Public Health Reports

Vol. 64 • **MARCH 25, 1949** • *No. 12*

ACCIDENT PREVENTION

Introduction

By DONALD B. ARMSTRONG, M. D.*

Accidents in the United States each year cause approximately. 100,000 deaths and result in the permanent or temporary disablement of about 10,000,000 persons. Numerically accidents represent the fourth most important cause of death. However, from the point of view of economic drain on the country and loss of productivity for which they are responsible, accidents can actually be considered as the *most* important cause of death since they generally claim their victims at a younger age than do the major chronic diseases—cancer, heart disease, and cerebrovascular diseases.

In the past, accidental deaths and injuries were accepted as more or less inevitable and their prevention considered to be outside the realm of science. A recent gradual change in this concept has been marked by some research, study, and action (chiefly in the fields of industrial and traffic safety) to correct environmental conditions and, through organized effort, to encourage or enforce individuals to follow safe practices. The success of some traffic safety programs in reducing child traffic fatalities exemplifies this type of effort. To a minor extent, this approach has been applied in the field of home safety. Up to the present time, however, insufficient research has been undertaken to determine the basic or underlying reasons as to why accidents occur; in other words, to measure the effect of individual physical, mental, psychological, and psychiatric factors upon accident causation. Obviously in the absence of such basic knowledge it has been impossible to prescribe an effective or lasting remedy.

Today, in view of the changing concept of public health, accident prevention is logically becoming a job for public health agencies, particularly with respect to epidemiological research and the determination of remedial measures. This does not mean that the pioneering efforts of many other sincerely interested groups should be discontinued or their progress in their respective fields of effort minimized.

* Second vice-president, Health and Welfare, Metropolitan Life Insurance Co., New York City.

These groups will still have an important contribution to make. It does mean, however, that official public health agencies, local, State, and Federal, must accept a broader responsibility for finding the answer to the problem of accident prevention.

Health departments contain all the elements—the epidemiological experience, the statistical knowledge, the engineering talent, the home and other contacts through the nursing services, and the educational facilities—needed to develop an accident prevention program that, with more information as to etiology, should substantially reduce the number of accidental deaths and permanent disabilities. Compared with the mortality and morbidity caused by most of the more dramatized diseases, home accidents alone present a problem of major importance. Home accidents cause well over 30,000 deaths each year and result in the injury of about 5 million people. These figures indicate that an area of profound significance for the Nation's health and well-being has been virtually ignored by public health agencies.

Evidence that home accidents have tangible and probably definitive causes lies in that fact that the number and type of accidents in any community can be predicted with reasonable accuracy once the statistical accident record in that community for several consecutive years is known. In other words, given the present conditions of ineptness and inexperience, any community can be virtually assured that approximately the same number and kind of accidents that occurred the previous year will happen again the following year. Obviously no public health agency could or would accept this kind of static and, indeed, retrogressive condition for any of the currently troublesome diseases. Even if the health department knew of no method of preventing a constantly recurring disease, much effort would be spent in finding out its epidemiological pattern and in conducting research to uncover its cause and cure. This is what must be done in the field of accident prevention. Until we know how to prevent accidents, we need to intensify our epidemiological investigations and undertake more research and demonstrations to determine practical remedial measures and effective methods for their application.

There is no simple solution to the accident problem, nor can a control program be centered exclusively on any of the various elements involved, such as education, engineering science, and technological progress, or physical status and fitness. Education is certainly important; but educational efforts must be aimed at motivation and as yet we are not quite sure how either children or adults should be motivated to prevent accidents. Engineering science cannot provide the whole answer because many people who are exposed to the same potential accident situations will not suffer any mishap, whereas the "accident-prone" individual will. We should know why. Again,

many feeble and infirm people successfully avoid injury and death from accidents year after year, while more physically robust and healthy individuals suffer repeatedly from accidents. These simple facts alone lead to the belief that there are more deep-seated causes of accidents then senility, poor health, and faulty or unsafe environmental conditions. Probably profound emotional and psychological factors are involved. The fact that in the average experience, a large percentage of accidents occur to a surprisingly small percentage of people should arouse the curiosity of any health officer. Complex, many-sided, and challenging are the factors which must be taken into account in the field of accident prevention.

Health departments, which employ qualified personnel for this purpose and are supported by adequate appropriations, working in cooperation with established safety organizations in the home, traffic, school, and industrial fields, are ideally suited to discover the answers to these puzzling questions. Until the answers are found we can predict that each year a continuing heavy volume of deaths and hospital admissions will result from accidents which can and should be prevented.

The Accident-prone Individual

By Franz Alexander, M. D.*

The tremendous practical importance of accidents in relation to our national economy is well known. Medical men, psychiatrists, psychologists, and statisticians have tried for a long time to establish precisely what is the human factor in the causation of accidents. Effective prevention requires such precise knowledge.

The contention of modern psychiatry that most accidents are not accidents at all but are caused largely by the victim's own disposition is but a confirmation of common observation. Strictly speaking, an accident is an occurrence, the cause of which is outside a person's control. A brick falling on a pedestrian's head is a completely accidental event, particularly if the pedestrian is not warned by a sign that such an event is likely to occur at a particular place. Most industrial, traffic, and home accidents, however, are of a different nature. The sufferer of the accident has some active part in its causation. It is popularly assumed that he was clumsy, tired, absent-minded; otherwise he might have avoided the accident.

From a paper presented before the Thirty-sixth National Safety Congress and Exposition, October 18-22, 1948, Sherman Hotel, Chicago, Ill.

*Director, Chicago Psychoanalytic Institute, Chicago, Ill.

Scientific scru'iny, however, has established that most accidents are not favored by such simple human qualities. Many scientific discoveries appear at the first moment unexpected and improbable. So does the fact that certain people are prone to have more accidents than others, not because they are clumsy or absent-minded, but because of the total structure of their personality. The significant factor is not a particular isolated feature such as slow reaction or lack of intelligence but something much more basic which pertains to the totality of the person as an individual. Here are a few startling facts concerning the human factor in accidents.

More than 20 years ago, Marbe, a German psychologist, established the remarkable fact that the person who had one accident is more likely to have another one than the person who never suffered an accident (*1*). Statistical studies in large industrial companies have shown that accidents are not evenly distributed among the employees; that a very small percentage of employees have a very high percentage of the accidents. One might conclude from this that possibly those employees who have more accidents are those whose assignments are most dangerous. That this is not so, however, is demonstrated by the fact that those persons who have the most accidents in one kind of a job have also the most accidents in other kinds of jobs. Moreover, those employees who have the worst accident records in their jobs have also the most frequent accidents at home or on the way to work.

In a study of motor vehicle accidents in Connecticut it was established that over a 6-year period as few as 3.9 percent of the drivers involved in accidents had as many as 36 percent of all of the accidents.

One large company which employs a great number of truck drivers became concerned about the high cost of its automobile accidents and tried to analyze the causes of accidents in order to reduce the frequency. Among other procedures, the company examined the accident records of each driver, and finally transferred those who had the most accidents to other occupations. By this simple device it succeeded in reducing the accident rate to one-fifth of the original level. The most interesting fact in this study is that the drivers who had a high accident rate retained their accident habit in their new occupation. This shows irrefutably that there exists an accident-prone person and that these individuals are accident-prone in any occupation—in their everyday life.

After this highly significant fact had been established, the next problem was to determine those qualities in a person which make him inclined to have accidents.

It was discovered that the total personality structure was to be held responsible for the accident-prone individual. Dunbar (*2*) who, with the modern methods of psychiatry, studied a large number of fracture patients describes the accident-prone person as follows: He is decisive

or even impulsive. He concentrates upon immediate pleasures and satisfactions. He is apt to act upon the spur of the moment. He likes excitement and adventure; he does not like to plan and prepare for the future. A large number of persons with the accident habit have had a strict upbringing and have derived from this an unusual amount of resentment against persons in authority. Briefly, they are men of action and not of planning, persons who do not interpolate much deliberation and hesitation between impulses and their actual execution. This impetuousness may have various reasons, but apparently rebellion against restrictions by authority and all forms of external coercion is its most common origin.

Planning and deliberation are potent factors which make one refrain from immediate rash action. The accident-prone person is essentially a rebel. He cannot tolerate even self-discipline. He rebels not only against external authorities but against the rule of his own reason and self-control.

Intensive psychoanalytic study of a few cases has allowed an even deeper insight into the intricacies of the emotional life of the accident-prone person. Particularly revealing were studies which scrutinized the emotional state of the person immediately before his accident. Dunbar, Menninger, Ackerman, Rawson, and others have shown that in most accidents there is an element of intention, though this intention is by no means conscious. In other words, most accidents are unconsciously intended. They belong to that category of phenomena which were described by Freud as the errors of everyday life such as misplacing an object, forgetting to mail a letter and carrying it for days in one's pocket, misspelling or mispronouncing a word. Freud showed convincingly that such errors are not accidental in the strict sense of the word but are unconsciously intended. When a president of parliament erroneously declared a meeting closed instead of opening it, he had some good but hidden reason for having the meeting over with before it started. A person who carries a letter in his pocket for days has some definite, although unconscious reason for not mailing it. Most accidents are similarly caused by unconscious motivations although they usually are of much graver consequence than these more harmless errors of everyday life.

Psychoanalytic investigations have revealed the nature of the unconscious motives which induce people to act in a way which invites accidents. The most common motive is a sense of guilt which the victim tries to expiate by self-imposed suffering, through self-imposed punishment. The unconsciously induced accident serves this purpose. A few brief examples will serve as illustrations. Ackerman (*3*) quotes the following case:

"A youth was driving his mother on a shopping tour. He begged her for the use of the car for a fishing party the following day. She

refused, whereupon he fidgeted angrily, 'accidentally' stepped on the accelerator and sent the car into a ditch, injuring both himself and his mother."

The combination of revenge and guilt was obvious in this case. This young man punished his mother, but at the same time he punished himself.

According to Rawson (*4*) 60 percent of persons suffering from fractures, when studied psychiatrically, confessed guilt and resentment in their relationship to some person in connection with the accident. He illustrated this by such revealing examples as the following:

"A 16-year-old Puerto Rican said: 'It was really my fault because mother said supper was ready and I was not to go out. I went out anyway, got into a wrestling match and got my arm broken. Anyway, I guess mother's sorry she's so strict with me.' "

"A 27-year-old woman was hurt sliding down a bannister. She had always worked off annoyance with her parents and later with her husband by such tricks. 'Perhaps I ought to know better but I wouldn't have been like that if they had had more sense, and had treated me more like a person instead of being so strict.' "

"A secretary fell and fractured her hip. 'I asked my friends why I must be punished so. I can't remember ever having done anything wrong, but I must have done something terrible.' "

The basis of this strange combination of emotions is a deeply ingrained attitude prevalent in our present civilization—that suffering expiates guilt. If the child commits something wrong he is punished. Through the suffering caused by the punishment he makes up for his guilt, and thus deserves and regains the love of his parents. The same emotional attitude is at the basis of our criminal procedure. The offender serves his punishment, after which he can return to the community as a free person who has expiated his wrongdoing. The human conscience applies this same principle within the personality. The conscience acts as an internal judge who demands suffering for our wrongdoings. Suffering relieves the pangs of a guilty conscience and restores the inner peace.

The most common causes of guilt feelings in children are hostile, rebellious impulses against the parents. The accident-prone person retains his childhood rebellion against persons in authority even in his later life. He also retains the guilt reactions originally felt toward his parents. The combination of these two, resentment and guilt, is the most common factor in accidents. Those who have a great deal of this self-punitive urge constitute the majority of the accident-prone individuals. The guilt feelings are convincingly

revealed in the frequent questions of the sufferer right after his accident, "Why did it happen to me? What did I do to deserve it?" These questions show that the guilt feeling, although not quite conscious, is vaguely sensed by the patient.

