of whether there is a real need for morbidity studies where good, well-grouped, up-to-date mortality figures are already available. The answer to this question can be summed up as follows :

1. Morbidity studies can be designed so as to give more detailed circumstantial information of value for programme development, on such matters as how and why the accident happened, and where it occurred (home, playground, school, etc.).

2. Morbidity studies may expose an accident problem of unexpected proportions. For example, mortality from accidental poisoning is low in most countries. Where morbidity studies have been made, however, a high frequency of accidental poisoning was disclosed. This knowledge led to the development in the countries concerned of a more effective treatment and prevention programme.

3. Morbidity statistics are particularly helpful in respect of the school-age groups where mortality rates are low. Studies show that the accident rate is still high in these older child age-groups.

It is noteworthy, however, that morbidity studies reveal only the accident pattern for a given region at a fixed time, and are influenced by geography, customs, technical development, and medical care. In general, their findings are not applicable to other regions or periods.

The Group stressed also the need for having a specific goal for accident studies ; from the start, the type of study to be undertaken in order to attain the goal must be determined. Expenditure in time and money must, of course, be taken into consideration, too.

Different types of morbidity investigations

Different types of morbidity studies are possible, each one having good points and limitations :

1. Investigations of special types of accident and/or selected groups, e.g., schoolchildren ;

2. Examination of hospital and/or private practitioners' records ;

3. Surveys of a population sample, covering either illnesses and accidents, or accidents only ; these involve, as a rule, house-to-house interviewing.

Studies of a special type of accident (as, for example, poisoning, traffic accidents, eye injuries) can be made more or less intensive, according, for instance, to whether they are based on hospital records only or on detailed investigations with a follow-up of patients. If based on available material, the study will cost rather less and may be carried out in a reasonably short period of time. Another type of special morbidity study is that focussed on one group of children (as, for example, children in schools, nursery schools, holiday homes, and so on). Provided their terms of reference are strictly defined, such studies are very useful, since they show the incidence of accidents for a given age-group or the special risks connected with specific surroundings—school buildings, playgrounds, etc.

Hospital morbidity research has almost always to take the form of special studies, because the classification used in hospitals gives only the clinical diagnosis (N Code). However, careful analysis of the material will very often produce valuable details. This type of study is to be recommended at the outset, as it is inexpensive and gives a review—even if not entirely representative of the population—of accidents which require treatment or medical care. The same applies to studies based on private practitioners' records.

In order to obtain information on accident risks, probabilities, rates, and so on, recourse is necessary to morbidity surveys which enumerate the occurrence of accidents in a known sample of the population. These may be carried out, either as long-term follow-up studies—where a large group of children are investigated over a number of years and all accidents are recorded by special forms and interviews—or, as general surveys. Such studies can be of considerable value for furthering preventive work and for evaluating preventive methods, depending on a careful choice of the population sample, and on the form of recording and interviewing. Definition of an accident is a further essential. The time factor is also important in accident recording, since minor injuries are soon forgotten, whereas serious ones will be remembered for a long time. Survey methods are discussed further in section 5 (see page 26).

To sum up, the Group agreed that morbidity studies—as carried out by local communities or health departments—aid in detecting local accident problems, give more detailed information on risks as regards time, season, period of the day, etc., and may reveal important contributing factors due to environmental and social conditions. Many of these facts would not be disclosed by the usual mortality data. It has also been shown that such studies are of help in building special preventive programmes and that they

provide data capable of convincing local authorities of the importance of accidents and of the necessity for official participation in the organizing of preventive work. They are useful, too, in demonstrating hazards and in securing the co-operation of architects, engineers, designers, and so on, in efforts to eliminate these.

Evaluation of accident prevention

Using statistics as a science has to be regarded always as a process of evaluation. For example, by compiling mortality and morbidity statistics, trends can be demonstrated which point to the effects of measures taken or give a stimulus to new efforts. This is the way in which statistics showing the volume of mortality due to traffic accidents have drawn the public's attention to this problem, and shown that safety measures are not sufficiently developed.

