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TECHNICAL, FINANCIAL AND ADMINISTRATIVE ASPECTS OF WATER

SUPPLY IN THE URBAN ENVIRONMENT IN THE AMERICAS

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In theory, at least, a health officer determines where to put major public health emphasis after a careful appraisal of the causes of disease and death. Such a review provides him with the guide lines by which his activities are to be defined. Practical adjustments are then made necessary by political, financial or emotional considerations. Before discussing the central subject matter of this paper, therefore, it is reasonable to assess the public health situation in the Americas in order to learn what the objectives of a public health program should be.

THE HEALTH SITUATION

In spite of the difficulties, with inaccuracy of reporting disease in many countries, it is helpful to know what people die of and what the implications of such causes of death are for future programming.

Complete or fairly complete mortality data are available for Argentina, Canada, Chile, Costa Rica, Guatemala, Mexico and the United States. For the remaining countries, registration is apparently incomplete. The estimated death rates for all ages for those countries with incomplete registration range between 15 and 20 per thousand population. Despite the deficiencies of the data, it is apparent that excessive mortality occurs in early childhood. A summary of health conditions in the Americas as reflected by the death rates for all ages, infants and children 1-4 years of age, appears in Table 1.

For children 1-4 years of age, Fig. 1^{1/} indicates that the group of diarrheal diseases was the leading cause of death in 12 of the 17 countries. In the other countries, the diarrheal diseases were among the first five principle causes.

While death rates from specific causes do not indicate the extent of the problem, due not only to inadequate registration but to incompleteness of medical certification, the death rates from typhoid fever and gastritis, enteritis, etc., are high in many of the countries. These conclusions are well illustrated in Tables 2 and 3. Comparison of many of these death rates with the corresponding figures in Canada and in the United States dramatizes the fact that these diseases take an extraordinarily massive toll of life and of disability in most of the Americas.

Although the number of typhoid fever cases reported in the past three years show fluctuations, some 40,000 cases are known to have occurred each year in the 22 countries listed. An interesting illustration of the comparative situations in two countries of the Americas appears in Table 4 in a study made by Gabaldon, Berti and Jove. From diarrhea and enteritis mortality data, these authors make clear in Table 4, that Venezuela still remains some 40 to 50 years in arrears in the prevention of these diseases. Table 5, from the same paper further demonstrates this unfavorable situation.

Dr. Gabaldon emphasizes the significant difference between the problems in such a country as his and in the United States by Figure 2.

^{1/} From Goddard, J. L., "The Prevention of Accidents in Childhood," Technical Discussions, XV Pan American Sanitary Conference, San Juan, Puerto Rico, September-October 1958.

This simple graph provides a striking basis for differentiating between the public health action required in one country and that in another with different public health problems.

This is not the place to extend the detailed consideration of the causes of death and illness, but enough has been presented to make clear that undoubtedly those diseases closely related to and reducible by environmental sanitation represent either the first cause or fall among the first five causes of death.

With these basic facts in mind, even a cursory canvass of the countries in question discloses the tremendous area of activity still to be covered in order to provide in the next five years a more significant reduction of disease than over the past five to ten years. Progress has undoubtedly occurred, but one cannot take pride in the reduction of these leading causes of death.

THE ENVIRONMENTAL SANITATION SITUATION

The following factors play a noteworthy part in the control or reduction of the diarrheal diseases.

1. The provision of a safe, ample water supply under pressure within or immediately adjacent to each house.
2. The provision of sanitary methods for excreta disposal within each dwelling, so that fecal pollution is removed from human contact.
3. The control of disease-bearing vectors, the provision of adequate housing and the sanitary control of milk and food.

4. The use of water and of the sanitary facilities provided to attain clean bodies, clean homes, and clean communities.

Detailed observations in California, Georgia, Kentucky, Guatemala, Korea and elsewhere demonstrated that shigella infections and other diarrheal diseases are universally associated with the lack of sanitary facilities, poor housing, limited or no water supply and poor personal hygiene.

If a single program were to be chosen for maximum public health dividends, the provision of safe and ample water, not only for drinking but for personal cleanliness, would be first in priority. This conclusion is well confirmed in one of the recent studies of the enteric diseases by the Pan American Sanitary Bureau. In general, all of the studies suggest that, quite irrespective of etiologic and sociologic differences, approximately 30 to 60 percent reduction in diarrheal diseases may be expected by providing a potable water supply in sufficient quantities and conveniently accessible to people.

Almost universal acceptance of these conclusions has prevailed in the Americas over many decades. Hardly any health worker contests the significance and desirability of providing a safe water. Active programs based upon these conclusions, however, have invariably fallen behind the lip service accorded them. In the past the health officer's activity has been dissipated over a variety of fronts sometimes influenced more by emotion or political expediency than by the realities of the situation. At times, he has been lured into activities singularly appropriate for some other country but quite inappropriate for his own.

THE EXPANDING NECESSITY FOR WATER

Safe water for the thirsty is not the sole objective. Water is necessary, in addition, to make it possible for a person to keep clean. This requires an ample quantity of water easily available to the individual. As Wood of Nigeria has recently pointed out, it is an insult to ask people to be clean when they have no water for bathing or when they must walk several blocks to a half mile in order to obtain a jug of water. Water is equally necessary in order to make public housing of any value from the public health standpoint. Public housing in which provision for water and sewerage is minimal or non-existent is less than a health asset.

The emerging urbanism and industrialization in every country of the Americas have already run away from the parallel provision for water. Water development is a pre-requisite to economic development. The assumption that a country may proceed with industrialization and that water facilities will follow, places the cart before the horse.

An historical block to the rapid introduction of water facilities, either into or immediately adjacent to the house lies in the almost universal "rural psychosis" of public officials. This emotional devotion to the tiny village or isolated rural house has literally prevented them from objectively appraising the overall water necessities and their public health implications. Deliberate exclusion of any attention to the water problems and service for aggregates of population, wherever they are or whatever the occupation of their inhabitants may be, has resulted in millions of people remaining without this facility. This conscious neglect stems from the erroneous assumption that the urbanized communities

of whatever size could and do take care of themselves.

THE WATER SITUATION

What are the realities of the water situation in the Americas? The PASB has collected data on the availability of water to people in the various countries of the Americas. One of the lessons learned from even this first inventory is that most of the countries are unaware of their water service conditions. If the survey does nothing more than arouse officials to an evaluation of their problem, it will have accomplished one of its major objectives.

With all of the disabilities and inadequacies of information now available, certain significant data have been accumulated which are presented in Tables 6 through 11. These tables indicate for a number of the countries the degree to which these populations now are lacking in water service.

Water service in this discussion is defined as the provision in the home or in the immediately adjacent courtyard of a water connection to a community piped water supply. Approximately 182 million persons live in the countries covered by this inquiry. Of these, 75 million live in cities with at least 2,000 inhabitants. Twenty-nine million persons or 39 percent of the people in these urban areas were without water services in 1958. It is difficult to reconcile this finding with the common assumption that urban areas usually take care of themselves.

Cities of 50,000 or more inhabitants have the best service but frequently more than 25 per cent of the inhabitants do not have water service as defined here. In fact the population without water service in major cities goes as high as 100%. Almost 50 per cent of the people living in cities of 10,000 to 49,999 are without such service. In cities of 2,000 to 9,999 over 70 per cent are not served.