It was 20 years ago that I first became convinced of the unconsciously intended nature of certain accidents. I was consulted by a very intelligent man in middle life suffering from a severe depression which developed out of an unsuccessful struggle for existence. He came from a well-to-do and socially eminent family but had married into a different social stratum. After this alliance his father and family refused to have anything more to do with him. His unsuccessful struggle for existence through many years terminated (on account of neurotically determined inhibitions) in a total psychic collapse. I advised him to begin an analysis with a colleague, because I had personal relations with him and his family and was well acquainted with his previous history. He found decision difficult. One evening when the final decision about the analysis was to have been made, he asked to visit me in order to talk over the pros and cons once more. But he did not arrive; he had been run over by an auto in the neighborhood of my home. He was taken to a hospital suffering from many severe injuries. It was only the following day that I heard of the accident. When I discovered him in the third-class division of the hospital, he was bandaged up like a mummy. He could not move and all one could see of his face were his eyes, shining with a euphoric light. He was in good spirits, free from the oppressive melancholy of recent days. The contrast between his physical condition and his mental state was striking. The first words with which he greeted me were, "Now I have paid for everything, now I will at last tell my father what I think of him." He wanted to dictate a determined letter to his father immediately, demanding his share of his mother's estate. He was full of plans and was thinking of starting a new life (*5*).

What is most impressive in this story is the emotional relief which this patient gained from his injury. It freed him from the pressure of his guilty conscience which was stirred up by his extremely hostile feelings against his family who refused to recognize his marriage. After the injury he was ready to express freely all his resentment and tell his father what he thought of him.

Occasionally there are other unconscious motives at work in the causation of accidents, such as the wish to avoid responsibility, the wish to be taken care of, even the desire for monetary compensation. There is also some evidence of a correlation between accident proneness and certain isolated faculties, such as side vision, which cannot be discussed here. Another interesting correlation is between accident proneness and low blood pressure. Since blood pressure is

correlated with certain personality constellations, the significance of this finding will have to be elucidated by future studies.

In summary, the accident-prone individual is an impetuous person who converts immediately into action his momentary impulses without deliberation and planning. He harbors a deeply ingrained rebellion against the early excessive regulations of his upbringing—a deep resentment against persons in authority. At the same time he has a strict conscience which makes him feel guilty for this rebellion. In the unconsciously provoked accident he expresses his resentment and revenge, at the same time atoning for his rebellion by his injury.

What can we learn from all this for the momentous practical problem we are interested in: the prevention of accidents?

Since the major factors in accidents are not external, such as defective machinery or unfavorable conditions like weather, darkness, and so forth, but lie in the person who has the accident, the primary measures must be directed toward the person. There are only two effective ways to approach this human factor: One is to change the individual and the other, to take the accident-prone person away from those occupations where the danger is great. Both measures require reliable methods by which the accident-prone individual can be spotted. Because the psychological factors which predispose an individual to accidents are not simple isolated qualities, they cannot be detected by the usual methods of psychological testing. The psychiatric interview, conducted by an expert, which reveals the whole previous life history of a person is the most, if not the only reliable method. The accident habit develops early in life and manifests itself in the youngster in a noticeable inclination to contract physical injuries, even if only minor. Also, the combination of excessive resentment and guilt manifests itself in early childhood in various ways familiar to the trained psychiatrist.

To alter such an ingrained emotional pattern as is characteristic for the accident-prone individual by psychotherapy is a major therapeutic task. It requires prolonged treatment and is, therefore, in the present state of psychiatric facilities, of no practical significance. The recognition of the accident-prone person and his removal from occupations which are dangerous for him and for the public is, at the present, the only effective measure.

REFERENCES

(*1*) Marbe, K.: Praktische Psychologie der Unfaelle und Betriebsschaeden. Muenchen und Berlin, 1926.
(*2*) Dunbar, F.: Mind and Body. Psychosomatic medicine. New York, Random House, 1947.
(*3*) Ackerman, N. W. and Chidester, Leona: "Accidental" self-injury in children. Arch. Pedia. **53:** 711 (1936).
(*4*) Rawson, A. T.: Accident proneness. Psychosom. Med. **6:** 88 (1944).
(*5*) Alexander, F: Psychoanalysis of the total personality. Nervous and Mental Disease Monograph Series 52, 1929.

Accident Prevention—A State Health Department's Responsibility

By F. C. Beelman, M. D.*

There was a time when hazards to life were so great that the annual toll from accidents passed unnoticed. The ravages of uncontrollable disease brought fear and despair—not only to individuals and families but to large cities. Just a lifetime ago recurrent epidemics decimated the younger population groups in entire communities. Infant diarrhea snuffed out the lives of thousands of infants shortly after birth. Smallpox, diphtheria, typhoid fever, yellow fever, scarlet fever, and tuberculosis were only a few of the more prevalent diseases threatening the lives of the youth of our Nation.

The compound microscope, with its oil immersion lens and the new world of bacteria, advanced medicine into a new era of scientific truths. Since the 1890's, in almost every State there have been constantly increasing efforts to avert preventable diseases and deaths. Public health and preventive medicine, the application of new medical skills, immunizing agents, and drugs, have changed the leading causes of death. In no group is this change more striking today than in the younger population. The first reliable mortality statistics for Kansas were tabulated in 1916, and by comparing causes of death in 1916 with those for 1947, a graphic story emerges concerning health progress in only 31 years. In 1916 there were 1,548 deaths from acute communicable diseases. In 1947 there were only 290 such deaths. For children of school age the mortality decrease is even more remarkable. In 1916, 318 children between the ages of 5 and 19 died from acute communicable disease, as compared with only 20 in the year 1947.

Many factors must be considered in giving credit for the remarkable changes that have occurred in the causes of sickness and death as compared with 30 years ago. The activities of preventive medicine and public health personnel, without doubt, have been the dominating factor in this approaching victory over the common diseases which were formerly the leading causes of sickness and death. However, in this optimistic résumé of the achievements of preventive medicine there is one discordant fact—one leading preventable cause of death and disability, which has not kept pace with its mates of half a century ago, is accidents. The estimated acute communicable disease death rate for Kansas during 1916 for ages 5 to 19 was 61 per 100,000 population, as compared with the rate of 4 for the year 1947—a decrease of 93 percent. Compare the accidental death rate for the

*Executive Officer, Kansas State Board of Health.

same years and the same ages. It was 40 for 1916, and 35 for 1947—a decrease of only 12 percent.

Unfortunately, there are only meager statistics available indicating the status of accidents as a factor in nonfatal, temporary disability, or crippling injuries. That the magnitude and seriousness of this phase of the accident problem goes unrecognized is demonstrated by lack of interest and initiative in the development of accurate statistical studies on nonfatal injuries.

Death statistics, however, are complete and indicate clearly the current risk from accidental death as compared with all other causes. For Kansas, in 1947, accidents were the fourth leading cause of death for the total population, but for all ages, up to 35, they were the leading cause of death. Further analysis shows that for ages 5 to 19, children of school age, accidents represent more than one-half of the total deaths. Specifically, 172 children in Kansas between the ages of 5 to 19 years were accidently killed in 1947. Contrast the relative importance of these 172 accident victims to the 20 dying from acute communicable diseases. In any State, accidents kill two to seven times the number of persons who die each year from tuberculosis. Many more are crippled through accidental injuries than are disabled by "the great crippler—poliomyelitis."

Accidents are, perhaps, the most preventable of all the misfortunes of mankind. People cannot be immunized against them—they must know how to avoid them. From the available records it seems that some small progress may have been made in accident prevention. Yet, at the present rate, it will be many decades before accidents have undergone a decline comparable to the experience in the control of communicable diseases. Are State health departments, which, in the past, have initiated and put into operation programs that have contributed so much to the saving of lives through communicable disease control, neglecting this leading cause of death of our young people? Or, fully aware of the devastating scope of the accident problem, are they convinced that nothing actually can be done about it?

To answer these questions fairly, and without prejudice, a questionnaire was prepared and mailed to every State health officer. An excellent response was obtained. Forty-one or 85 percent completed and returned the questionnaire. Three State health officers replied that, in their departments, nothing was done toward accident prevention. All the others carried on accident-prevention activities to some extent. The questions and information obtained follow:

The first question was: "In what place do accidental deaths rank as a cause of death in your State?" Two States, Nevada and Idaho, reported accidents as the second leading cause of death. In 9 States, Texas, Utah, Louisiana, Montana, New Mexico, California, Arizona, North Dakota, and Florida, accidents ranked third; in 19 States,

fourth; and in 7 States, fifth as a cause of death. One State each reported accidents as the sixth, seventh, and eighth cause of death. In 31 out of 41 States, 75 percent of the accidents ranked fourth or higher as a cause of death.

The second question was: "To what extent should State health departments engage in accident-prevention activities?" Ten State health officers replied that it should be a major activity; 27 stated it should be a minor activity; 3 did not commit themselves, and 1 stated it should not be a function of State health departments. Recognition of the responsibility of the State health department in the field of accident prevention is clearly indicated by the 25 percent which felt it should be a major function, and the 66 percent which indicated it should be a minor activity.

The next question, entirely in the realm of speculation, was: "In your opinion, what would a major accident-prevention program in the State health department, operating on a divisional basis (comparable with tuberculosis control), accomplish in decreasing the accidental death rate for your State?"

Five State health officers replied that with this type of program the accidental death rate could be reduced 25 percent; 12 estimated a 15-percent reduction; 9 States—10 percent, and 6 States—5 percent. Nine State health officers gave no opinion.

Even the reduction of 10 percent, or more, which 64 percent of health officers believe could be accomplished, would result in a greater saving of lives than in many other areas of intensive public health activity.

The fourth question was: "What is the extent of your State health department's organization responsibility for accident prevention?" None of the States, at the present time, has a major division with full-time personnel engaged entirely in accident prevention activities. New York is the only State with a minor bureau with full-time personnel. Additional information obtained from New York is as follows:

The New York State Department of Health embarked upon a Home Farm Safety Program in 1942. This was carried out essentially as a public health educational program and consisted of the employment of two field workers to work with State and local organizations to stimulate interest in this field. Recently the program has been transferred to the Division of Medical Services as a Home Accident Section. It is now planned to expand the services to include a more complete public health approach. Public health education will still comprise a major portion of the program but it is also planned to conduct epidemiologic studies in hospitals to determine more accurately the circumstances leading to the occurrence of accidents and to detect the accident-prone individuals. A further step will be to establish adequate clinical facilities to assist the accident-prone person, whether his proneness be attributable to physical or psychologic disorders.

In 1947 there was established in this State a Division of Safety which operates as part of the Governor's office. The purpose of this Division is to coordinate the

safety activities in all State departments. While this Division is still in the stage of planning its program, it potentialities are great. Obviously a home accident program reaches into other phases, as injuries suffered in the home will affect attendance on the job and in schools. The accident-prone person will have accidents in the home as well as on the highway and on the job. Through the Division of Safety, each of the departments concerned in accident prevention can meet and plan combined programs which will assist in reducing the over-all accident rate. Actually only one meeting of this type has been held so far, but plans have been made to get the program going.

Many of the States are carrying on some accident prevention work as a part of the activities of various State health department divisions.

Activities	*States*
Health education services	31
Maternal and child health	13
Industrial hygiene	29
Vital statistics	24
Division of sanitation	15
No activities	2

The fifth question was: "What type of accident prevention activities are carried on in your State health department?"

26 States carry on special statistical studies on accidents.
6 promote organization of local safety councils.
4 coordinate State-wide accident prevention activities.
16 furnish consultation services to other State departments on accident prevention.
1 State health department lends personnel to other State departments.
19 participate in State safety council activities.
11 prepare and publish special reports on accidents.
5 prepare and publish pamphlets.
7 prepare and publish posters.