At the present time, economy and efficiency require that the means of evaluating preventive work should automatically be at hand whenever public-health activities of the kind are started. The systematic assessment of progress towards a pre-determined goal is essential.

For individuals concerned with accident prevention as a public-health activity, evaluation should represent a state of mind or attitude towards the work they are carrying out. It cannot be too much stressed that this should be an objective attitude on the part of all concerned in the preventive field.

5. DESIGN OF STATISTICAL STUDIES AS A BASIS FOR PREVENTIVE WORK AND FOR ITS SUBSEQUENT EVALUATION

Uses to which statistics on child accidents may be put include the following :

1. Determination of the extent of the problem : mortality data, supplemented by morbidity data.

2. Planning the best means of reducing different types of accident : information on causal factors.

3. Evaluation of control programmes : morbidity data. Mortality data will often be inadequate for this purpose, since control is carried out locally and the number of fatalities in accidents of certain types is small.

4. Planning of safety campaigns and educational programmes.

It should be emphasized that the established national statistics services are able to provide valuable data on fatal accidents which, when properly

studied, can throw light on major factors involved in deaths due to accidents in a given country. In fact, it is recognized that in many countries mortality data alone may be for some time to come practically the only comprehensive organized source of information on accidents. For the purpose of analysing the accident situation, particularly among young children, it may be desirable and feasible to present mortality figures broken down into narrower age-groups than is often the case at present. Further, it may sometimes be found possible, particularly for propaganda purposes, to prepare tentative advance material on the mortality situation before the final figures for any one year can be worked out, as is already done in some countries.

It must be realized, however, that the particulars given by the physician certifying the cause of death may be limited to a large extent to the injuries sustained and may not always provide adequate information on the etiology of accidents ; this may have to be sought by additional inquiry.

As mortality data cannot alone give a complete indication of the frequency of many types of accidents or of their social and economic consequences, statistical information on non-fatal accidents is needed. This is not likely to be available at present on a full nation-wide scale in any country. Morbidity statistics on child accidents are therefore to be sought either as a component of existing general morbidity studies or through specific *ad hoc* inquiries.

Various sources of morbidity statistics are mentioned below. A good deal of information of a statistical nature bearing on the problem of accident prevention is already available from several of these sources, and it is suggested that this material should be fully exploited by means of statistical studies.

The Group considered it to be of value to suggest, for those countries which might wish to use it, a suitable form of schedule for the collection of information on which to base accident prevention work and its subsequent evaluation, and to make certain observations of a statistical nature having a bearing on problems of accident prevention.

The schedule, as drawn up, is merely meant to provide a preliminary guide to the planning and evaluation of public-health services in accident prevention, since the Group recognizes that statistical methodology in the morbidity field has not yet been standardized. The headings cover, not the maximum information that could be produced, but rather a reasonable minimum. Since the countries of the European Region are in general well advanced as regards statistics, the standards have not been set at a low level.

Although this section is primarily concerned with information of a statistical nature only, it is suggested that non-statistical information

needed for preventive action should also be assembled at the same time.

To acquire significance, the items suggested for inclusion in the schedule should not only be studied separately, but also in relation to each other. In an epidemiological investigation the ideal is to have the number of accidents related to the actual population at risk, and all inquiries, whether on a national, local, or *ad hoc* basis, should aim at this ideal. Wherever possible, the factors contributing to accident causation (such as, for example, number of motor vehicles, mileage driven, open fires, electrical fittings) should also be reckoned up and related to the number of accidents. As stated already, these items by no means cover all the factors or circumstances, nor does the order of their listing indicate relative importance. Additions to the schedule may be necessary to suit local conditions and, above all, the specific objectives of the inquiry. The schedule is intended to facilitate inquiry into individual cases. Not all its elements are directly transferable to analytic statistical tables.