Another 107 million persons who are not classified as urban inhabitants live either in smaller communities than 2,000 or in rural areas. Of these 107 million far more than 70% are without water service and yet many live in community groups where the density of living demands community piped water and sewerage systems. This latter group, virtually urban in character and living in well constructed homes, has been almost completely neglected because by definition they are usually considered to be rural, and attention has been diverted from the economic and sanitary convenience of community facilities to the individual well and privy.

The situation within metropolitan areas and in the surrounding fringe areas is dramatically illustrated in Table 8. Although the data are limited they shed light by showing that the percentage of population without water service in certain major cities runs as high as 42. In the metropolitan areas outside the city limits the percentage is as high as 100.

Inadequacy of reporting makes it almost impossible to elaborate upon these findings^s, particularly within the emerging great metropolitan areas. The innumerable communities surrounding each of the country capitals have grown at a very much higher rate over the last 20 years than

the capitals themselves. This excessive rate of growth has aggravated the water service problem, which was already great, and has resulted in large numbers of people living with almost primitive water conditions, even though residing in areas where water is assumed to be available. Table 12 gives a typical example of the nature of this problem in the metropolitan areas surrounding Buenos Aires. This situation may be paralleled in many metropolitan areas. Most have large portions of the population without modern water service.

These data do not downgrade the remaining problem of the population living in communities of less than 2,000 people. Their number is great. However, for a given unit of effort, more success is likely to be obtained in a period of five to ten years in a major attack on the heavily populated urban areas from 2,000 people and up, than by the devotion almost exclusively of all effort to the populations living in aggregates of 2,000 and under. That these latter groups cannot and must not be neglected, everyone must agree. That they should be chosen for major effort to the exclusion of urban groups can only result in a dismal failure to reduce disease in any measurable degree. It may well be pointed out that historically sanitation like other public improvements has moved from the larger urban areas outward to the rural, never the reverse.

The force of these comments is well illustrated in the case of Mexico where there are 24 communities of over 50,000; 135 of 10,000 to 50,000 and 824 of 2,500 to 10,000. The number of communities of less than 2,500 is 97,607. Simple arithmetic would indicate that a public agency

devoting its attentions exclusively to the last group, at the present rate of accomplishment, could well use 75 to 100 years and still not cover the needs of any large number of people.

If the objective of the health department is to increase rapidly the number of lives saved, the first dominant areas for public health attack are in the aggregate population communities in excess of 2000 people each. The vast opportunities for fruitful endeavor in such urban areas are illustrated in Tables 6 and 11.

If one applies reasonable criteria to the choice for a public health activity in the field of environmental sanitation, that function should be chosen which best complies with the following criteria:

- a) It brings potentially the greatest public health, comfort and economic returns;
- b) It affects the greatest number of people;
- c) The programme can be dramatically "sold";
- d) It gives more than reasonable expectation of easy and prompt execution;
- e) It requires for promotion a minimum expenditure of time and energy;
- f) It rests to a major extent upon the resources of the people;
- g) It requires a minimum education of all the people;
- h) It requires little or no additional research.

A PROGRAM FOR PROVIDING WATER

South of the border of the United States, at the present rate of installation of water facilities, it will take anywhere from 50 to 100 years to provide the bulk of the people in community aggregates with this important and necessary service. The present rate of installation in many instances is barely keeping pace with the increase in population growth and in some instances is even losing ground.

No single cause, of course, is responsible for this slow pace, but the desire for perfectionism along the entire environmental front was certainly one of the obstacles to past progress. A philosophy of all or nothing, even though for sound public health purposes, has not paid the maximum dividends.

The extraordinary emphasis placed upon the rural problem has already been commented upon, but it needs to be emphasized that many workers in the field of health still cling to this purpose as their major objective. As long as they persist it is doubtful whether large numbers of people will obtain water systems with any rapidity. The best promise for increasing the pace of service is the determination for greatest effort in working in urban areas.

The provision of water at a public tap in the street should not be accepted as a major public health asset. Water which must be carried from some central square does not meet essential conditions for the protection of the public health of the community.

Since the installation of water systems will require large amounts of capital investment, this cost has created great fears in the minds of many public health administrators. A proper understanding of the significance of source and methods of repayment of capital will do much to eliminate this fear. The large amount of capital required is less important than the annual amounts required for interest and amortization. These annual costs are the costs that need to be understood and stressed since in many instances these are well within the normal resources of the community.

An equally persistent obstacle to progress is the firm conviction both of the public and of some officials that water should be provided to all people free of charge. This assumption has been variously described as an essential characteristic rooted in the culture and history of the people. Such views however, are not paralleled by the realities in many places in Latin America. Many leading citizens insist upon exactly the contrary philosophy. Many communities have so acted and have been able to transfer water service from the concept of free to one of complete or almost complete reimbursability or repayment.

This emphasis upon "free water" has forced most countries to look to central or national governments for the money with which to provide such services. Such a practice has always resulted in less and less availability of large capital funds. In recent years when these demands upon the central government for capital funds have grown greater and greater by many additional competitive requirements of national life, the amounts of money for sanitary purposes in general and water service in particular are at a greater premium year by year. The hand-writing is on the wall; as long as this central government source is made necessary

through the perpetuation of the principle of free water the rate of installation of new service will undoubtedly be small and become smaller from year to year. This will require that Ministries of Health, local health officers, volunteer health agencies, and all possible sources of help must be marshalled, under the leadership of the health teams, to educate, indoctrinate, persuade, cajole, influence, and lead people to the point of agreeing to accept their obligations for the water bill. This will be one of the foundation stones on which the success of this program will rest.

Lastly, as long as major officials in health activity give an intellectual acceptance to the necessity of water, but do not match this acceptance with an emotional enthusiasm for its development, progress will be retarded. Leadership by public health officials in this field, hitherto not militantly at hand, is a prime prerequisite to the development of this program. In environmental sanitation, first things should come first. When water has been provided to the degree herein discussed, other features of environmental sanitation historically have always followed. Broader public health developments likewise become easier of acceptance, particularly when money is released from central government sources by the rapid acceptance of the repayment character of water service.

With these negative attributes understood and avoided, the positive characteristics of the urban water supply program are stated below.

1. Technology

In the development of water service, technological or scientific understanding of the methods and principles of design, construction and

operation has been available for many decades. One need not wait upon further technological advance to push a program as rapidly as possible. Obviously, new concepts will appear as time goes on, but absence of new knowledge does not retard immediate and rapid progress.

The need to strengthen the technical potential of Health Organizations at all levels is immediately apparent. There are some governments which have extremely weak engineering services in their Health Ministries. There are others who have a limited number of competent engineers at national level but none at lower levels of government. In almost every country, the total number available is inadequate and the organizational structure needs strengthening.

Governments should not overlook the place of private engineering firms and private consultants in an expanded water program. Because of the ability of such private companies to increase or decrease this activity with local demand, a much greater flexibility of engineering service can be provided than where government itself tries to do the work of design and construction. This is not to minimize the place of engineers in the Ministry of Health whose function it should be to not only stimulate all Ministries, Agencies, and parties to build more water systems, but also to review and approve the plans, supervise the operation and maintain the needed public health control over all water and sanitary facilities. Engineers in private practice while in short supply in most Latin American countries, should be encouraged and assisted.