Safety Inspection Services

18 States carry on safety inspection services in industry.
11 inspect public buildings for safety measures.
7 inspect mines for safety practices.

Health Education Services

27 States prepare and release newspaper articles.
15 prepare radio releases.
21 have talks given by personnel.
27 distribute pamphlets on accident prevention.
16 distribute posters.
24 distribute films on safety.

It is evident that health department activities now concern themselves largely with the study and educational aspects of accident prevention. A few are entering on more specific control programs such as promotion, assisting in forming local safety councils, coordination and inspections. Sixty-six percent of those replying are developing programs.

The sixth question concerned itself with personnel, and it is an im-

portant question: "Indicate the number of health department personnel engaged in accident prevention activities." Answers to this question were disappointing as the totals indicated relatively few persons are actually engaged in accident prevention programs in State health departments.

	Personnel
1 State—full-time employment	2
1 State—full-time employment	1
1 State—half-time employment	2
1 State—half-time employment	1
30 States—small amount of time	170

The seventh question asked for some indication as to the amount of money that was being spent for accident prevention programs: "What is the estimated amount of funds expended on accident prevention by your State health department?"

Replies revealed the following approximate expenditures:

Amount	*States*	*Amount*	*States*
$1,000 or less	15	$5,000	2
$2,000	4	$8,000	1
$3,000	1	$10,000	2

12 States did not make a statement.

Answers to the sixth and seventh questions indicate that State health departments have not, as yet, seriously undertaken the task of accident prevention. Any State-wide program, to be effective, must have full-time trained personnel, with an adequate budget. In the control of tuberculosis, which kills approximately 50 percent of the number lost through accidents, State health departments are spending more than $10,000,000 and have a small army of trained personnel of at least 10,000. It would be decidedly interesting to see what might be accomplished if forces of that magnitude were available and functioning in the field of accident prevention.

In the eighth question an attempt was made to obtain information from the health officers relative to other State organizations and departments outside the health department that were active in the field of accident prevention.

Twenty-four States listed a State safety council; 6 States had a safety commission; 5 States, a safety committee; 3 States, an industrial safety commission, and 7 States had a public safety department.

In 31 States accident prevention activities were carried on by the highway departments, and in 16 States by the department of labor. Departments of education were listed as participants by 21 States, and offices of the State fire marshal by 17. Other State departments mentioned were: State police, commerce department, insurance department, and Workman's Compensation Commission. In most

States, one or more State organizations were active in the field of accident prevention.

Twenty-five States had regular appropriations for safety to a State agency; 11 had no State appropriations, and 6 gave no answer. Twenty-eight States had full-time personnel which totaled approximately 212 persons; 9 did not have full-time personnel, and 4 gave no answer. One question was asked as to the scope of accident prevention activities by these various State agencies. The answers showed that:

13 carried on programs to control all accidents.
25 carried on only highway and traffic accident prevention programs.
15 engaged in home accident prevention.
15 included farm accident prevention.
15 industrial accidents.
14 school accident prevention.
15 included fire prevention safety programs.

This brief review of information from 41 State health officers presents a fair picture of the progress which is being made toward the development of accident control programs within State health departments.

Accidents can be prevented and it is reasonable to assume that the death rate can be decreased directly in proportion to the effort made. Agricultural accidental deaths in Kansas in the last 15 years have decreased 32 percent. At the same time the use of farm machinery has increased many times. Farm organizations—stimulated by State agencies—have hammered home the cold facts of agricultural hazards through accident prevention programs. The excellent and wholly practical efforts of many farm youth organizations have paid off. Not to be discounted have been the safety changes and measures worked out by interested, cooperative manufacturers of farm equipment. It is reasonable to expect this specific death rate to decrease more rapidly through a well-organized agricultural safety program, promoted by trained personnel and funds to carry out activities.

Accidental poisonings in the home have decreased over the last 15 years approximately 50 percent. The press, radio, magazine articles, and the cooperation of drug manufacturers, together with legislative action, all have contributed to this reduction.

In the field of industry many large manufacturing plants have done a remarkable job in controlling accidental injuries. Perhaps the most outstanding example of what active and planned safety programs can accomplish is the death trend in railway accidents. Today, in Kansas, the average annual loss is less than one-half the number of deaths which occurred 15 years ago. This reduction is not due to mere chance. It is the result of hard and earnest efforts of the labor organizations—railway workers—and railroad management.

State health officers who are responsible for the development of health programs are, in general, fully aware of the seriousness of the accident problem. They further believe that control measures can reduce the death rate. In fact, 26 or 60 percent of the questionnaires returned indicated that accident prevention on a divisional basis comparable to tuberculosis control would reduce the accidental death rate 10 percent or more. Yet, only 10 of these 26 health officers thought that accident prevention should be a major activity of the State health organization. If these replies are accepted only in part, it is clear that State health departments are allocating grossly inadequate funds and personnel for accident prevention activities in relation to the seriousness of the problem and their belief in what may be accomplished. On the other hand, most State health departments are going through a period of rapid growth in the reorganization and realignment of forces to tackle major health problems. High on that list of problems—and one that will not be passed over—is the increasing number of Americans who are accidently killed, crippled, and injured needlessly.

State-wide accident prevention programs are still in the experimental and planning stage. There is, apparently, no Nation-wide uniform well-organized agency—either official or voluntary—with full-time personnel and funds actively covering the broad field of accident prevention. Many States have funds appropriated for various phases of accident prevention. No specific Federal funds, or national voluntary agency funds, appear to be available to States for demonstrations, program planning, or the training of personnel in the field of accident prevention.

The many facets of the accident problem demand that a great variety of forces work together for its solution. Many organizations, State and local governmental agencies, industries, schools, farm bureaus, railroads, and safety councils, will be actively engaged in controlling accidents in which they may be specifically interested. In recent years motor vehicle and traffic accidents have received wide attention. As a result, more States have organized programs within State highway departments—working on this specific problem—than in any other accident field. This has been aided by Federal grants to the States for highway construction. State labor departments are interested in occupational and industrial accident prevention. Industries have done an outstanding job in solving their own accident problems. On the other hand, several important aspects—home accidents for one—have not, as yet, been considered.

The majority of State health officers believe that the accident problem is a public health problem. It will require broad, coordinated community action for its solution. The first step toward an accident

prevention program—that of obtaining detailed information on accidental deaths—has already been taken by many States. Approaching the problem through both the individual and his environment offers plenty of action with favorable odds for success. Items for administrative action would vary as developing programs are reconciled with legal responsibilities, personnel, and funds of State health departments. The following items, however, would constitute the basic structure around which a State-wide program could be formulated:

1. The collection and interpretation of statistical information in order to obtain detailed knowledge of the accident problem is essential. Nonfatal accidents which result in permanent physical impairment should be studied.

2. Education: Bringing to bear on the individual, through every avenue of approach, those educational techniques essential to habit formation. Conditioning of the individual to the end that right action, at the right time, in situations which are hazardous or a potential hazard, is the only approach that offers any possibility of success. Awareness or the recognition of possible dangerous situations, and the building of sound judgment, can be accomplished through conditioned experiences. As a part of health education, it would be necessary to weave accident education throughout the school experience of the individual. Through adult education, family participation could be enlisted to carry on essential home responsibilities in this educational process. The educational pattern established would revolve around the school, family, and community.

3. Promotion: Continuous, promotional activities would be necessary to produce community action. The development of local safety councils, which may be committees of local health councils, are effective in providing community leadership.

4. Coordination: Accident prevention requires broad, coordinated action for its solution. Many organizations, both voluntary and official, have specific interests and responsibilities. To keep them functioning efficiently, with a minimum of overlapping and friction, would mean the difference between the success and the failure of the program. This can be done best through the local and State health departments.

5. Demonstrations and evaluation: The establishment of controlled demonstrations in an effort to develop the most effective accident prevention program would be essential. Home accident prevention programs could be developed, promoted and actively carried out by local health units. Evaluation of efforts, techniques, and programs should result in progressive improvement.

Let's apply an accident problem to this pattern and see how it works—keeping in mind the individual and his environment. In

Kansas, the automobile accident is the leading cause of death in the age group of 15 to 20 years; therefore, the automobile in the hands of a boy or girl of that age is a deadly instrument unless experience, judgment, and proficiency in its use is brought into the situation. In one actual serious accident, a front wheel of an automobile dropped off the concrete highway slab into the rut along the side. The teen-age driver whipped the car hard to the left to bring the wheel back onto the road. The wheel suddenly responded—the car shot across the highway and skidded into a bridge abutment, killing four of the teen-age occupants. We know from detailed knowledge of the specific accident hazard that this is not an uncommon cause of automobile accidents—the rut is an environmental factor and the teen-age driver is an individual factor.

A required driver's training course, a part of which is devoted to actual experiences in driving with a qualified instructor going through simulated known hazardous situations, should produce a degree of proficiency and judgment. The course should be a part of every school curriculum and should be required for the obtaining of a driver's license. Had the driver been conditioned to meet this particular situation by slowing down and keeping the wheel in the rut instead of whipping the car hard to the left, back onto the road, it might have prevented a serious automobile accident which cost the lives of four persons.

The second approach to the accident problem through changes in the environment is also well illustrated by this accident. In addition to conditioning the driver to known hazards, the accident might have been prevented by the highway department's filling the rut at the edge of the highway. Changes in the environment which are hazardous, or potentially so, offer great possibilities in the control of accidents. The importance of coordination of organizations is brought out by the need for calling the attention of the highway department to the fact that ruts at the edge of hard surface roads are hazardous and are the direct cause of many automobile accidents. Through promotional activities, a local safety council can be organized which, in turn, could bring, when necessary, community action to bear on highway departments to keep the edge of highways in good condition.

Accidents follow patterns. Specific environmental hazards can be corrected. The individual can be conditioned to protect himself and others. Many factors peculiar to certain individuals contribute to accidents. Uncontrolled emotion such as anger can be a factor—fatigue, worry, physical handicaps, sickness, and alcohol, all play a part, at times, in serious accidents. Who the accident-prone individual is and what makes him different from anyone else is still a question. Any of the above uncontrolled factors could contribute to repeated,

serious accidents experienced by any individual. Through accumulated, centralized information, these individuals might be found and brought under control.

Basically the problem is one of education and could be handled by a sufficient number of health educators in State and local health departments. Working full-time on the job of accident prevention, the problem would be one of State-wide promotion, organization, education, coordination, demonstration and evaluation. The thinking and action of engineers and other experts in various fields could be brought to bear on problems as necessary. Manufacturers can cooperate in changes to machinery, automotive equipment and other products to increase safety.

Summary

Thousands of deaths and injuries from accidents today constitute a formidable public health problem. However, its solution may not be as difficult as many of the public health problems already tackled and solved by the indomitable courage and energy of pioneering health workers.

It is evident that progress is slowly being made by State health departments in assuming responsibilities in the accident prevention field. The increasing seriousness of the problem warrants greater effort on the part of all interested State and national health organizations. Only through organized and coordinated activities embracing the concerted action of official and nonofficial organizations can we hope to curb this needless loss of life.

Accident Prevention Research

By Barry Griffith King, Ph. D.*

The causes and prevention of accidents can best be determined by what is called the convergent type of research. This term was originally used to mean that a number of scientific disciplines or specialties were brought to bear upon a specific problem. In this presentation the term "convergent" is used in its broadest sense so that the experimental plan calls for: (*a*) Investigation and analysis of all types of accidents for identification and better understanding of common factors and of laws of cause-effect relationship which are generally applicable for accident prevention; (*b*) the conduct of a broad program of experimental studies; and (*c*) utilization of organized teams of specialists, each contributing the unique talents and applying the special knowledge and techniques of his professional field. The teams should include, but not necessarily be restricted to, competent representatives for statistics, biometrics, preventive medicine, all branches of engineering, industrial hygiene, and for all of the ancillary medical sciences and other related biological sciences. The emphasis which is given to any one of the arts or sciences should vary with the nature of the problem under investigation and the professional specialties of those within the immediate working group.