Inasmuch as the Group has emphasized the importance of collecting epidemiological data in respect of accident causation, it is axiomatic that the same care as goes into the recording of case histories of hospital admissions due to other causes should be observed in compiling accident histories.

Suggested form of schedule

1. Name, additional identifying details if necessary, home address

2. Date of birth

3. Sex

4. Date, day of week, and hour of accident

5. Place of accident : home, institution, farm, place of recreation or sport, street or highway, public buildings, or other specified places

   5.1 Location in premises where accident occurred

6. Type of accident : motor vehicle ; other transport ; poisoning ; fall ; machinery ; fire and explosion ; hot substance, corrosive liquid, and steam ; radiation ; firearm ; drowning and submersion ; other

   Note : Information to be supplied should be sufficient, not only to indicate the type of accident as listed here, but also to allow the accident to be assigned to the correct individual rubric of the E (External Cause) Code of the International Statistical Classification of Diseases, Injuries, and Causes of Death.

7. Nature of injury

   Note : Information to be supplied should be sufficiently detailed, not only to indicate the nature of the injury, but also to allow it to be assigned to the correct individual title of the N (Nature of Injury) Code of the International Statistical Classification of Diseases, Injuries, and Causes of Death.

8. Supervision of child at time of accident: under direct supervision; supervised in a group; non-supervised

9. Hospitalization: duration as in-patient; duration as out-patient

10. Result of accident

    10.1 *Death:* date of death
    place of death

    10.2 *Disability:* permanent
    temporary (state duration)
    none

    10.3 *Nature* of disability, if any

11. Responsibility of child

    Note: The purpose of this item is to distinguish between accidents which occur owing to the lack of knowledge or foresight on the part of the victim by virtue of his being a child, as distinct from accidents in which a child was involved, but where the fact of his being a child played no part in the causation of the accident.

12. Size of family

13. Number of other persons injured

The Group stresses the importance of uniformity in methods of classifying or grouping the data by adhering to the rules and procedures specified in the WHO Nomenclature Regulations, 1948, as amended by the Additional Regulations of 21 May 1956, particularly in respect of age grouping; and to the classification of injuries and causes of death according to the E (External Cause) and N (Nature of Injury) Codes of the International Statistical Classification of Diseases, Injuries, and Causes of Death. The age groupings should, as a minimum, identify the following groups: under 1 year; 1 year and under 5; 5 years and under 10; 10 years and under 15. Under certain conditions and for particular purposes, a more detailed age grouping may be necessary.

Sources of information

For the purpose of planning, administering, and evaluating a prevention programme, there are many sources of morbidity or mortality statistics on accidents that may be of use, each with its own limitations. The Group sets forth below various such sources, without passing any opinion on their respective merits. Selection and combination of the sources to be used will depend upon local circumstances. At the same time, several sources taken together may provide fuller information than a single one. In tapping these sources, it is essential to have the co-operation of the persons responsible for making available the information, if reliable and useful data are to be obtained.

1. Mortality records

2. Records of accidents treated in hospitals and dispensaries

3. General practitioners' records

4. School health statistics

5. Social or private insurance records

6. Preventive child health service records, particularly those where home visiting is done

7. Special morbidity surveys, including longitudinal surveys

8. Records of police and other services concerned with particular types of accident

9. Records of special organizations concerned with accident problems

Combination of sources of information is likely to enhance considerably the value of each one's individual contribution. Thus, in hospitals, a series of post mortem findings can be supplemented by records from the hospital case histories and, again, by information obtained through home visits by special investigating staff.

The Group wishes to emphasize the necessity for a clear understanding on the part of all concerned regarding the definitions of the terms used, so that comparability can be ensured. In this regard the definitions already formulated and given in the *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death* (section on accidents, poisonings, and violence) should be followed in so far as they are applicable.