That sufficient technologic skills are not available in other Ministries in every country is likewise true. The water program therefore must encompass training of practitioners in order to make the effort continually successful. The program, however, should not wait upon the development of all of the skills in all of the countries, since personnel is already available to initiate and to pursue the objectives in mind. The education and training of skilled professionals will probably go on forever, as populations grow and as problems emerge. The perfect state of affairs rarely, if ever, attained, is not a good reason for deferring active work.

2. Administrative Structure

The actual design, construction and operation of water works is carried out usually by departments of public works, on a national level. A number of examples, however, are at hand where the development of local facilities is largely in the hands of either a municipality or an autonomous local authority. The number of municipal agencies responsible for water service is unfortunately small. Generally, even very large communities wait upon the central or national government both for funds and for execution of projects. No good reason exists, other than custom, for permitting local groups to remain quite helpless and without responsibility in this important activity. Each situation, of course, needs to be reviewed within its own setting, but it is undoubtedly true that greater strength and responsibility must be increasingly placed upon large communities for working out their own water salvation.

Striking examples of these local possibilities are available in Guatemala City, the Federal District of Mexico, the Puerto Rico Authority

and in earlier years in the Argentina.

Multiple central agencies often have responsibilities in the field of water development. This has resulted in a certain degree of confusion and in strange partitioning of function among various agencies. The functions sometimes allocated to various agencies have been determined upon the basis of population groups. In any event, some increasing integration of effort, both for reasons of economy and for reasons of speed, with consequent consolidation of activity, would certainly appear desirable. Emphasis upon the desirable integration of central government functions should not lead, however, to further delay in program execution. Already this effort at integration, exclusive of all other practical activities, delays the program, while the search for the perfect governmental structure holds maximum attention.

Examples are likewise at hand where the Ministry of Health has responsibilities for design and construction of water facilities. In general, it is important that such activities should normally not be the responsibility of ministries of health. Where this is the case, the major function of the Ministry of Health suffers, namely, of stimulating other agencies in the installation of water facilities.

No single type of administrative structure is suggested for any particular country. In principle, however, public works departments would appear to be the natural agency to design, construct and operate systems. Ministries of health similarly should strengthen their forces and their objectives in the area of leadership and promotion of water facilities, without dissipating energies in the actual execution of projects, normally small in number and equally small in impact. Increasing responsibility and

autonomy are essential for local aggregates of people, beginning with those groups in excess of 100,000 each and rapidly extending that responsibility to groups down to even 2,000 in population.

It is desirable to stress again the leadership role which Ministries of Health must accept. This will require a strengthened environmental sanitation division in all Ministries and a new administrative approach in working with other Ministries and agencies of government. It will be difficult in many countries to exercise the influence and exert the pressure necessary to make the water program a dynamic force in those countries where the engineering services of the Health Ministry are maintained at a token level. Ministries of Health must decide if they want to get into this activity and if they decide in the affirmative, they must take immediate action.

3. Financial Considerations

The practice of providing money for water service via national or central government is well nigh universal. The wide use of such practice is well exemplified in Table 13. Even where Table 13 indicates that municipal sources of capital are available, this rarely means that capital is raised largely via municipal sources. It often means that large amounts of money are allocated by the central government to the district or municipality for expenditure or that the central government remains the arbiter for the issuance of local bonds.

It is rare indeed that municipalities have full autonomy with respect to the fiscal aspects of water service, including direct responsibility for the issuance of bonds resting upon the credit of the local entity.

The absence of such authority has brought unfortunate results in that major cities in many instances are unable to meet the requirements of existing populations or of those populations which have grown up in the metropolitan areas adjacent to them. The hopeless pressure for more capital on the national government accounts for the general hope that some mysterious source of capital may be found, either in loans or grants from agencies external to each country. Since charges for water service are not only variable, but in some instances close to non-existent, capital investment is obviously unattractive to either private or public lenders. Since relatively long term bonds at low interest rates are necessary for water supply facilities, this demand is rarely met through public or private lending agencies.

The income from most water systems in South and Central America hardly ever pays for the interest or amortization of capital invested. In fact, it is quite rare that such income supports even the annual cost of maintenance and operation. A commodity, therefore, such as water, which has no sales value or income, is unlikely to be an attractive investment. No government, no matter how humanitarian its instincts, has successfully supplied its people with clothing, food, houses and services without any hope of repayment.

The health officer, therefore, must confront himself with the necessity of bringing new conviction to governments and to peoples that water service, a first pre-requisite for public health returns, must be converted into a commodity service. The cost of this service must be reimbursable in part or in total, as each community may gradually be raised to such a level of self-support. In other words, the mythology

that a commodity which costs money to produce and to deliver is as free as the air must be rapidly expunged from the minds of officials and people. This conversion of attitudes has already taken place with large numbers of people in Latin America, even in those areas where officials still fall back upon this reasoning to justify the delay in the development of water service.

People pay for water in every one of the countries under discussion. When the housewife travels great distances to the public square to purchase a small can of water, she often does so at a cost ten times the cost of a safer water in greater quantity available to the house. Yet when water is piped into the house the great plea is made for extending this service free of charge.

Acceptance of the "free water" gospel is by no means universal. It is the line of least resistance, but it is breached even in a single country. In the same countries, water is often paid for in some communities, while adjacent ones hide under the cloak of past history in avoiding payment.

It is worth pointing out that almost nowhere is electric power provided free and when the bill is unpaid, the electricity is turned off. "Free" service apparently has different connotations in the same country for different public services - and cultural anthropology should not be invoked to justify only the bad practice.

Charges for water use, partial payment for water investment via property taxes and revenues from other sources, have all been used in the Latin countries for the financing of water systems, in whole or in part. It is only rarely, however, that both capital charges and maintenance and operation are fully provided for.

In many very large and reasonably well-to-do communities, the charges for water border on the ridiculous. Courageous correction of these situations is essential in preparation for the long term program. The evidence supplied in Table 14 gives reasonable indication that many consumers in Latin American countries pay something for water. These amounts no matter how low represent real milestones along the road toward self support.

Mr. Eugene R. Black, President of the International Bank for Reconstruction and Development, has summarized this situation perhaps better than almost anyone else in the following terms:

"A steadily expanding supply of essential public utility services is a requisite of economic growth in all underdeveloped countries today. Over the next decade, many thousands of millions of dollars in capital for these services must be found. There is simply no practical way to raise this money unless a substantial part of it is generated by the utilities themselves through adequate charges to the users of their services.

"The Bank has been laboring this point for a very long time. We have held it is dangerous for a developing country to be sentimental or practically expedient about things like railroads and power plants; that policies based on these attitudes only create an intolerable drain on the savings which are the lifeblood of every country's future prosperity. We have said that adequate utility rates are especially important in a country where there is no organized capital market. By 'adequate' rates we have meant rates which enable utilities not only to cover the real cost of their services, but also to retain out of earnings substantial sums each year to help finance the expansions which inevitably will be needed to sustain

future growth. And we have made no distinction in advocating adequate rates between privately-owned and publicly-owned utilities.