The purpose here is to present a general plan for experimental studies of certain biological factors which may act in causing or preventing accidents, and to discuss some aspects of the integration and application of the results of all types of studies directed toward accident prevention. In a number of instances experimental details and suggestions have been presented. This is not done with the intent to establish specific lines of procedure, but rather to submit a definite plan of action.

Investigation of Biological Factors

The proposed plan calls for establishing and testing the four following hypotheses:

1. Accident proneness is a clinical entity.
2. Physical impairment is a contributing factor in accidents.
3. Accidents will increase in frequency when the lowest level of human tolerance to stress is exceeded; the frequency and severity of accidents will be related to the degree to which the stress exceeds one or more of the higher tolerance levels.
4. Consideration of human requirements in the design of machinery, devices, and procedures will reduce the incidence of accidents.

*Medical Service, Office of Aviation Safety, Civil Aeronautics Administration.

Hypothesis 1. Accident proneness is a clinical entity

The finding that a relatively small percentage of the accident group is responsible for a high percentage of the total accidents does not constitute proof of the existence of accident proneness as a clinical entity. It does not identify biological characteristics invariably associated with this special susceptibility, nor does it preclude the possibility of a greater exposure [1] of the "accident prone" group to hazardous situations. The test of the hypothesis lies in the success or failure to identify causal physiological or psychological characteristics, or their combination, present in individuals showing a high frequency of accidents, and absent or present to a lesser degree in "accident free" individuals with a comparable background of experience.

The first step would be to establish two groups of adequate size for the comparative study. The following factors should be considered in setting up the groups:

(*a*) Individuals in both groups should be clinically free of physical impairment and organic disease. The influence of these factors should be considered separately. The apparent state of physical fitness should be thoroughly checked by medical examination.

(*b*) Age limits should be established to eliminate children and the aged. The influence of general inexperience, lack of instructions adequate to cover the variety of new situations encountered, and relative lack of discipline would tend to obscure interpretation of the results of studies which included children. The aged should be eliminated to preclude the influence of the poorly defined as well as the demonstrable senescent changes.

(*c*) The corresponding individuals in the two groups should be matched with extreme care in order that the subsequent comparison will be valid.

(*d*) Each group should include people living under a wide variety of circumstances and conditions ranging from those commonly considered safe to those generally acknowledged as hazardous. The inclusion of people subject to relatively great hazard should increase the opportunity to identify "repeaters" and increase the likelihood that a significant proportion of the accident-prone individuals, if such exist, have been involved in accidents. The reason for selecting subjects living under "safe" conditions is to insure that individual susceptibility will not be masked by an overwhelming opportunity for injury.

The preliminary screening for the selection of experimental material

[1] Criteria selected for determining exposure rates are not always reliable. Miles or hours driven in automobiles do not reveal traffic conditions which vary with many factors, including the amount of driving in urban or rural sections, and the time of day; in aviation the frequency of individual flights may possibly constitute a more significant criterion than miles or hours flown (which are closely related) since landings and take-offs constitute the more hazardous phases of flight.

might be accomplished by study of the records of holders of personal and property accident insurance policies, those participating in group health or similar organizations, workers in industry, men and women in the armed forces, and licensed or certificated operators of motor vehicles including aircraft. Family physicians and local authorities in areas of relatively stable populations should be interviewed to obtain the names of people to represent the domestic, traffic, agricultural, and small-business situations for both groups.

The initial groups should necessarily be large, since practical considerations will reduce the number that can be enlisted as subjects for the subsequent study. The fact that only a small number of subjects may be available for study in any one location need not be discouraging, provided that the research techniques are standardized so that the findings may be pooled.

The laboratory phase of the investigation should include a complete physical examination with quantitative description of vision and hearing, and personal interview to obtain as comprehensive case histories as possible. Inquiry should be made to determine the individual's experience with accidents in situations determined by conditions other than those related to his occupation; any tendency of the subject to consider himself "lucky" or "unlucky" in everyday life may be revealing.

The other phase of laboratory study may be conducted by determining the subject's response to a suitable battery of tests. The selection of critical tests is admittedly difficult, but it may be profitable in tentatively establishing a standardized procedure to select individual tests to measure manual dexterity; reaction time; attention; ability to interpret and follow instructions; judgment when allowed free choice of alternate methods of performing a given task; frequency of interruption through initiating or participating in a conversation with a cosubject; and indices of emotional reaction revealed by changes in blood pressure, heart rate and respiratory pattern, flushing, perspiring, and muscular tremor.

While considerable effort has been directed toward the study of those who have sustained accidental injury, too little emphasis has been placed upon the study of accident-free individuals. Such study is, however, essential for testing the accident-prone hypothesis.

Here, as elsewhere in the over-all program for research in the field of accident prevention, techniques of multivariate analysis provide a powerful tool in the statistical treatment of the results. Accident proneness, if such exists as a clinical entity, may be extremely complex, and thus escape identification when attributes of character or performance are considered singly.

Hypothesis 2. Physical impairment is a contributing factor in accidents

Knowledge of the influence of physical impairment is essential for preventing accidents and establishing a factual basis for determining what restrictions or limitations, if any, are required to provide protection of physically impaired individuals and of the public. Constructive measures cannot be satisfactorily undertaken in the absence of adequate knowledge. Studies on the incidence and severity of accidents of the physically impaired have been concerned with populations in which some degree of selection has occurred. While such studies have accomplished their intended purpose of dealing with specific situations, this selection has obscured the basic question and limited the general applicability of the results.

The test of this hypothesis lies in a comparative analysis of the performance data of representative groups of individuals with and without physical impairment. In addition to matching the individuals in the groups, the following factors should be considered in the choice of samples:

(*a*) Age limits should be extended to include the aged. Where adequate histories can be obtained, this would afford an opportunity for comparing records of the individual before and after the development of such physical decrement as may result from senescence.

(*b*) People living under a wide variety of circumstances and conditions, with accident-free and single-accident histories, should be included to minimize the bias of voluntary, proprietary, or occupational restrictions leading to the reduction of hazardous exposure.

(*c*) The one group should include as many types of physical deficiencies and as many degrees of these impairments as is possible, while the other should be restricted to people who exhibit no impairment and do not require any corrective devices (such as lenses or supports).

The subsequent study of the individuals should stress personal interview, but should also include laboratory tests which are designed to measure attention, ability to receive instruction, judgment when free choice of methods is offered, precision of voluntary movement, and diagnostic or performance tests to supply quantitative measures of impairment in terms of strength, freedom of movement, or sensory deficit.

Individuals with physical impairment who have performed successfully over a wide range of situations may reveal inherent or acquired attributes which are effective in acting toward the prevention of accidents. Comparison with the "accident free" group of the accident proneness study may be profitable.

In the programs proposed for testing the first two hypotheses, the

assumption that one of the comparative groups is serving as a control group should be avoided. Since both the causes and the methods of prevention of accidents are under consideration, there is equal concern for the protective and for the predisposing physiological and psychological characteristics which may be contributing factors.

Here again multiple correlations must be thoroughly investigated. This search for significant combinations as well as individual characteristics is fully justified since the two hypotheses are directed toward a study of man, with little or no concern for the influence of the stresses or design deficiencies which may also act in determining an accident.

Hypothesis 3. Accidents will increase in frequency when the lowest level of tolerance to stress is exceeded; the frequency and severity of accidents will be related to the degree to which the stress exceeds any one of the higher levels of tolerance

A considerable program of research in stress physiology is a prerequisite to evaluation of this hypothesis; further, since it deals with "stress" in general, it will be necessary to (*a*) consider different types of stress and (*b*) select criteria for the various levels of human tolerance which are applicable for describing the results of all, or the majority, of the stresses.

The following classification of stresses is submitted for reference. Such classifications are necessarily arbitrary so that alternate treatments may serve equally well.

STRESS

I. *Physical*
- (*a*) barometric—total pressure; partial pressure of component gases.
- (*b*) thermal—heat; humidity; cold.
- (*c*) mechanical—acceleration; deceleration; static loads; vibration (including noise).
- (*d*) radiation—infrared; visible; ultraviolet; roentgen; gamma rays; (cosmic rays?).
- (*e*) electrical.

II. *Chemical*
- (*a*) toxicological, as used in its broadest sense to include noxious gases,[1] asphyxiant gases,[1] irritants, injurious solutions and poisons.
- (*b*) pharmacological.

III. *Biological*
- (*a*) deficiency—thirst; nutritional.
- (*b*) dynamic—posture; work.
- (*c*) psychological.
- (*d*) aging and disease.

The following criteria for determining the various levels of human

[1] Alternatively, these might be considered equally well as "partial pressure" stresses.

tolerance, based upon biological responses common to most, if not all, stresses, are suggested:

(*a*) Threshold level for perception of the stress.

(*b*) Level at which measurable bodily compensatory changes occur (such as increase in respiration or heart rate or postural reflexes).

(*c*) Level at which the compensatory mechanisms fail, allowing for significant impairment in the physical condition of man.

(*d*) Level at which man is no longer able to take the steps necessary for his further protection or survival.

(*e*) Level at which survivable but serious injury (either permanent or temporary) occurs.

(*f*) Level resulting in death.

The rank order of these levels must be rearranged to indicate increasing severity for different types of stress. For example, this order is satisfactory for exposure to the chemical stress, carbon dioxide in harmful concentrations, and the physical stresses, infrared radiation and deceleration. It would not be satisfactory, however, for methyl bromide under certain conditions of exposure (concentration x time) where (*e*) and (*f*) might occur without this noxious gas being perceived, or any compensatory reaction or immediate impairment in performance resulting.

For the most part, the level of perception of a stress is well below that which will cause injury, but unfortunately this is not invariably the case. However, even when the stress does not cause marked physiological reaction or tissue damage, it may be a contributing factor in accidents, since recognition, by definition, implies some degree of distraction and divided attention.[2] Since any serious consideration of comfort was, at one time, considered to be "coddling," this author has employed the term "distracting discomfort" to emphasize that some impairment of performance potential must necessarily result from divided attention. Further, if a stress is perceived, or even suspected, it may cause fear or alarm out of all proportion to its hazard for bodily injury. This may be illustrated for an aviation situation where gasoline fumes, even in innocuous concentration, or water vapor, mistaken for carbon dioxide escaping from the fire-extinguishing system, may cause alarm, distraction until the danger is evaluated, or decision to take action warranted only in a true emergency.

The effects of mild or moderate stresses frequently cannot be demonstrated in terms of individual performance decrement in laboratory studies or in field experiments simulating emergencies. For this

[2] It is recognized that in certain situations distracting influences are advantageous, e. g., the case of the sleepy automobile driver.

reason, it is suggested that the investigators concerned primarily with studies of the cause and prevention of accidents attempt to measure the *compensatory reserve* of the body, or its systems, rather than performance decrement as the index of stress. This could be accomplished by imposing a standard conditioning stress which would, in itself, fail to bring about a measurable compensatory reaction; the stress under investigation could then be applied in increments to attain successively increasing intensities until a measurable response occurred. Such procedure could be repeated, if necessary, at higher levels for the standardized stressful condition where it is desired to determine the point of failure of the compensatory mechanism.

There are several points in the study of intense stresses which warrant the attention of the accident investigator. The lower portion of a strength-duration chart to identify the various levels of human tolerance to exposure to stress can be carried out by planned experimentation. Data from even highly motivated subjects can, however, define only the points lying below the level of injury, so that animal experiments, studies with cadavers, and full utilization of natural experiments, i. e., accidents, are necessary to determine the areas of the more extreme effects. While studies of cadavers are of limited usefulness and applicable to only certain stresses (deceleration, static load), their value would be greatly increased in these situations if parallel studies on live, freshly dead and embalmed animals were used to indicate the direction, if not the extent, of the changes which occur, as an aid in interpretation of the results.