In stressing the need for inquiries into morbidity to supplement the information available from mortality data, the Group wishes to draw attention to the possibilities offered by special inquiries of limited scope directly aimed at establishing the ratio between numbers of fatal and non-fatal accidents of particular types and the collecting of information on the degree and length of disability resulting from non-fatal accidents. In such studies it would be necessary to establish standards of " seriousness " of non-fatal accidents in order to exclude trifling incidents and so not detract from the practical value of the ratios established. The Group feels that in defining " seriousness " it is essential to rely on objective criteria such as the type of medical care required, rather than on subjective impressions of the prognosis.

6. CIRCUMSTANCES, CAUSES, AND CONSEQUENCES OF ACCIDENTS

Circumstances and causes

Social

The proverbial phrase " accidents will happen " is an indication of a widespread, fatalistic belief that little can be done to prevent them. It is no doubt true that in spite of the most stringent precautions accidents will continue to occur, but this is no argument against making every effort to reduce them in number and severity. A number of countries have already taken effective preventive measures against some general causes of injury. Public alarm at the large number of drowning fatalities among young children in the Scandinavian countries has led to careful ascertainment of the points of greatest danger—ponds, rivers, and canals—and to protection (by fences, etc.) against them ; public seaside resorts are being provided to an increasing extent with safety patrols, boats for life-saving, and life-belts. In many countries more or less effective road safety measures have been introduced—pedestrian crossings and tunnels, roundabouts, traffic lights and other signs, the improvement and more rigid enforcement of driving regulations, greater emphasis on courtesy on the road, and the introduction of safety belts in cars and protective helmets for motorcyclists.

It is in and around the home, however, that social circumstances operate for good or ill. The poor, overcrowded home in an out-of-date, dilapidated building forms a special focus of accidents. The mother has difficulty in looking after the safety of small children when all domestic operations, such as cooking and washing, have to be carried out with inadequate or ill-designed equipment and under crowded conditions. Danger is ever present when saucepans or kettles containing hot fluids have to be placed on the floor for lack of table space ; when there is no cupboard in which medicines or dangerous substances can be stored ; or where an open fire occupies a prominent position in a small room. Dilapidation, especially when stairs and floors are broken, is a constant source of danger ; the absence of play space within or around the home forces children into the streets. Again, where families are in poor social circumstances and the mother has to go out to work, young children are apt to be left at home for considerable periods with inexperienced or no care at all. Burning accidents—the most serious of all in young children—are especially apt to occur when children are left alone. A frequent feature of indifferent social conditions is out-of-date domestic equipment—in itself a hazard. The old-fashioned open fire set just above floor level, or the ill-protected electric or gas fire, are

constant dangers, especially affecting little girls dressed in light, flammable materials. One large British department store has recently issued a notice that it will no longer sell flammable nightdresses for girls, on account of the fire hazard. Unfortunately, the provision of reasonably fire-resistant clothing is at present costly, so that those who are least able to pay stand in the greatest danger.

In recent years a number of new hazards in the home, rendering the lower economic groups especially vulnerable, have arisen. The introduction of insufficiently earthed electric wiring and cheap-quality cables adds risks to the use of radio, television and electrical fittings in many homes. In some countries safety standards for numerous articles and fittings have been introduced, but supervision is difficult and prohibition out of the question. It is noteworthy that many cases of poisoning in the United States have been associated with social conditions, that is, with the custom of having a great many medicaments in the home, and the practice of self-medication. In the United Kingdom the operation of the National Health Service has led to a similar situation by permitting the provision of drugs on an unprecedented scale. These drugs, some of them poisonous to young children, are frequently left in accessible places because there is not enough cupboard space, or because the older members of the family do not appreciate the risks involved.

An additional hazard to children, especially in rural areas, is associated with the keeping in or near the home, of chemicals such as kerosene and lye ; the use of insecticides and modern cleaning materials has created new risks which are not being met with sufficient understanding.