"I feel the Bank's insistence on sound utility finance is being vindicated today by events in many member countries. All over Latin America and in many other parts of the underdeveloped world, officials charged with the job of finding capital for development are themselves struggling to get a recognition of the simple principle that utilities should pay their way".

One of the important results of the enforcement of the principles on reimbursability herein discussed is that central government money is then released for other important public purposes which do not lend themselves easily to the application of the repayment principle. If water service and the capital required therefor is eliminated from the drain on central government funds, the central government dollar is so stretched that more money is made available for the general services in health, education, medical care, hospitals, etc. These latter now are in competition with required water facilities which are not, but should be, self supporting.

4. Sources of Funds

The hard fact that programs for resources development must be financed through local sources, is very well understood by ministers of finance and economics in every one of the Latin countries. The fruitless search for easy sources of money, either within the country or preferably from some external source, is unfortunately one of the major efforts of officials.

For certain kinds of water development, such as irrigation and hydroelectric power, external sources of money, often in the form of

loans, are available. A list of these sources is shown in Figure 3 (Banker's Trust Company pamphlet on foreign trade). The World Bank or an international finance corporation rarely makes extensive loans for community water service. This does not mean that such sources of capital are not available under certain conditions. No money is available, however, for loan purposes from most of these agencies, unless there is a clear demonstration of the total economic validity of the purposes of the loan and equally convincing demonstration that there is more than a reasonable chance that the loan will be repaid and that maintenance and operation of the facilities will be adequately provided for through appropriate rates.

The recently created Inter-American Bank to promote development of Latin America may offer less stringent sources of development money. The charter for this bank was accepted in April, 1959, and provides for two complementary agencies. The first and larger one will be the Inter-American Development Bank. It will make most of its loans in dollars. The loans will be reimbursable in the currencies in which they are made and the terms will be those of regular commercial banks.

The second agency will be a fund for special operations. It will make loans normally regarded as non-acceptable bank risks. These loans will finance projects that are socially useful, though not necessarily self-liquidating. Such loans will have easier terms and will be repayable in local currencies.

The Inter-American Bank will also provide finance, managerial and

technical experts to assist the countries in moving toward stronger administrative and fiscal status.

None of these sources, however, should be considered as substitutes for the rapid development of local sources of funds based upon the principle of self support and repayment. It is particularly important to recognize that the development of water service in Latin America will rest upon the maximum utilization of local resources of manpower, materials, and money.

The kind of program here visualized will only become effective when a new and imaginative approach is made to fiscal support by means of maximum local loans at low interest rates and with long amortization periods. Judicious and restrained use, for stimulation purposes, of grants-in-aid, and the rapid development of the principle and the reality of complete financial self support are the keys. Many water systems throughout the world pay for themselves by property taxes, charges for water used, special assessments or by combinations thereof. Their lessons must be applied in whole or in part to all of the Latin America, with appropriate adaptation to local practices, cultures and fiscal attitudes.

If one waits upon the availability of vast amounts of international aid, the program will wait a very long time. Local and national resources, infrequently supplemented by bi-lateral and international funds, can provide the bases for rapid extension of water to the people.

If the provision of community water is always to be viewed through the spectacles of the past, success is unlikely. That it need not be viewed on the basis of the status quo has been demonstrated already in

many areas in Latin America, for water essentially is cheap and can well pay for itself. People can and do learn why this must be so, if one takes the pains to make the principle understood.

ELEMENTS FOR IMPLEMENTATION

Assuming general acceptance of the desirability of a program for urbanized water facilities, the following steps for action are indicated. They are noted in maximum simplicity because their detailed elaboration would require a separate monograph. They are divided into two major divisions and it would be reasonable to assume that action could proceed in both simultaneously.

I. The Organization and Administrative Action

Each country should:

1. Initiate a study of the best type or types of organization for carrying out the national water program.
2. Enact such laws and enabling legislation, and adopt such procedures as are required to implement a program of sound, well managed, well operated, adequately financed water systems.

II. The Technical Action

Since it may be expected that changes in organization and administrative structure require time, it is urged that no country wait for

success in those activities before proceeding with the following technical actions. Every country should:

1. Have a reasonably complete inventory of the water service situation in community aggregates of people throughout the country.
2. Have a classification of areas unsupplied with water according to sizes of communities.
3. Make a selection of the areas which are the largest, which have the greatest need, and which will offer the fewest obstacles to immediate success.
4. Prepare a preliminary design and cost estimate for servicing each of the areas selected. This should include new sources, treatment plant, pumping facilities, etc., if required.
5. Prepare for each area a rate structure, encompassing property taxes, consumption charges, special assessments, or other sources, sufficient to pay annually charges for interest on and repayment of loans, for maintenance and operation and for new additions.
6. Provide for establishment of the managerial instrument to execute, finance and administer the project, whether national or local.
7. Provide for the creation of the administrative unit to be responsible for total water development and finance in the large capital and other metropolitan areas.
8. Prepare the legislation required to implement the items delineated above.
9. Arrange for the continuing collection of pertinent experience of other areas to provide for the education of officials, general public, industrialists, economists and financiers, and water consumers.

10. Delineate each proposed project in great detail -from its engineering elements to the charge for water to each class of consumer - in order to sell its value and low cost to the public.

11. Prepare and distribute authoritative and sound literature spelling out examples of successful water service, self-supported, in other countries.

In selecting the area or areas where the initial effort is to be made, one should be chosen where obstacles will be the least. This will provide a background for experience. It will permit development of the channels and mechanisms by which the later, more difficult areas can be approached.

These steps in the early action program proposed represent in virtually every instance a direct, almost daily, cooperative effort of the ministries of health, of public works and of finance. They entail likewise an early grasp of the inner workings of both national and local political units, in order to formulate procedures best adapted to each country and its subdivisions.

SUMMARY

The extension of water facilities to the people, not only for the thirsty, but to provide cleanliness and expand industry, housing facilities, and tourism must be one of the great public health endeavors for the next 5 to 10 years. The past success in making such facilities available is incredibly small. It is not keeping pace even with the annual increment of population growth. At the present rate of development, water will be

made available to 75 percent of people in the countries of Latin America only after 50 to 100 years.

If one waits until all of the theoretical requisites for such a program are at hand, one will wait forever. Technologic skills, improved administrative structure and new devices for financing, with strong self-liquidating features, are all sufficiently well understood now to make the initiation of a militant program practicable at once.

The success of such a program is contingent upon the leading health officers of every country not only accepting the theoretical validity of the program, but giving it more than lip service to carry it forward successfully.

A joint attack upon this problem by the ministries of health, of public works and of finance is essential. Reorientation of the activities of virtually all of the departments of health must precede these objectives.

PASB/WHO and ICA have major responsibilities in providing leadership in the education of officials in the administrative, technologic and finance features; the national and international banking units in the development of credit; and the national and local political units in the responsible execution of the projects. Sharp divisions of responsibility are impractical and academic. PASB/WHO and its national governing members must supply the spearhead for strengthening the inter-relationships among all of the groups noted above.