It is admittedly difficult to obtain comprehensive, quantitative data from natural experiments; this may be the principle deterrent which so frequently results in the failure to conduct an orderly, thorough, and intensive investigation of accidents. While it may be impossible to determine the absolute values of the stress or stresses which were involved, they may be approximated to the extent of bracketing them within a certain range. For example, in accidental death from toxic gases, the maximum and minimum concentrations which could have existed can be determined; in electric shock cases the circumstances of the accident can be reconstructed to afford approximate values of contact impedance, current, current pathway, and probable duration of exposure. A sufficient accumulation of such data will aid immeasurably in defining the areas of the higher tolerance levels.

Hypothesis 4. The frequency and severity of accidents are related to the adequacy of the design of machinery, spaces and procedures in providing for human requirements

A broad program of investigation must be carried out in order to test this hypothesis. It will be necessary to—

(*a*) Develop a number of quantitative descriptions of man as a

basis for specifying human requirements for a given situation or condition.

(*b*) Evaluate existing designs in relation to these specifications.

(*c*) Establish designs for fitting machinery and procedures to man.

(*d*) Determine correlations between the incidence and severity of accidents and the degree of success or failure with which specific designs provide for human requirements.

A list of the characteristics of man which require complete quantitative description include:

(*a*) The classical anthropometric dimensions such as weight; stature; sitting height; length of arms and legs; arm and foot "reach" at various points in space; and width, depth and girth at various levels along the longitudinal body axis. The descriptions of dimensions which are influenced by body posture must, however, be based upon measurement of the subjects in habitual, easy posture rather than the standardized and somewhat unnatural anthropometric positions, since the latter are seldom of use for engineering design.

(*b*) Sitting and standing eye level (in natural posture); total field of vision when eyes are fixed, when eye but not head movements are permitted, and when head but not body movements are permitted.

(*c*) Orderly summaries of the degree of freedom of movement, and the precision and force of movement, of the component parts of the body, with and without body support and with various degrees of flexion, extension, rotation, abduction and adduction.

(*d*) Descriptions essential for comfortization to minimize postural and work stresses.

(*e*) Summaries of latent periods; reaction times; manual dexterity; time required for arm, hand and foot travel and positioning; time for hand and foot operations; time required for check and interpretive reading of instruments.

Machine design requiring operations which have not been related to man's physical characteristics or his psychological capabilities constitute a major confounding factor in accident analysis. In many cases the human elements described under the general classification of "error in judgment," "lack of attention," "pilot error" and "deviation from rules of safe practice" may, perhaps, be explained to a large extent by inadequacies of design. In other cases, faulty design may be a contributing but not the primary factor in accidents. The likelihood of breaking down these large general categories will be greatly increased when the influence of inadequacies of design have been eliminated.

It is clearly the responsibility of those in preventive medicine and in the various biological fields to develop these essential descriptions as a factual basis for providing for human requirements in the design

of spaces, machines and operational procedures. Until recently, biologists have not accepted this responsibility, so that the engineer has had to use estimated "average" values and apply a percentage factor to provide for individual variation. This is unsatisfactory because (*a*) the use of average values in designing machinery or structure for individual use results, by definition, in arrangements which are unsatisfactory for 50 percent of the population, and (*b*) the safety or general allowance factor is based upon a poorly established value so that the percentage provided for by this procedure cannot be predetermined. Average values serve only the special case where the structure is designed for simultaneous use by groups of 30 people or more, and where the pertinent variable, such as weight, is normally distributed in the series. If quantitative statistical descriptions are available to the engineer, he can select his cut-off points with full knowledge as to the extent of his provisions.

Integration and Application of Results

Cumulative treatment and correlation of data from studies of the numerous phases of investigation of the cause and prevention of accidents present a formidable task. The effort would, however, be justified by the increased rate of accomplishment of the over-all program. Such a plan could be put into effect by establishing a central repository for the experimental results and maintaining an adequate staff of specialists with full-time responsibility for treatment of the data.

The initial activity of this group should be directed toward analysis and integration of existing data, both as a pilot study for analytical procedures and as a basis for evaluating detailed experimental project proposals to insure the completeness of the plan for obtaining all necessary items of information. The staff should then turn to analysis and integration of the results of both current biological studies and the statistical and engineering investigations which may be presumed to be proceeding concurrently.

A considerable emphasis should be placed upon the use of advanced statistical techniques, particularly multivariate analysis. This is a practical method of studying the effect of interaction of a set of causes, especially where some causes cannot be subjected to physical measurements. Provision should be made for the use of these methods in the attempt to relate the many factors which in combination may cause or prevent accidents, and also for the extension of theoretical mathematical statistics to techniques particularly adaptable to the field of accident control.

An additional function which might be performed effectively by the staff of specialists would be the task of dissemination and early appli-

cation of results. If the accident-proneness hypothesis were found to be valid, research investigators could be encouraged to initiate studies for the development of therapeutic measures or methods for the reeducation of accident-prone individuals. As successive comprehensive descriptions of man are completed, design engineers could be advised of the findings.

There is a serious time delay in the use of existing knowledge and this will inevitably continue unless groups of scientists, having a broad knowledge of field conditions and practical limitations in operating procedures, assume responsibility for acting as intermediaries between the laboratory and the field. In general, research investigators are reluctant to concern themselves with application of their findings, so that special provision must be made for carrying out the essential step of digesting and interpreting research results and advising the applied specialists as to their utilization.

All the knowledge gained by the studies on human factors would be of permanent value not only for prevention of accidents but also as a contribution to the fund of scientific knowledge. The information derived from the study of current cultural situations may be expected to reveal general principles of safety design and rules of safe practice, even though information concerning specific devices or arrangements will become obsolescent at intervals which will depend upon the rate of introduction of new devices.

The Home Environment and Accidents

By Leonard M. Board, M. P. H.*

The role of the home environment, in its physical rather than sociological sense, as a cause of accidents has been accepted generally, but it is not yet possible to assign relative values to the various environmental hazards involved in the several types of accidents. Recognizing the evident need for extensive research and study of home accident causation, we are obligated at the same time to appraise all available data and glean from it such valid information as can be employed in mapping sound preventive measures.

The National Health Survey—a pioneering effort to obtain morbidity data, including home accidents, by cause, on a nation-wide scale—revealed a consistent increase in home accident frequencies as rental or value of dwelling units decreased, and as family incomes decreased (*1*, *2*). The correlation held true for all age groups and for both sexes. Assuming that family income and property value or rent are indicative of housing quality, including hazardous conditions, it can be concluded that the home environment was one factor in the accident frequencies found.

However, we should not overlook the significance of other conditions accompanying the low income status. The association between accidents and dwelling rental or value shown by the youth group (15–24 years) discounts the factor of impaired physical condition of the individual. For those of this group in owned homes and in rented multiple dwellings the accident rate almost doubled as the value reported dropped from $3,000 or more to less than $1,000 and as monthly rental dropped from $30 or more to less than $10; for those in rented single dwellings the excess was over 60 percent. From these findings the correlation between substandard housing and increased accident rates appears to persist in the age group normally expected to be the least affected by physical handicap.

Another oft-quoted study of nonfatal home accidents is the Cook County Survey of 4,602 cases treated at the Cook County Hospital (*3*). The analysis of reports of cause revealed that mechanical factors were involved in 64 percent of the cases. The frequent combination of causative factors is illustrated by the finding that in 68 percent of the cases, personal factors were reported as contributing to the accidents. The report concludes ". . . there were few cases that did not have either a definite personal or mechanical factor, and most of them had both."

Presented before the Public Health Education and Vital Statistics Sections, American Public Health Association Annual Meeting, Nov. 12, 1948, Boston, Mass.

*Senior Sanitary Engineer, Public Health Service.

Several other home accident surveys have been reported, but they have been limited for the most part to fatalities, which are heavily weighted in the age groups under 5 and over 65 years. The Cincinnati study of fatal accidents in 1947 is one such case (*4*). The health department, safety council, and Public Health Federation collaborated in seeking supplemental data on a selected portion of the 316 accidental deaths. The principal type of accidents, by location, were home accidents, with 132 deaths or 42 percent of the total.

Analyses of fatal home accidents disclosed that the death rate for recognized substandard housing areas was approximately twice (41.4 per annum) that of the rest of the city, (21.2) and a similar relationship prevailed between the lowest economic group and the higher economic groups (40.7 for lowest, 22.5 for middle and 21.4 for highest).

Fatal falls, constituting 47 percent of all fatal accidents, were selected for follow-up nursing visits. From information collected in this fashion it was reported that mechanical or other external factors were involved in 39 of 102 cases, and that illness or disability was present or preceded the fall in 77 cases.

The final conclusion related in the report of this study states: "Educational programs which emphasize only caution and external hazards fail to reach the root of the problem which is primarily a problem of disease rather than a problem of accident." Again it must be remembered that the subject cases did not constitute a representative sample of all home accident cases.

Still another illustration of the disparity of findings and conclusions based on the admittedly inadequate studies of the home accident problem is found in a vague reference in a recent news article to a "research bureau's survey." This report states that "only 17 percent of accidents are the fault of mechanical defects" (*5*). The account further quotes Dr. H. Flanders Dunbar, of New York's Presbyterian Hospital, as saying that accident-prone individuals are responsible for 80 percent of all accidents that occur in the United States. A number of studies of occupational and traffic accidents have pointed to the high accident frequencies experienced by a small percentage of the total subjects studied, and the term "accident prone" has been applied to such individuals. It is a rational assumption that similar factors influence home accident incidence.

The foregoing examination of accident studies emphasizes the need for more careful objective, comprehensive studies, supported by adequate controls. To encompass the influence of environmental conditions, thorough examination of such conditions is indicated for all dwellings in the control and study groups of the survey. The writer is unaware of any study of this character having been reported. There is some hope, however, that the experimental program cur-

rently being inaugurated in Kalamazoo City and County, Mich., will afford opportunity for some pioneering efforts in such studies. It is understood that several other organizations and communities are contemplating similar studies. One intriguing possibility is presented by the housing appraisal activities being undertaken by several city health departments. The scope and nature of these surveys is sufficiently broad to permit the inclusion of rather comprehensive accident surveys without major alteration of technique and procedure.

Consideration of the influence of the home's physical environment on accident frequencies should not be confined to such accidents classified as being caused solely by mechanical factors. The principal criticism of home accident studies is the lack of objective consideration of *all* possible causative factors. It should be clear by now that an overwhelming majority of all home accidents are the result of combinations of conditions and circumstances. Does it not follow that the correction of unsafe conditions would reduce accident frequencies to a greater extent than might be anticipated on the basis of those accidents caused solely by hazardous conditions? Similarly, an educational program of accident prevention should effectively negate in considerable measure the potential effect of unsafe conditions, as well as influence personal behavior.

It is pertinent to contemplate for comparative purposes the role of environmental factors in other fields of accident prevention and related activities. Occupational safety programs have since their inception emphasized the elimination and safeguarding of mechanical and physical hazards.

Educational activities directed at the worker's habits have become increasingly popular to supplement the achievements gained by environmental controls. Without attempting to evaluate the relative effectiveness of these techniques, their combined accomplishment is noteworthy. The accident rate based on exposure, among the industries reporting to the National Safety Council has been reduced approximately 50 percent during the past 15 years (*6*).

Motor vehicle accidents, which constitute a problem replete with obstacles and varied implications, have likewise been subject to preventive measures combining environmental and educational tactics. Engineering skills have been applied to devise safety improvements in the vehicle and the highway. Education and legislation have been employed to effect a reduction of unsafe acts. The results reported by the National Safety Council indicate a reduction in rates based on mileage, of 35 percent in 16 years (*6*).