Apart from strictly social causes, the prevalence in Sweden of poisoning from cigarette eating is worthy of mention. In the United States and elsewhere, a custom has arisen among manufacturing chemists of colouring and packaging drugs in a manner attractive to young children. In addition, the sale of drugs such as aspirin, rendered specially palatable to children, has introduced a new risk : that of poisoning from excess dosage.

In the Netherlands, petrol is used to an increasing extent for heating and cooking, and young children have been known to drink the fluid with serious and sometimes fatal results. The dangers of chocolate-covered laxatives and brightly coloured tablets of ferrous sulfate should also be mentioned. In Austria, the Government has attempted to control the production of such drugs.

It has been suggested that the increasing use of electricity may have brought about a striking change in the pattern of accidents in the home : there is growing danger of children suffering from burns around the lips as a result of holding frayed wires to their mouths. It is felt that stricter control of standards of manufacture and installation could be introduced

by the authorities, including the siting of electric points out of the reach of small children, or at least protected from prying fingers.

Physical and environmental

The physical circumstances surrounding accidents among children are important in relation to the age of the child, exposure to harmful influences, and appreciation of risks involved. In a relatively simple rural community, wind and weather, hill, river, and lake are potential causes of accident.

In the beginning of acute illnesses children may be irritable, restless and unhappy—an emotional state which may render them particularly liable to accident. They may also be clumsy in managing activities which they usually do very well. The same temporary emotional and physical states can be found in convalescence, or at times of extreme physical or mental fatigue. This may explain the increasing accident rate reported by several investigators among children towards the evening and in younger children before sleep. Among other factors, the importance of diminished blood-sugar level has been stressed, not only in the case of road accidents involving adults, where drivers have not had a meal for a long time, but also in children. The state caused by alcohol or drugs is another factor, and should not be overlooked as a possibility in some accidents to children. These factors, though of obvious importance in the etiology of accidents, have not received very much study in this connexion.

Further, there has been little study of the relationship to accidents in children of special physical handicaps, such as impaired vision and hearing. These may be of more significance than is now realized.

In regard to individual or family accidents, the physical circumstances have already been discussed above. The main concern in such cases is to secure early medical attention and the rapid transmission of the injured to hospital.

Mental

The statistical status of the concept of " accident proneness " is obscure ; it can be said, however, that a certain number of people may be expected to have more accidents than others and it is thus necessary to agree on expected frequencies before any one person can be regarded as unusually prone. Furthermore, data regarding accidents among groups of people engaged in the same type of work relate to persons who differ in many ways which may be of importance, as, for example in age and previous experience of the work. Such factors would affect their liability to accidents.

The Group is of opinion that persons probably do exist whose character structure renders them more liable to accident, but such persons are difficult to identify.

It is possible in some cases that children may be seeking punishment and realize their unconscious desire through an accident. In general, however, the Group feels that this is probably not a question of "accident-prone" character, but one of a temporarily variable state of mind which might render a child more prone to accidents at one time than at another.

It has been noted in some studies that a certain attitude of carelessness and instability of purpose is much more prevalent among those children who have had accidents. Children of this type often come from broken homes or problem families; their recklessness and disregard of consequences is primarily a mental factor which may at times express itself in a physical behaviour, resulting in unforeseen accidents. Little research has been done in this field.

Accident consequences: individual, social, mental, and economic aspects

It is impossible to determine the whole range of social consequences of an accident to a child, or even its ultimate cost to the community. The general picture of accident consequences is fairly clear, but the findings in the case of children are meagre. One survey,[1] made in an orthopaedic hospital and covering 457 cases of burning accidents among children, disclosed that the total hospital stay for the whole group exceeded 90 000 days, at a total cost of over half a million dollars. The difficulties inherent in treating such cases are the repair of damaged tissues and the rehabilitation of the patient after disfigurement.