That the provision of community piped water to the people is a worthy public health endeavor is perhaps best summarized in the opening statements by WHO Director General, Dr. M. G. Candau, at the Twelfth

World Health Assembly in 1959. He there stated:

"Water predominates as the major constituent in practically every phase of an individual's physical, social and economic life. Experience has proved that making potable water available to the individual is the foundation on which rests the health and economic progress of the community. Because of the basic public health importance of community water supplies, WHO cannot remain aloof from its obligation to supply the stimulation and assistance needed to bring about their construction."

"It is disheartening to record that in 1959 in many major cities and their densely urbanized satellites many millions of people are still dependent upon individual wells, springs or itinerant purveyors for this life-giving commodity. Cities, ranging from two to seven or eight million people, not only fail to furnish water through pipes to households of several hundreds of thousands of their inhabitants, but even to those directly connected to the system they supply an unsafe water, often on a rationed basis of a third of each day or less. This significant fact is often ignored in determining environmental sanitation programs. "

"The labour involved in drawing water and transporting it for a long distance, a task which often falls to the lot of the women, results in their virtual enslavement. Frequently as much as one-half of their time, day after day, month after month, is taken up with this essential chore. A very simple calculation will show that there is no more efficient means of transporting water than by a pipe. A small pipe, one inch in diameter, will deliver in a day, without human effort, as much water as can be carried by 150 women working steadily for eight hours. Even in the most advanced countries there are still great deficiencies."

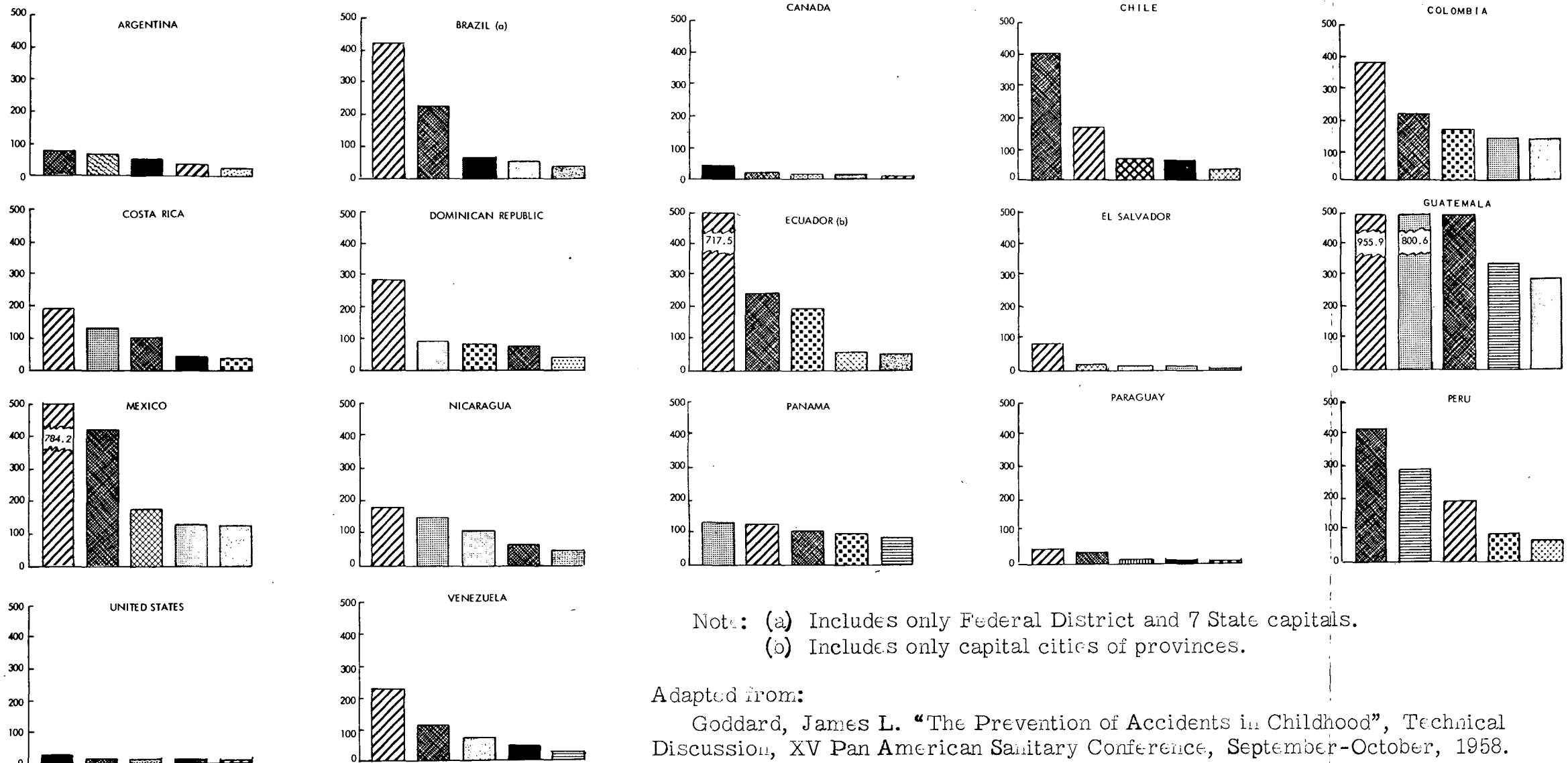
"For such a programme to be successful it should move rapidly beyond lip service to real effort, including budgetary allotments, increases in skilled personnel, and actual operating programmes. Its success would demand of ministries of health a militant and continuing leadership and a far closer co-operation with departments of public works than now generally exists. It is sound to separate the stimulative functions of a health department from the executive functions of a public works department. Such administrative separation, however, does not justify each in going its own way. Their co-operation is essential in carrying forward a water supply programme".

ACKNOWLEDGEMENT

I should like to express my appreciation to the Director of PASB and his headquarters staff, to the Zone representatives and engineers and to the many people of the Ministries of Health in the countries of this Region who have assisted me in providing, collecting and consolidating information and who have so willingly given of their time and effort.

Figure 1

PRINCIPAL CAUSES OF DEATH AMONG CHILDREN 1-4 YEARS OF AGE IN THE AMERICAS, 1956
(Rates per 100,000 population)