In one major category of home accidents, dwelling fires, a number of cities have reported significant reductions accomplished by annual inspection of dwellings by fire department personnel (*7*). Typical of

this type of program is that of the Cincinnati, Ohio, Fire Department (*8*). The practice of annual dwelling inspections for fire hazards was inaugurated in 1934. The average annual number of dwelling fires for the 6 years preceding the adoption of this program was 995, and for the succeeding 6 years the average was 500, a reduction of 50 percent. The average number of dwelling inspections per year for the same periods was increased from 9,015 to 73,740. Thus we might say that 64,000 additional inspections prevented 500 fires—or for each 128 inspections one fire was prevented.

This program is continuing, and despite the increase in number of dwellings, the number of dwelling fires for the period 1943–47 averaged 540 per year. A further indication of accomplishment is noted in the reduction of fire hazards found—43 percent less in 1947 than in 1943 despite a more complete coverage by inspection. There were 42 percent more inspections in 1947, compared to 1943. It is unfortunate that records were not maintained of persons injured in dwelling fires. The thoroughgoing inspection program has served as the spearhead for a continuous program of community education, including all of the recognized techniques of such activity. Legislation and enforcement has also been employed, but in a minor role. A total of five violations required court action during this 5-year period.

Having examined the available information as represented by the studies previously discussed, and having considered the accomplishments of established programs of accident prevention, we are confronted with the question of planning and developing program activities for the prevention of home accidents. The home's physical environment is so fundamental in the entire problem that any conceivable program must revolve around it. In its broad material sense, home environment includes not only the dwelling structural soundness, its furnishings and equipment, but the design, arrangement, storage facilities, functional suitability, housekeeping and maintenance, and similar factors. Particular safeguards are needed for young children, the aged, and infirm occupants. Overcrowding is a vital factor. The extent to which emphasis may be given to environmental controls may vary with questions of personnel, extent of entire safety program, and other factors. There is evidence that a program of routine dwelling inspections by health department personnel would be justified, assuming an adequate educational program would be integrated with it. Enforcement practices should probably be minimized, but regulations would undoubtedly prove practicable for new construction, remodelling, installation of major equipment, and so forth.

In conclusion, it is emphasized that any consideration of the home accident problem, whether concerned with field studies, research, or

prevention programs must give due attention to the environmental conditions. The health department engineering personnel are admirably fitted to supply this necessary balance in cooperation with the medical, nursing, statistical, educational, and other personnel, in the same manner in which such joint efforts have proved effective in many other public health programs. The activities proposed by the American Public Health Association Subcommittee on Accident Prevention illustrate the conviction that home safety programs require the combined competencies and efforts of the entire professional team in the health department (*9*). Staff in-service training is essential to provide all professional groups with an adequate appreciation of the environmental association with home accidents. The more readily we accept the premise that accident rates will succumb to a program combining the correction of unsafe conditions with education stressing the reduction of unsafe acts, the more logical and sound will be our program planning. Then it becomes a question of demonstration and evaluation, to adapt the established public health methods and techniques, as indicated upon closer acquaintance with the problem.

REFERENCES

(*1*) Britten, Rollo H., and Altman, Isadore.: Illness and accidents among persons living under different house conditions. Pub. Health Rep. **56:** 609–640 (1941).
(*2*) Britten, Rollo H., Klebba, Jean, and Hailman, David E.: Accidents in the urban home as recorded in the National Health Survey. Pub. Health Rep. **55:** 2061–2086 (1940).
(*3*) Rupp, Francis, and Battey, Alvan D.: Hurt at home. Public Safety, August 1936.
(*4*) A study of fatal accidents in Cincinnati, 1947. Mimeographed report. The Public Health Federation, Cincinnati, Ohio, June 1948.
(*5*) Philips, Paula: That was no accident. This Week, pp. 9, 26, Sept. 19, 1948.
(*6*) National Safety Council: Accident Facts. Chicago, 1948.
(*7*) Blake, M. S.: Dwelling inspection by fire departments. Quarterly, April 1936.
(*8*) City of Cincinnati, Division of Fire: Correspondence and mimeographed reports, 1948.
(*9*) American Public Health Association, Subcommittee on Accident Prevention: Accident prevention—an essential public health service. Am. J. Pub. Health **35:** 216–220 (1945).

Accident Facts From Accident Fatalities

By Evelyn H. Halpin, Ph. D.*

The Public Health Service is proposing a program for the collection of supplemental information on fatal accidents. The starting point in this accident fact-finding program is the death certificate filed in the vital statistics offices of the State health department. For each accident fatality reported on a death certificate, a follow-back will be made through local health departments using a special accident fatality report form to obtain information on the cause and circumstances of the accident.

It is recognized that the proposed program is but a limited approach to the solution of the total accident problem because it deals only with fatal accidents. Most accidental injuries do not result in death, but those that do are obviously of a serious nature. Despite the limitations of mortality statistics, they provide useful information on accidents. Accident deaths are discrete events which may be counted readily and are not subject to the difficulties of definition encountered in the enumeration and description of nonfatal injuries. Supplemental accident facts obtainable from a follow-back procedure described briefly here will immediately make available certain basic information needed for formulating accident-prevention programs.

The information for the supplemental accident reports will be obtained by local health department personnel through interviews, usually with the informant named on the death certificate who presumably has knowledge of the facts surrounding the death. Such a procedure has been in operation in Nassau County, N. Y., under the leadership of Dr. Earle G. Brown. In those instances where branches of the State or local government other than the health department have the function of investigating accidental deaths, the health department may obtain the accident facts directly from those sources rather than from the informant named on the death certificate. An arrangement by which traffic and health authorities cooperate to combine facts on motor-vehicle accident fatalities is already in existence in each State. Consequently the program now proposed will include only accident fatalities other than those in which motor vehicles are involved. In areas without full-time local health departments, the State vital statistics offices may collect information on the circumstances of fatal nonmotor vehicle accidents by mail. The collection of accident reports by mail has been practiced successfully by the Kansas State Department of Health for over 15 years.

A copy of a report on each accidental death thus collected will be retained by the local health department for its use, and duplicates will

*Biostatistician, National Office of Vital Statistics.

be sent to the State health departments for compilation of State-wide information by the vital statistics offices. The way in which local health departments can utilize such reports and develop prevention programs has been described in a report of the Subcommittee on Accident Prevention of the American Public Health Association.[1]

Although accidents rank fourth in the list of principal causes of death, the investigation of accident fatalities is not expected to impose a very heavy load on any one local health department. The probable work load may be estimated in advance from a count of accidental deaths, excluding motor-vehicle fatalities, which occurred in any recent year.

Interrelated accident facts tabulated according to a uniform design by the participating States will be consolidated by the National Office of Vital Statistics of the Public Health Service for national use. In addition to publishing national data on accident fatalities, the Public Health Service will assist by providing uniform report forms, procedural manuals, consultation services, and other aids. Also, in cooperation with organizations such as the Home Safety Conference and the National Safety Council, the Public Health Service will carry on activities to develop uniform definitions and other tools which are necessary for obtaining comparable statistics.

The Conference of State and Territorial Health Officers has on several occasions acknowledged the need for health department participation in accident prevention programs, particularly for home accidents, because of the importance of accidents as a cause of disability and death. The proposed program is one step in carrying out the recommendation made at the forty-sixth annual meeting of the conference that the Public Health Service "collect factual data upon which detailed action programs can be promulgated through the State health authorities."

[1] D. B. Armstrong, M. D., Chairman, Subcommittee on Accident Prevention, American Public Health Association: Accident prevention—an essential public health service. Suggested home safety activities. Am. J. Pub. Health 35: 216-220 (1945).

INCIDENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MARCH 5, 1949

Summary

A total of 27,727 cases of measles was reported for the week (last week 24,133, 5-year median 18,962), a seasonal rise of 15 percent, as compared with 22 percent last week and 26 percent (to a total of 34,238) in the corresponding week of 1944. Decreases were reported in the South Atlantic and Mountain areas. States reporting the largest increases are Kansas (from 902 cases to 1,414), California (1,100 to 1,559), Massachusetts (1,224 to 1,658), and New York (1,620 to 2,042). Virginia reported a decline from 1,388 last week to 615 for the current week. The total for the year to date is 161,230, 5-year (1944–48) median 93,989.

Of the total of 4,609 cases of influenza, Texas reported 2,266, South Carolina 736, and Virginia 367. The total to date is 41,359, 5-year median 99,620.

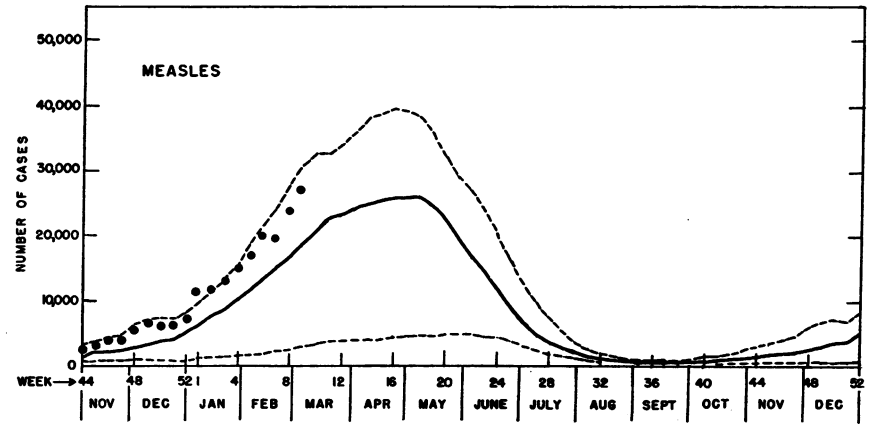
Of 48 cases of poliomyelitis (last week 57, 5-year median 26), 7 occurred in California (last week 14) and 5 each in New Jersey and Texas. No other State reported more than 3 cases. Of the total of 808 cases reported for the year to date (same period last year 292, 5-year median 340), no State has reported more than 26 cases except California (265), Texas (70), Washington (38), Minnesota (36), and New Jersey (31).

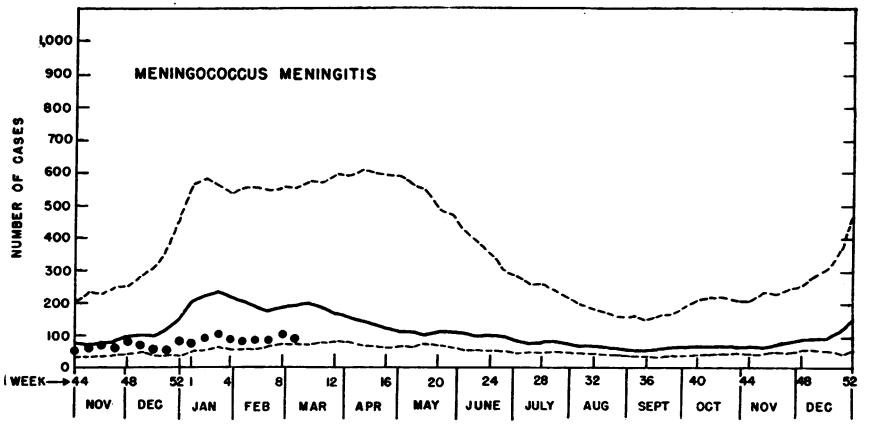
During the week 4 cases of smallpox were reported, 2 in Idaho and 1 each in South Dakota and Kentucky. Maryland and Tennessee each reported 1 case of Rocky Mountain spotted fever, bringing the total for the year to date to 12, as compared with 5 for the same period last year and a 5-year median of 4.