In accidents involving disfigurement or disablement, the cost of litigation is usually very high, and the compensation awards suggest that public opinion places a high monetary value on the results of accidents to children. It seems likely that the simplification of legal proceedings would reduce anxiety in the parents and, to some extent at least, the suffering and fears of the injured child.

The Group generally agreed that the hospital itself is suitable for the study of the after-effects of accidents. In Kansas, a survey [2] covering an entire year was made, with the object of collecting information on the care of injuries and the cost of treatment. In all, 3289 injuries were reported, two-thirds of which occurred in the 0-14 year age-group. A total sum of $98 000 was expended for medical care, yet this group represented less than 5% of the total number of home injuries incurred in Kansas during the year in question.

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[1] Bleck, E. E. (1955) Causes of burns in children. *J. Amer. med. Ass.*, **158**, 100

[2] Kansas State Board of Health (1955) *An experience in development, with Kansas Blue Shield. A study of non-fatal accidents*, Topeka, Kans.

In another study,[1] carried out in Illinois, an estimate was made of the cost of rehabilitation. 227 children were under care ; two out of every five injuries were due to burns. The average cost per accident was found to be $700, and that per case of burns, $1000.

In the United States of America lead poisoning has occurred among children in slum areas through the licking of old lead paint from neglected doors, walls, and porches. Similarly, cases of lead poisoning with serious results occurred recently in England when a dump of old car batteries was used for burning in open fires. The main consequence of these and similar accidents is not infrequently a change in public opinion in favour of protective measures. It is not as a rule necessary to seek legal protection, for the pressure of opinion is generally sufficient to prevent industrial firms from continuing to use dangerous substances. It is often possible to secure by voluntary action the acceptance of safety measures and standards for the manufacture of substances, such as paint, so as to reduce the risks to a minimum. In the last resort, however, it may become necessary to have enforceable legal measures, as when the provision of fireguards or the efficient earthing of electrical circuits was made compulsory.

Rehabilitation measures present a more serious problem in relation to severely crippled children than they do in the case of adults. Adults as a rule require only a short term of re-training after an injury to fit them for their previous work, or at least for employment in the same industry. The injured child, on the other hand, usually has to undergo a long and costly period of vocational training to render him capable of competing for employment, or even of taking sheltered employment.

On the psychological side, it is relatively seldom that children are affected by traumatic neurosis. On the other hand, parents not infrequently show emotional reaction to a child's accident or injury which can result in a degree of over-protection harmful to the child's emotional development. It should be a fundamental principle that a child who has suffered injury should be re-admitted to an ordinary school whenever possible. Special schools should be reserved for cases in which there is no hope of restoration of function, or when blindness, deafness, or other permanent disablement necessitates specialized re-training measures. In practice, it has been found that the overwhelming majority of crippled children are anxious to stay on in an ordinary school and consider the minor disadvantages of their condition a small price to pay for the privilege of normal education.

A more serious state of affairs arises in some countries when injured children are not sent back to school and lose their chance of education because of lack of follow-up measures. They thus suffer the double handicap

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[1] Zook, R. E. (1953) Shows dollar-cost of hospitalized accidents. *Safety Educ.*, **32**, 10

of physical injury and mental—or educational—disability. Many of these children inevitably become lonely and forgotten as adults, are not able to earn a living, and are a burden to the community as well as to themselves. It is of the utmost importance that there should be follow-up of all cases of children suffering from disabilities, whether caused by accident or sickness.

In some countries cases of crippling are compulsorily notifiable to the health authorities, whose duty it is to make appropriate arrangements for both medical care and continued education. In Norway, provisions of this kind came into force in 1936. School attendance is compulsory up to 15 years, and every effort is made to secure complete rehabilitation, either by teaching a trade or by providing education at the professional level.