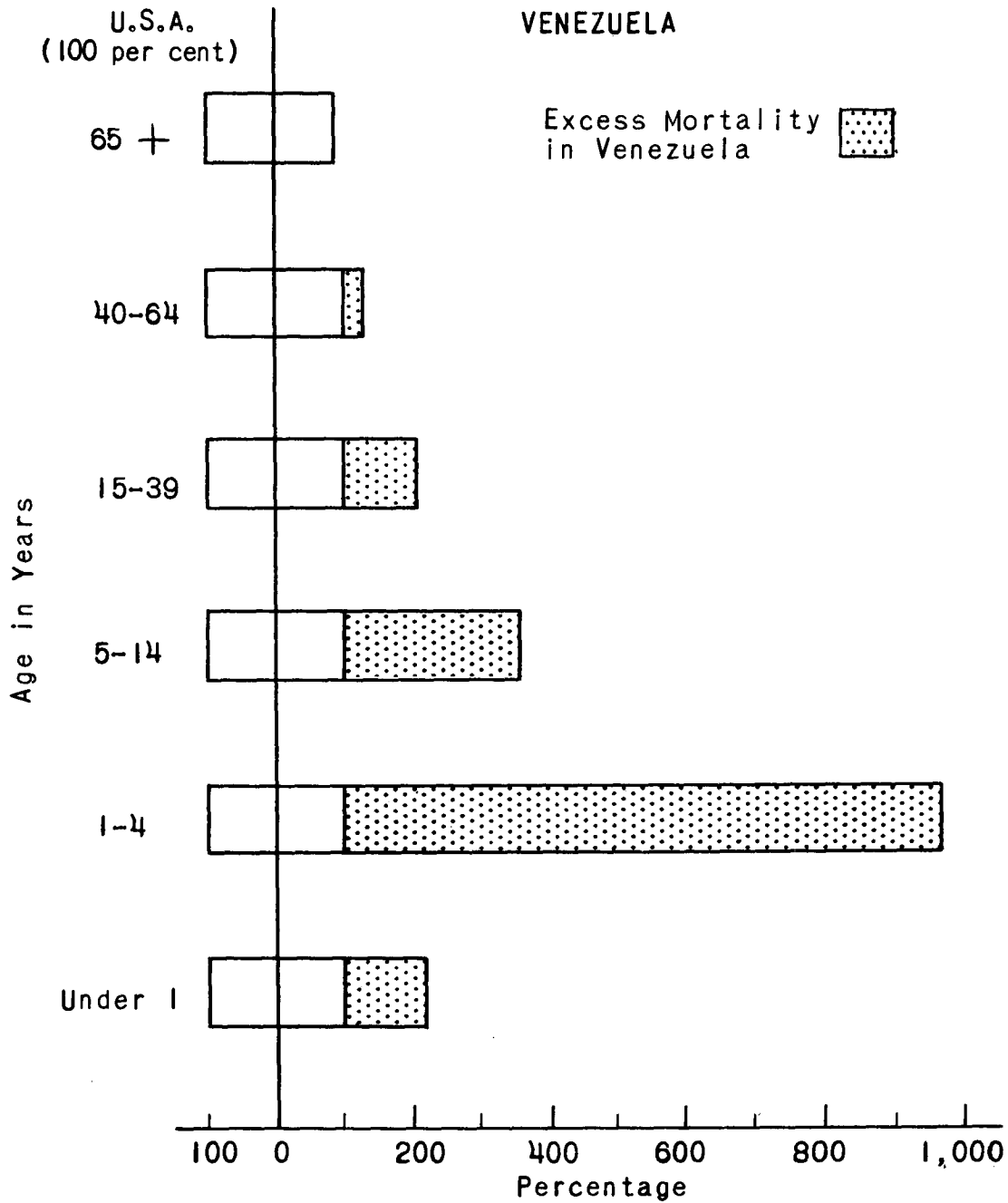
Adapted from:

Goddard, James L. "The Prevention of Accidents in Childhood", Technical Discussion, XV Pan American Sanitary Conference, September-October, 1958.

- | | | | | | |
|--|----------------------------------------------------------------|--|-------------------------------------------|--|----------------------------|
| | Tuberculosis, all forms | | Measles | | Diseases due to helminths |
| | Anaemias | | Congenital malformations | | Gastritis, enteritis, etc. |
| | Congenital malformations and certain diseases of early infancy | | Malignant neoplasms | | Influenza and pneumonia |
| | Nonmeningococcal meningitis | | Avitaminoses and other metabolic diseases | | Bronchitis |
| | Certain diseases of early infancy | | Malaria | | Whooping cough |
| | Paratyphoid fevers and other Salmonella infections | | Nephritis and nephrosis | | Dysentery, all forms |
| | Diseases of the heart | | | | Accidents |
| | Diseases of the circulatory system | | | | Rheumatic fever |

Figure 2

Mortality Rates from All Causes in Venezuela as Percentages of Mortality Rates in the United States, by Age Group



Source: A. Gabaldon

Figure 3

UNITED STATES AND INTERNATIONAL AGENCIES THAT HELP TO FINANCE FOREIGN TRADE
(Prepared by Bankers Trust Company)

UNITED STATES AGENCIES

INTERNATIONAL AGENCIES

	EXPORT-IMPORT BANK	EXPORT-IMPORT BANK COOLEY AMENDMENT FUNDS	DEVELOPMENT LOAN FUND	COMMODITY CREDIT CORPORATION	WORLD BANK	INTERNATIONAL FINANCE CORPORATION
PURPOSE	To promote U. S. exports.	Economic development; expansion of markets for U. S. agricultural products.	To finance productive projects in less developed countries having a great capital need.	To promote export of U. S. surplus agricultural commodities.	To finance projects helping to build the foundations of economic growth in less developed countries.	To finance private enterprises contributing to economic development of member countries.
NATURE OF LOANS	Lends in dollars only. Agricultural commodities, 12-15 months; machinery and equipment, 3-5 years; projects or development, 5-15 years.	Lends in local currencies at local interest rates; 3-15 years; loans must be acceptable to the foreign country.	Lends in dollars repayable usually in local currencies; 3-40 years. Loans in local currencies will be available later. Rates: Private Sector - same as Export-Import Bank; Public Sector - 3½% per annum. Foreign government guarantee not required.	Credits up to 3 years supported by confirmed letters of credit of U. S. banks.	Lends in dollars and other currencies. Term, 5 to 25 years, depending on project. Present rate, 5¾% per annum. Government guarantee required.	Makes loans to industrial and mining ventures, with convertibility to or rights to acquire capital stock. Lends in dollars; local currency loans will be available later. No government guarantee required.
WHO CAN BORROW	U. S. private enterprises; foreign private enterprises and governments of friendly countries qualifying under the Battle Act.	For business development: U. S. private enterprises. For agricultural markets expansion: private enterprises of U. S. or country whose currency is borrowed.	Private enterprises of U.S.; government or private enterprises in any country qualifying under the Battle Act.	Export firms in the United States.	Public or private entities in member countries.	Private enterprises in member countries.
WHERE THE FUNDS MUST BE SPENT	United States.	Recipient countries, which must have signed agreements with U. S. Department of Agriculture.	Any friendly country.	United States.	Member countries, normally other than that in which project is located.	Member countries, normally other than that in which project is located.
PRIVATE PARTICIPATION IN LOANS OF THE AGENCIES	Commercial banks and other financial institutions welcomed.	No.	Welcomed.	Not applicable. See "Nature of Loans."	Commercial banks and other financial institutions welcomed.	Welcomes financial institutions in member countries.
MUST SEEK PRIVATE CAPITAL FIRST	Yes.	No.	Yes, and also Export-Import Bank, World Bank and International Finance Corporation capital.	See "Nature of Loans."	Yes, and other public capital.	Yes.
MUST SHIP ONLY IN UNITED STATES VESSELS	Yes, unless waived by Maritime Administration.	Yes, unless waived by Maritime Administration.	Yes, unless waived by Maritime Administration.	Not applicable.	Not applicable.	Not applicable.