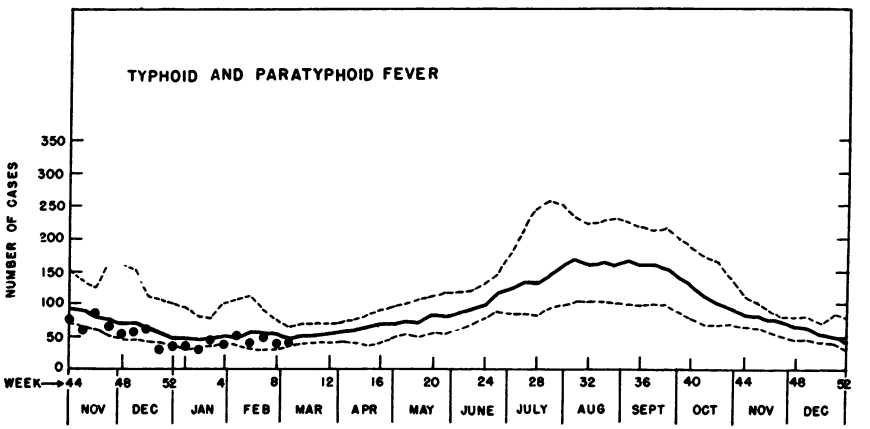
Deaths recorded during the week in 94 large cities in the United States totaled 9,801, as compared with 9,419 last week, 9,832 and 10,235, respectively, for the corresponding weeks of 1948 and 1947, and a 3-year (1946–48) median of 9,929. The total for the year to date is 89,048, same period last year 93,534. Infant deaths during the week totaled 634, last week 649, 3-year median 671. The cumulative figure is 6,043, same period last year, 6,400.

Communicable Disease Charts

All reporting States, November 1948 through March 5, 1949







The upper and lower broken lines represent the highest and lowest figures recorded for the corresponding weeks in the 7 preceding years. The solid line is a median figure for the 7 preceding years. All three lines have been smoothed by a 3-week moving average. The dots represent numbers of cases reported for the weeks of 1949.

Telegraphic case reports from State health officers for week ended March 5, 1949

[Leaders indicate that no cases were reported]

Division and State	Diphtheria	Encephalitis, infectious	Influenza	Measles	Meningitis, meningococcal	Pneumonia	Poliomyelitis	Rocky Mountain spotted fever	Scarlet fever	Smallpox	Tularemia	Typhoid and paratyphoid fever [1]	Whooping cough	Rabies in animals
NEW ENGLAND														
Maine	1			654	1	23			10				6	
New Hampshire			4	26	1	1			4				2	
Vermont				405					6				2	
Massachusetts	7			1,658	1				308				52	
Rhode Island				534		12			9				9	
Connecticut	1		14	532	2	83			44				12	
MIDDLE ATLANTIC														
New York	9	1	[3] 4	2,042	8	394	3		[3] 280			1	153	5
New Jersey	1		7	993	5	97	5		188			2	58	3
Pennsylvania	17		([2])	2,474	6		2		242				71	
EAST NORTH CENTRAL														
Ohio	3		2	139	3	57			330			2	58	15
Indiana	10		36	118		32	2		93		1	1	28	13
Illinois	5	2	13	98	4	149	2		194			3	35	2
Michigan [4]	3		7	667	2	40	2		409				21	1
Wisconsin			94	846	2	17	3		95				38	1
WEST NORTH CENTRAL														
Minnesota	2			132	1	6	3		72				3	
Iowa				28		2			23				8	9
Missouri	2		5	565	1	45	1		59		1	1	9	
North Dakota	1		2	56	1		1		10				17	
South Dakota	1			10			1		[3] 4	1			2	
Nebraska	1		2	82					13				4	
Kansas	1		2	1,414		16			44				2	
SOUTH ATLANTIC														
Delaware	4			21					11					
Maryland [4]			6	1,582	1	70	2	1	[3] 48			1	12	
District of Columbia	2			49		6			8				3	
Virginia	1	1	367	615	1	106			11			3	18	2
West Virginia	3		69	181	1	16			26			2	19	
North Carolina	4			598	3				16		2		26	
South Carolina	3		736	241	3	211			12		1	2	41	3
Georgia	1		20	481	3	28	1		12		9	4	1	9
Florida	4			235		10	1		11		1	2	5	

EAST SOUTH CENTRAL														
Kentucky	6		20	729	7	47			56	1			36	14
Tennessee	1		124	314	3	102		1	37		1	2	15	
Alabama	7		148	611	1	102	1		23				8	6
Mississippi [4]	4		36	106	2	42	1		2		4	5	5	
WEST SOUTH CENTRAL														
Arkansas	1		180	692	1	92	1		6		2	2	16	
Louisiana	3		4	50	3	20	1		1				1	1
Oklahoma	4		73	311	1	80	1		9		1	1	4	4
Texas	18		2,266	3,909	8	604	5		34		2	4	102	26
MOUNTAIN														
Montana	2		4	34					13					
Idaho			11	68		17			[3] 19	2			3	
Wyoming	1			23		8			11					
Colorado			24	375	1				14			1	2	
New Mexico	2		3	217		30			9					
Arizona	4		175	147		51	1		5				21	
Utah [4]				91		5			6				28	
Nevada				2					1					
PACIFIC														
Washington	1		93	469	6	4	1		70				18	
Oregon			38	544		37			21				12	
California	3		20	1,559	6	25	7		[3] 35			1	15	1
Total	144	4	4,609	27,727	89	2,687	48	2	2,964	4	25	40	1,001	
Median, 1944-48	253	10	5,337	18,962	202		26		3,948	5	12	47	2,142	
Year to date 9 weeks	1,635	63	41,359	161,230	798	22,069	808	12	25,109	12	282	363	9,437	
Median, 1944-48	2,724	66	99,620	93,989	1,845		340	4	28,330	63	189	394	20,136	
	(27th)		(30th)	(35th)	(37th)		(11th)		(32nd)	(35th)		(11th)	(39th)	
Seasonal low week ends	July 10		July 31	Sept. 4	Sept. 18		Mar. 20		Aug. 14	Sept. 4		Mar. 20	Oct. 2	
Since seasonal low week	6,749		77,629	213,623	1,642		28,135		47,807	27		3,482	19,470	
Median, 1943-48	10,290		143,178	120,113	3,349		13,743		66,901	139		4,618	45,174	

[1] Including paratyphoid fever; reported separately, as follows: New Jersey 1; Salmonella infections, not included, New York, 1 case.
[2] New York City and Philadelphia only, respectively.
[3] Including cases reported as streptococcal infection and septic sore throat.
[4] Period ended earlier than Saturday.

Alaska: Influenza 4; measles, 13; pneumonia, 1; scarlet fever, 1; streptococcal sore throat, 1.
Territory of Hawaii: Influenza, 120; measles, 264; poliomyelitis, 1.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended February 19, 1949.—During the week ended February 19, 1949, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		22	3	265	771	34	27	68	201	1,391
Diphtheria				17	1	4		6	2	30
Dysentery, bacillary				1						1
German measles				140	9		16	9	21	195
Influenza		43			18	4				65
Measles		351	13	374	236	187	94	310	164	1,729
Meningitis					2					2
Mumps		54	3	220	364	27	14	42	174	898
Poliomyelitis						1				1
Scarlet fever		10	1	136	87	5	6	13	14	272
Tuberculosis (all forms)		14	33	82	22	14	4		54	223
Typhoid and paratyphoid fever				10					2	12
Undulant fever					1			1		2
Venereal diseases:										
Gonorrhea		7	5	89	65	26	11	22	57	282
Syphilis		9	6	72	43	11	5	5	14	165
Other forms									1	1
Whooping cough		10		220	15	11	13	2		271

FINLAND

Notifiable diseases—January 1949.—During the month of January 1949, cases of certain notifiable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	7	Poliomyelitis	11
Diphtheria	139	Scarlet fever	321
Dysentery	1	Syphilis	108
Gonorrhea	833	Typhoid fever	23
Paratyphoid fever	91		

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From consular reports, international health organizations, medical officers of the Public Health Service, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place	January–December 1948 (Includes week ended Jan. 1, 1949)	January 1949	February 1949—week ended—			
			5	12	19	26
AFRICA						
Egypt	1					
Cairo	1					
ASIA						
Burma	46					
Akyab	5					
Bassein	1					
Moulmein	1					
Rangoon	2					
China:						
Hupeh Province	3					
Wuchang	3					
Kiangsi Province	[1] 9					
Kiangsu Province	2					
Shanghai	1					
India	178,166	11,146	3,132	141	108	
Ahmadabad	77					
Allahabad	[2] 6					
Alleppey	1					
Bombay	[2] 49				1	
Calcutta	[2] 7,985	638	204	137	106	
Cawnpore	157					
Cocanada	15					
Colachel	12					
Cuddalore	36	1				
Jodhpur	[2] 56					
Kilakarai	21					
Lucknow	48					
Madras	1,177	9				
Masulipatam	33					
Nagpur	74					
Negapatam	19	7	1	4	1	
New Delhi	26					
Raj Samand	6					
Tuticorin	16	11	1			
Vizagapatam	1					
India (French):						
Chandernagor	21					
Karikal	309	49		[3] 6		
Pondicherry	441	49		[3] 51		
Yanaon	2					
India (Portuguese)	29				•	
Indochina (French):						
Annam	[4] 49					
Cambodia	1,355		3	1	2	
Cochinchina	597					
Bien Hoa	1					
Chaudoc	2					
Cholon	29					
Giadinh	23					
Longxuyen	7					
Mytho	56					
Rachgia	133					
Saigon	136					
Laos	[5] 32					
Tonkin	20					
Pakistan	44,393	3,883				
Chittagong	[2] 52	35	3	2		
Karachi	7					
Lahore	415	1	3			
Siam	44					
Syria	3					

[1] Suspected.
[2] Includes imported cases.
[3] Jan. 30–Feb. 12, 1949.
[4] Includes suspected cases, also 4 deaths reported as cases in December 1948.
[5] Includes 12 deaths reported as cases in February 1948.

PLAGUE

(Cases)

Place	January–December 1948 (Includes week ended Jan. 1, 1949)	January 1949	February 1949—week ended—			
			5	12	19	26
AFRICA						
Belgian Congo	23	2				
Costermansville Province	[6] 12					
Stanleyville Province	11	2				
British East Africa:						
Kenya	39					
Tanganyika	319					
Ethiopia	9					
Madagascar	[7] 240	23		[8] 6		
Tamatave	1					
Tananarive	33	1				
Rhodesia, Northern	[7] 21					
Union of South Africa	[9] 54	1	3			
ASIA						
Burma [10]	1,114	173			1	
Mandalay	18					
Rangoon	19				1	
China:						
Chekiang Province	43					
Wenchow	14					
Fukien Province	343					
Foochow	4					
Kiangsi Province	[11] 66					
Kwangtung Province	116			[8 12] 6		
Yunnan Province	149					
India	25,022	2,886	1,023			
Indochina (French):						
Annam	267	5	2	14	5	
Cambodia	6	1	4	1	2	1
Cochinchina	45					
Laos	5	3				
Mountain Area South-Indochina	23					
Java	3,107					
Pakistan	[13] 11					
Siam	135					
EUROPE						
Portugal: Azores	17					
SOUTH AMERICA						
Argentina	12					
Buenos Aires Province	9					
Brazil	224					
Alagoas State	22					
Bahia State	158					
Ceara State	16					
Pernambuco State	28					
Ecuador	40					
Chimborazo Province	1					
Loja Province	39					
Peru	[14] 79					
Cajamarca Department	13					
Lambayeque Department	4					
Libertad Department	1					
Lima Department	36					
Piura Department	4					
Venezuela:						
Aragua State	7					
OCEANIA						
Hawaii Territory: Plague-infected rats [15]	5					

[6] Includes 1 case of pneumonic plague.
[7] Corrected figure.
[8] Feb. 1–10, 1949.
[9] Includes 4 cases of pneumonic plague.
[10] Includes imported cases.
[11] Includes suspected cases.
[12] Pneumonic plague.
[13] In Lahore, Apr. 27–May 3, 1948.
[14] Includes 21 cases reported for November 1948 (not previously reported). Details of distribution of these cases and also of 9 cases reported for December 1948 (see Public Health Reports, Feb. 25, 1949, p. 254) will be printed in the April 1 issue.
[15] Plague infection was also reported in Hawaii Territory, under date of Feb. 27, 1948, in a mass inoculation of tissue from 19 rats.