In severe crippling through accident, especially when this involves sudden loss of sight or hearing, it is vital to start measures of re-education with the least possible delay. On the physical side, specialist care should be undertaken as soon as possible and continued so long as there is hope of fuller restoration of function. Examples of unskilled care and neglect with tragic consequences emphasize the importance of this phase of prevention in an accident programme. It is of the utmost importance, however, that an injured child's education should be continued while he is under treatment in a hospital or other institution. It is hard to make up a substantial loss of schooling in a growing child and the addition of educational backwardness to physical injury is to be avoided wherever possible.

7. PREVENTION

Review of general principles

The Group did not consider that a very detailed examination of the various possible measures for preventing accidents in childhood would serve a useful purpose at the present stage. However, a short review of the general principles involved may be of value.

The cardinal bases of accident prevention fall into three categories: education; engineering; regulation and law enforcement.

Education

The Group agreed that the key-note of prevention is education in the widest sense of the word. It is an essential part of education, by parents and school, to make the child aware of the accident hazards of every-day life and of the means of avoiding them.

Although this kind of education is more effective as children mature, it is clear from experience that even toddlers can be taught simple but

important steps in self-protection, as, for example, care in avoiding hot objects and dangerous play areas. At this young age, the practical demonstration is of particular value. For a small child to be allowed, for example, to light a match under supervision—something that would be dangerous if the child were to do it on his own—is to teach the child the safe or proper way, and affords some protection against that particular hazard. Even a very young child can be taught by demonstration the risks of interfering with electrical fittings. Training in how to behave as a pedestrian in modern road traffic is another example of education that should start very early in the life of every child in modern society, to be extended later to usage of the road as a cyclist, etc.

The younger children, including infants, obviously require a large measure of protection. Here again, education plays a primary role—education of the parents in the particular hazards to which their growing children are subject at specific ages. Nurses, health visitors, doctors, and others, should be trained to note accident hazards. It should be their task, also, to point out hazards and the importance of safety training for children when meeting parents at the surgery or on home visits.

Engineering

Education of important groups outside the family circle is also required : for instance, of the toy manufacturer in how to make his products accident-proof, of the town planner in providing adequate playing space, of the architect in making houses and flats safe against accident ; of the legislator in instituting the necessary legal measures where other steps do not suffice.

Elsewhere in this report, examples have been cited showing the importance of this type of preventive action. A most impressive illustration comes from the United Kingdom, where re-designing of open-fire guards has been a major factor in reducing burning accidents. In the United States, too, the co-operation of engineering groups has been enlisted through the American Standards Association for the purpose of developing manufacturing standards for products designed for children.

Regulation and law enforcement

Legislation may be said to complete the tripod upon which sound accident prevention programmes are supported. The Caustic Poisons Act in the United States has virtually eliminated lye poisoning in most parts of the country. Legal measures to require the covering of dangerous pools and wells in Norway is another example of this means of accident prevention. Road safety is, of course, dependent to a large extent upon law. Compulsion for motorcyclists to wear metal or plastic helmets and the

closing of certain streets to road traffic in order to provide more play space for children in congested cities are further illustrations of the use of regulation and law enforcement.

Clearly, many of the measures referred to above are not specifically aimed against accidents in childhood ; they are for the benefit of the population in general. The strict official control of electric appliances and hot water and other heating units in homes is an example. A further illustration is to be found in the important activities for improved road safety, which are being carried out in most countries and which have been instrumental in diminishing traffic risks for children. In this connexion, the Group listened with great interest to the account by the representative of the Economic Commission for Europe of the activities of that body's Working Party on Prevention of Road Traffic Accidents in promoting internationally co-ordinated effort in this field.

Propaganda and education—the present situation

In many European countries, agencies such as accident prevention groups, the Red Cross, the schools and insurance companies, as well as some child welfare organizations, have been actively engaged in providing information to the public about the problem of accidents in childhood. Printed material, including pamphlets, posters, and charts, have been designed to attract attention to the problem and to give guidance to parents. The United Kingdom and Sweden appear to have been particularly active in this respect.