Table 1

Number of Deaths and Death Rates for All Ages, Under 1 Year and 1-4 Years in the Countries of the Americas, 1956

Country	All ages		Under 1 year		1 - 4 years	
	Number	Rate(a)	Number	Rate(b)	Number	Rate(c)
Argentina	159,191	8.2	27,143	58.5	6,499	3.8
Bolivia	* 32,639	10.1	d)10,113	92.7	d) 8,114	...
Brazil (e)	71,158	11.9	18,131	100.3	6,140	11.7
Canada (f)	131,585	8.2	14,259	31.7	2,317	1.5
Chile	83,744	12.7	27,509	109.1	7,118	10.4
Colombia	171,984	13.3	55,912	103.8	34,277	20.3
Costa Rica	9,518	9.6	3,685	71.6	1,240	9.8
Cuba	36,321	5.8	...	...	...	...
Dominican Republic	23,728	9.1	8,183	77.2	4,901	13.5
Ecuador	56,390	14.8	18,181	101.8	g) 2,108	18.7
El Salvador	28,127	12.4	7,486	70.3	6,096	22.7
Guatemala	66,280	19.8	14,499	88.8	17,066	38.8
Haiti	...	...	...	...	...	...
Honduras	17,397	10.2	3,702	58.4	3,462	16.8
Mexico	*368,877	12.1	*101,360	71.0	h)87,473	24.0
Nicaragua	9,792	7.6	3,342	63.5	1,455	9.3
Panama	8,268	9.3	2,007	55.7	1,161	10.2
Paraguay (i)	7,260	4.5	1,802	81.7	790	3.8
Peru	* 59,782	6.8	h)29,705	94.8	d)19,087	19.6
United States	1,564,476	9.3	108,183	26.0	16,603	1.1
Uruguay	* 18,421	7.0	* 2,212	73.0	353	...
Venezuela	59,369	10.3	18,538	66.7	9,501	12.5

* Provisional. ... Data not available. (a) Per 1,000 population. (b) Per 1,000 live births. (c) Per 1,000 population 1-4 years of age. (d) Year 1954. (e) Federal District and seven State capitals. (f) Excluding Yukon and Northwest Territories. (g) Capital cities of provinces only. (h) Year 1955. (i) Registration incomplete.

Table 2

Number of Deaths from Typhoid Fever and Gastritis and Enteritis with Rates per 100,000 Population in Countries of the Americas, 1956

Country	Typhoid fever		Gastritis, Enteritis, etc.	
	Number	Rate	Number	Rate
Argentina	133	0.7	2,552	13.1
Bolivia (a)	92	2.9	685	21.7
Brazil (b)	94	1.6	9,421	157.1
Canada (c)	9	0.1	905	5.6
Chile	149	2.3	5,645	85.7
Colombia	561	4.3	15,638	120.9
Costa Rica	16	1.6	1,221	123.6
Cuba	...	...	...	...
Dominican Republic	104	4.0	2,509	96.2
Ecuador	900	23.7	d) 3,928	106.4
El Salvador	45	2.0	3,521	155.2
Guatemala	328	9.8	8,489	253.5
Haiti	...	...	...	...
Honduras	84	4.9	609	35.6
Mexico	3,666	12.0	56,336	184.5
Nicaragua	47	3.6	1,191	92.5
Panama	3	0.3	490	55.3
Paraguay (e)	13	0.8	264	16.5
Peru (a)	214	2.6	2,029	24.9
United States	54	0.0	7,508	4.5
Uruguay (d)	23	0.9	524	20.0
Venezuela	63	1.1	5,577	96.6

... Data not available. (a) Year 1954. (b) Federal District and seven State capitals. (c) Excluding Yukon and Northwest Territories. (d) Year 1955. (e) Registration incomplete.

Table 3

Number of Reported Cases of Typhoid Fever with Rates per 100,000
Population in Countries of the Americas, 1956-1958

Country	1956		1957		1958	
	Number	Rate	Number	Rate	Number	Rate
Argentina	1,830	9.4	1,884	9.5	1,474	7.3
Bolivia	309	9.6	156	4.8	209	6.3
Brazil (a)	b) 2,355	24.9	...	...	...	...
Canada	377	2.3	b) 279	1.7	b) 304	1.8
Chile	4,172	60.1	b) 5,371	75.4	b) 5,086	69.7
Colombia (b,c)	12,864	108.3	11,643	96.8	12,696	100.2
Costa Rica	224	22.1	194	18.4	220	20.0
Cuba	1,065	17.0	241	3.8	331	5.1
Dominican Republic	211	8.1	178	6.6	...	...
Ecuador	b) 1,569	41.3	1,958	50.3	2,046	51.1
El Salvador (c)	817	74.7	654	57.1	b) 771	61.1
Guatemala	b) 503	15.0	354	10.3	402	11.3
Haiti	249	7.4	155	4.6	944	27.6
Honduras	...	...	...	...	374	...
Mexico	5,130	16.8	4,683	14.9	6,004	18.6
Nicaragua	184	14.3	134	10.1	351	25.5
Panama	53	5.6	47	4.9	66	6.6
Paraguay	128	8.0	55	3.4	129	7.7
Peru (b,c)	5,067	115.1	7,162	150.2	6,527	133.0
United States	1,700	1.0	1,231	0.7	1,076	0.6
Uruguay	399	15.1	359	13.4	280	10.3
Venezuela (c)	b) 1,322	38.4	695	19.3	979	25.4

* Provisional. ... Data not available. (a) Federal District and State capitals. (b) Including paratyphoid fever. (c) Reporting area.

Table 4

Deaths from Diarrhea and Enteritis per 100,000 Population in United States and Venezuela and the Year in Which the Mortality in the United States is Similar to that in Venezuela

Age (years)	United States					Venezuela	
	1900	1910	1920	1930	1940	1952	Year in U.S.A.
Under 1	4429.8	3778.8	1625.9	836.9	407.0	2844.1	1911
1 - 4	303.0	271.8	141.3	95.6	30.2	445.4	Before 1900
5 -14	8.8	6.1	4.1	3.0	0.9	13.3	
15-24	5.7	1.9	1.7	1.1	0.7	3.1	1905
25-34	7.5	3.2	3.0	1.5	1.0	3.7	1908
35-44	10.5	5.0	4.3	2.2	1.6	5.7	1911
45-54	18.6	9.3	7.4	3.6	1.9	11.6	1903
55-64	49.3	23.9	12.7	7.2	3.4	23.0	1910
65-74	130.4	74.3	32.7	16.7	7.0	45.2	1915
75-84	316.9	230.7	107.5	59.5	23.0	77.6	1922
85 and over	676.1	584.5	258.3	173.5	71.1	343.4	1915

Source: Gabaldón, A., Berti, A.L. and Jove, J.A. "El Saneamiento en La Lucha Contra La Gastroenteritis y Colitis" from I Congreso Venezolano de Salud Pública y III Conferencia de Unidades Sanitarias.

Table 5

Comparison Between the Mortality by Age Group for Some Communicable Diseases in Venezuela and United States in 1947.

The rates for the United States are percentages of the Venezuelan rates.