SMALLPOX

(Cases—P=present)

Place	January–December 1948 (Includes week ended Jan. 1, 1949)	January 1949	February 1949—week ended— 5	12	19	26
AFRICA						
Algeria	397	32				
Angola [15]	593					
Basutoland	3					
Bechuanaland	2					
Belgian Congo [15]	3,016	179	56			
British East Africa:						
Kenya	148	4				
Nyasaland	5,042	171	91	47		
Tanganyika [15]	1,389	41				
Uganda	215	2				
Cameroon (French) [15]	6					
Dahomey	474	72				[16] 12
Egypt [17]	479	23	4	5		
Eritrea	9					
Ethiopia	25					
French Equatorial Africa	16					
French Guinea	136					
French West Africa: Haute-Volta	438	4				
Gambia	27					
Gold Coast	1,515					
Ivory Coast	838	33		[18] 2		
Libya	263					
Mauritania	2					
Mauritius	[19] 1					
Morocco (French)	36	3				
Mozambique	373	22				
Nigeria	4,150					
Niger Territory	421	8				
Rhodesia:						
Northern	774	4				
Southern	1,763					
Senegal	8	3				
Sierra Leone	202					
Sudan (Anglo-Egyptian) [15]	1,464	23				
Sudan (French)	21	12		[18] 10		
Swaziland	6					
Togo (British)	24					
Togo (French)	119	4		[18] 2		
Tunisia	544					
Union of South Africa	402	4	P.	2		
ASIA						
Arabia	8					[20] 14
Bahrein Islands		27	[17] 5			
British North Borneo	1					
Burma [17]	3,040	107	4		35	63
Ceylon [17]	22					
China [17]	4,128	142		[18] 72	[16] 39	19
India	61,293	3,755	1,355	1,106	895	
India (French)	6			1		
India (Portuguese)	195	37				
Indochina (French)	4,097	177	23	51	27	6
Iran	1,195	80	3			
Iraq [17]	1,761	154	17	11	10	17
Japan	[21] [22] 29	1				
Java [17]	2	[23] 66	[21] 207	17	14	31
Korea		135				
Lebanon [17]	180	88	5	4		
Macao Island: **Macao**	11					
Malay States (Federated) [17]	546					
Manchuria	78					
Pakistan [17]	12,470					
Palestine	8					
Philippine Islands: Mindoro Island	[23] 335					
Siam [17]	541	7	21	1		
Sumatra [17]	1,695	9	5	3	8	2
Straits Settlements: **Singapore**	13					
Syria	898	93	43	4	6	
Transjordan [17]	62	45	4	7	1	7
Turkey: **Izmir**	4					
(See also Turkey in Europe.)						

See footnotes at end of table

SMALLPOX—Continued

Place	January–December 1948 (Includes week ended Jan. 1, 1949)	January 1949	February 1949—week ended— 5	12	19	26
EUROPE						
France	3					
Germany	3					
Greece	[20] 8					
Italy [17]	11	[26] 2				
Portugal	80					
Spain	19					
Canary Islands	9					
Turkey	48	15	18	20	3	
NORTH AMERICA						
British Honduras [15]	3					
Guatemala	2					
Mexico	980	3				
SOUTH AMERICA						
Argentina	50					
Bolivia	31					
Brazil [15]	753	26	2	8	7	
Chile	8					
Colombia	6,356	227				
Ecuador [15]	3,731	215				
Paraguay [15]	113					
Peru [15]	3,727	93				
Trinidad	[27] 12					
Venezuela [15]	4,888	163				[29] 50

[15] Includes alastrim.
[16] Feb. 11–20, 1949.
[17] Includes imported cases.
[18] Feb. 1–10, 1949.
[19] Imported.
[20] In the port of Makalla, Aden Protectorate.
[21] Corrected figure.
[22] Through week ended Dec. 25, 1948.
[23] Jan. 10–17, 1949.
[24] Jan. 18–Feb. 6, 1949.
[25] Includes 1 case reported from Baguio City, Luzon Island.
[26] In Lombardia Province.
[27] Alastrim.
[28] Feb. 13–26, 1949.

TYPHUS FEVER [29]

(Cases)

(P=Present)

AFRICA						
Algeria	202	10				
Basutoland	10					
Belgian Congo [30]	248	12				
British East Africa:						
Kenya [30]	71					
Zanzibar	1					
Egypt	325	12	2			
Eritrea	48	9		3		
Ethiopia	201					
French Equatorial Africa	1					
Gambia: Bathurst	1					
Gold Coast [30]	10					
Libya [30]	501	14		4	1	
Madagascar: Tananarive [31]	7					
Morocco (French)	82	5		[32] 1		
Morocco (International Zone)	5					
Morocco (Spanish) [30]	8					
Mozambique [30]	3					
Nigeria [30]	7					
Rhodesia (Southern)	[31] 1					
Senegal	[31] 4					
Sierra Leone	[31] 18					
Somalia	2					
Tunisia [30]	633	4		[32] 1		
Union of South Africa [30]	430	5	1	2		

See footnotes at end of table

TYPHUS FEVER—Continued

Place	January-December 1948 (Includes week ended Jan. 1, 1949)	January 1949	February 1949—week ended—			
			5	12	19	26
ASIA						
Burma	7					
China [30]	[33] 194					
India	3	2	1			
India (Portuguese)	11	1				
Indochina (French) [30]	73					
Iran [30]	150	8				
Iraq [30]	222	2	2		2	
Japan	[34] 488	32				
Java	3					
Korea		23				
Malay States (Federated)	[31] 14					
Manchuria	38					
Pakistan	22		6			
Palestine [30]	12					[35] 100
Philippine Islands [30]	[36] 5		1			
Straits Settlements: **Singapore** [30]	[33 37] 20					
Syria [30]	66					
Transjordan	70	4	1			
Turkey (see Turkey in Europe).						
EUROPE						
Albania	15					
Bulgaria	781	31				
Czechoslovakia	9	1				
France	5					
Germany:						
British Zone	8					
French Zone	12					
United States Zone	[33] 2					
Great Britain:						
Cyprus	[31] 1					
England and Wales	[31] 2					
London	[38] 2					
Ireland (Northern)	[31] 2					
Malta [31]	29		1			
Greece [30 36]	347	16	3			
Hungary	61	2			3	
Italy [30]	[33] 138					
Sicily	27	7				
Netherlands	[31] 1					
Poland	405	21				
Portugal	[33] 8					
Azores: **Ponta Delgada**	[39] 3					
Maderia Islands: **Funchal**	1					
Rumania [30]	22,211	147	25			
Spain	21					
Turkey	391	34	5	7	5	5
Yugoslavia [30]	633	20				
NORTH AMERICA						
Costa Rica [31]	35	3	1			3
Cuba [31]	24					
Guatemala	181					
Jamaica [31]	20		1			
Mexico [30]	1,128	11	2	5		2
Panama Canal Zone [30]	13					
Panama Republic	7					
Puerto Rico [31]	38		1			1
SOUTH AMERICA						
Argentina	21					
Bolivia	[40] 93					
Brazil	[30 33] 14					
Chile [30]	609	5				
Colombia [30]	3,234	256				
Curacao [31]	21					
Ecuador [30]	446	35				
Peru	1,255	1				
Venezuela [30]	180	1	1			2

See footnotes at end of table

TYPHUS FEVER—Continued

Place	January–December 1948 (Includes week ended Jan. 1, 1949)	January 1949	February 1949—week ended— 5	12	19	26
OCEANIA						
Australia [31]	173	10	1			
Hawaii Territory [31]	22	3				
Honolulu	3					
New Caledonia	1					

[29] Reports from some areas are probably murine type, while others include both murine and louse-borne types.
[30] Includes murine type.
[31] Murine type.
[32] Feb. 1–10, 1949.
[33] Corrected figure.
[34] Through week ended Dec. 25, 1948.
[35] Outbreak during the month of February 1949.
[36] Includes suspected cases.
[37] Includes nonresident and imported cases.
[38] Imported.
[39] Deaths.
[40] Includes 9 deaths reported as cases in Cochabamba Department in March 1948.

YELLOW FEVER

(C—cases; D—deaths)

AFRICA							
Belgian Congo:							
Stanleyville Province D		[41] 4					
Gold Coast:							
Kumasi D	1						
Accra D	2						
Ivory Coast:							
Gagnao D	1						
Sudan (French):							
Sebekoro D	1						
NORTH AMERICA							
Panama:							
Pacora C		[42] 8					
SOUTH AMERICA							
Argentina D	1						
Cerro Azul, Misiones Territory D	1						
Bolivia: [43]							
Brazil D	3						
Bahia State:							
Ilheus City, Itajuipe D	1						
Ubaitaba County D	1						
Rio Grande do Sul State:							
Sao Luiz Gonzaga D	[44] 1						
British Guiana D	1						
Colombia D	19						
Antioquia Department:							
Maceo D	4						
Yolomba D	1						
Boyaca Department:							
Campohermoso D	1						
Caldas Department:							
La Dorado D	1						
Samana D	1						
La Victoria D	1						
Cundinamarca Department:							
Medina D	7						
Intendencia of Meta:							
Cumaral D	1						
Restrepo D	1						
San Martin D	1						

See footnotes at end of table

YELLOW FEVER—Continued

Place	January–December 1948 (Includes week ended Jan. 1, 1949)	January 1949	February 1949—week ended—			
			5	12	19	26
SOUTH AMERICA—continued						
Peru:[45]						
Loreto Department:						
Nauta, Loreto Province.....D	1					
San Martin Department:						
Saposoa, Saposoa Province.....D	[46] 1					
Venezuela:						
Bolivar State:						
Boatanamo, Tumeremo County.....D	1					

[1] All in Paulis area, dates as follows: Jan. 1, 1949, 2 deaths, Jan. 15, 1 death, Jan. 31, 1 death.
[42] 5 cases confirmed.
[43] Delayed report: During the months of April and May 1947, 5 cases of yellow fever were reported in Bolivia, distributed as follows: Santa Cruz Department—Nuflo de Chavez 1, Concepcion 1, Cercado 1; La Paz Department—Province of Sud Yungas, Chulmani 1, Province of Nor Yungas, Coroico 1.
[44] Suspected.
[45] Delayed report: On July 23, 1948, 1 death from yellow fever was reported to have occurred in Tingo Maria, Huanoco Department, Peru, in the month of November 1947.
[46] On July 11, 1948.

DEATHS DURING WEEK ENDED FEB. 26, 1949

[From the Weekly Mortality Index, issued by the National Office of Vital Statistics]

	Week ended Feb. 26, 1949	Corresponding week, 1948
Data for 94 large cities of the United States:		
Total deaths	9,419	9,811
Median for 3 prior years	10,200	
Total deaths, first 8 weeks of year	79,247	83,702
Deaths under 1 year of age	649	604
Median for 3 prior years	626	
Deaths under 1 year of age, first 8 weeks of year	5,408	5,725
Data from industrial insurance companies:		
Policies in force	70,596,198	66,855,148
Number of death claims	10,568	10,696
Death claims per 1,000 policies in force, annual rate	7.8	8.4
Death claims per 1,000 policies, first 8 weeks of year, annual rate	9.6	10.5