Much of the organized accident prevention work for children in Europe is directed to traffic and road safety. This is all to the good and such activities should be increased in view of the growing importance of motor vehicles as a cause of injury to children. A substantial number of programmes should nevertheless be directed to safety in the home and its vicinity and to the prevention of drowning accidents. Many of the organizations which at present limit their efforts to traffic safety campaigns could with advantage turn their attention to other hazards of childhood as well and undertake preventive measures in co-operation with those who are primarily concerned with child welfare. In one country, for example, the paediatricians, working through their national and local committees, have been largely instrumental in developing, in co-operation with the pharmaceutical industry, measures to minimize the hazard from aspirin poisoning and, in co-operation with paint manufacturers, a standard for a paint which is safe for use on children's toys, furniture and interior surfaces. Again, paediatricians in some countries, because of their special interest in the infant and pre-school child, have led the movement to focus attention on accident prevention in this age-group—the least accessible to organised safety educa-

tion and yet the one with the highest accident mortality rates of childhood. Physicians who supervise the health of infants and children, public health nurses, nursery school teachers, and others with access to the family and homes of these small children, have begun to give guidance in accident prevention as a part of their instruction in child care.

Parents may need to be made more aware of their responsibility as teachers of their children. They may also need help from more informed sources in discharging this responsibility, especially in regard to the safe management of cycling, swimming, skiing, and suchlike activities. Here, the school has an increasingly important role to play in safety education.

For some years past, schools in many countries have been giving training in safety precautions, in regard to road safety, in particular. Some countries provide instruction in swimming and first aid, too, and on the safe use of the bicycle. The use of the home safety check-list, taken home by the schoolchild, is a part of the safety programme of some school systems. For the adolescent age-group, some countries have organized instruction in automobile driving. As exhibits, posters, films and other visual aids are further developed, the safety education programme in schools will be enriched.

Although much remains to be done, important contributions such as the encouraging developments described above have been made in many places towards the prevention of accidents in childhood through the use of effective methods of education, assisted by striking propaganda. While education and propaganda inevitably have to be adapted to different problems and conditions, it is clear that great gains can be anticipated from an international exchange of ideas and experiences in this field.

8. SUMMARY OF OBSERVATIONS AND RECOMMENDATIONS

The following summary contains the more significant observations and recommendations which developed out of the Group's work :

1. Accidents to children are a major health problem in European countries, outranking any other cause of mortality in children over the age of one year.

2. The study and prevention of accidents in childhood should receive high priority in the public-health programmes of European countries.

3. Fact-finding is basic to the development of accident-prevention programmes.

4. Mortality statistics are available in most countries. With suitable grouping and more rapid reporting and processing of data, this information will provide a useful basis for preventive measures.

5. Morbidity studies are necessary as a complement to mortality data. Significant accident problems which may be masked by low mortality can be disclosed by adequate case-finding measures.

6. The use of epidemiological techniques for fact-finding is recommended, especially in connexion with morbidity studies. Emphasis is placed on relating the incidence of accidents to the population at risk and, whenever possible, to the frequency of the hazard to which the individual is exposed. In assembling information on accidents, stress should be laid on reporting the chain of events or circumstances which lead up to the actual traumatic event. Information about social circumstances (e.g., overcrowding), and the physical and emotional condition of those involved in the accident situation, is of value for research purposes.

7. Greater uniformity and thoroughness in recording information on accidents is recommended. A basic minimum of information has been recommended (see section 5, page 26) as necessary for prevention programmes and their subsequent evaluation.

8. In regard to the question of rehabilitation after accidents, as a phase of prevention, the importance of having skilled treatment available at the earliest possible moment is stressed. Education, growth, and development problems involved in the rehabilitation of children are recognized as of the utmost importance in accident-prevention programmes.

9. Education, engineering, and adequate legislation, while not the primary concern of the Group, received consideration as elements of an accident-prevention programme. A review of certain general principles involved in these aspects of preventive work appears in section 7 of the report (see page 36).