Age (years)	Country	Diarrhea and enteritis	Tuberculosis	Pneumonia	Whooping cough
Under 1	Venezuela	3259.4	86.2	1086.9	360.4
	U.S.A.	152.8	10.5	343.5	41.9
	%	4.7	12.2	31.6	11.6
1 - 4	Venezuela	531.7	71.7	170.4	79.9
	U.S.A.	5.8	6.6	21.7	3.9
	%	1.1	9.2	12.7	4.9
5 - 9	Venezuela	47.6	34.7	25.1	9.1
	U.S.A.	0.5	1.9	4.2	0.3
	%	1.0	5.5	16.7	3.3
10-19	Venezuela	9.2	69.3	9.0	0
	U.S.A.	0.4	9.5	3.4	0.1
	%	4.4	13.7	37.8	-
20-29	Venezuela	12.8	178.9	12.6	0.2
	U.S.A.	0.8	31.8	4.8	0
	%	6.2	17.8	38.1	-
30-39	Venezuela	16.5	233.7	14.0	0
	U.S.A.	0.9	36.4	8.1	0
	%	5.4	15.6	57.9	-
40-49	Venezuela	30.7	275.7	25.9	0.4
	U.S.A.	1.1	46.6	17.7	0
	%	3.6	16.9	68.3	-
50-59	Venezuela	37.5	292.8	41.2	0
	U.S.A.	1.4	58.6	34.3	0
	%	3.7	20.0	83.2	-
60-69	Venezuela	86.5	389.2	100.9	0
	U.S.A.	3.2	71.6	75.8	0
	%	3.7	18.4	75.1	-

Source: Gabaldón, A., Berti, A.L. and Jove, J.A. "El Saneamiento en La Lucha Contra la Gastroenteritis y Colitis" from I Congreso Venezolano de Salud Pública y III Conferencia de Unidades Sanitarias.

Table 6

Estimated Number and Per Cent of Population Lacking Water Service^(a) in Cities of 18 Latin American Countries^(b) in 1958 by Country and Size of Cities

Country	Estimated population (July 1, 1958) (thousands)	Cities of 50,000 or more inhabitants				Cities of 10,000-49,999 inhabitants				Cities of 2,000-9,999 inhabitants						
		No. of cities	Total population		Population without water service		No. of cities	Total population		Population without water service		No. of cities	Total population		Population without water service	
			Number (thousands)	Per cent	Number (thousands)	Per cent		Number (thousands)	Per cent	Number (thousands)	Per cent		Number (thousands)	Per cent	Number (thousands)	Per cent
Total	149,509	114	34,839	23.3	7,877	<u>23</u>	507	12,639	8.5	5,907	<u>47</u>	2,402	12,581	8.4	8,861	<u>70</u>
Argentina	20,256	26	9,158	45.2	1,241	<u>14</u>	84	2,241	11.1	732	<u>33</u>	375	2,053	10.1	1,439	<u>70</u>
Bolivia	3,305	4	557	16.9	c) 160	c) <u>29</u>	4	118	3.6	83	<u>70</u>	40	182	5.5	d) 136	<u>75</u>
Brazil	62,725	33	12,259	19.5	3,006	<u>25</u>	187	e) 4,973	7.9	3,039	<u>61</u>	950	e) 5,260	8.4	4,153	<u>79</u>
Chile	7,314	9	2,457	33.6	1,035	<u>42</u>	39	1,050	14.4	488	<u>46</u>	80	474	6.5	238	<u>50</u>
Colombia	13,522	14	3,189	23.6	669	<u>21</u>	42	923	6.8	266	<u>29</u>	254	949	7.0	413	<u>44</u>
Costa Rica	1,072	1	135	12.6	3	<u>2</u>	6	92	8.6	-	<u>0</u>	16	73	6.8	1	<u>1</u>
Dominican Republic(f)	2,791	2	429	15.4	99	<u>23</u>	7	146	5.2	72	<u>49</u>	27	166	5.9	103	<u>62</u>
Ecuador	4,007	3	839	20.9	126	<u>15</u>	9	174	4.3	63	<u>36</u>	49	257	6.4	g) 157	<u>61</u>
El Salvador	2,434	2	289	11.9	62	<u>21</u>	10	164	6.7	59	<u>36</u>	43	181	7.4	142	<u>78</u>
Guatemala	3,549	1	361	10.2	138	<u>38</u>	4	83	2.3	59	<u>71</u>	83	418	11.8	314	<u>75</u>
Haiti	3,426	1	199	5.8	88	<u>44</u>	6	82	2.4	37	<u>45</u>	22	h) 110	3.2	105	<u>95</u>
Honduras	1,822	1	97	5.3	52	<u>54</u>	4	88	4.9	54	<u>61</u>	29	136	7.5	94	<u>69</u>
Nicaragua	1,376	1	175	12.7	63	<u>36</u>	8	169	12.3	83	<u>49</u>	21	107	7.8	75	<u>70</u>
Panama	995	2	198	19.9	-	<u>0</u>	3	45	4.5	23	<u>50</u>	21	92	9.2	30	<u>32</u>
Paraguay	1,672	1	240	14.4	100	<u>42</u>	3	51	3.1	51	<u>100</u>	40	168	10.0	161	<u>96</u>
Peru	10,213	3	1,437	14.1	114	<u>8</u>	22	i) 762	7.5	134	<u>18</u>	151	i) 962	9.4	735	<u>76</u>
Uruguay	2,710	1	850	31.4	150	<u>18</u>	28	594	21.9	218	<u>37</u>	43	187	6.9	123	<u>66</u>
Venezuela	6,320	9	1,970	31.2	771	<u>39</u>	41	884	14.0	446	<u>50</u>	158	j) 806	12.8	442	<u>55</u>

a) Water service is considered to be lacking in houses which have no connection in either the house or its adjacent courtyard to a piped community water supply. b) Two countries excluded: data for Mexico not available by size of cities; no data from Cuba. c) Estimated from reporting in three of four cities. d) Estimated from reporting in 22 of the 40 cities. e) Population estimated on assumption of yearly increase of 4.5 per cent of census figure. f) Population estimated on assumption of yearly increase of 10 per cent of census figure in cities over 50,000; 5 per cent in all other cities over 2,000. g) Estimated from reporting in 12 of 49 cities. h) Population estimated on assumption of yearly increase of 2.5 per cent of census figure. i) Population estimated on assumption of yearly increase of 4 per cent of census figure. j) Estimated from proportion of total population in this group at last census.

Table 7

Estimated Population in Thousands of Urban (a) and Rural Areas with the Estimated Number and Per Cent of Urban Residents Lacking Water Service (b) in 19 Latin American Countries in 1958

Country	Total population	Urban population			Rural population	
		Total	Without water service		Total	Per cent of total population
			Number	Per cent		
Total	181,857	74,737	29,273	39.2	107,120	58.9
Argentina	20,256	13,452	3,412	25.4	6,804	33.6
Bolivia	3,305	857	379	44.2	2,448	74.1
Brazil	62,725	22,492	10,198	45.3	40,233	64.1
Chile	7,314	3,981	1,761	44.2	3,333	45.6
Colombia	13,522	5,061	1,348	26.6	8,461	62.6
Costa Rica	1,072	300	4	1.3	772	72.0
Dominican Republic	2,791	741	274	37.0	2,050	73.5
Ecuador	4,007	1,270	346	27.2	2,737	68.3
El Salvador	2,434	634	263	41.5	1,800	74.0
Guatemala	3,549	862	511	59.3	2,687	75.7
Haiti	3,426	391	230	58.8	3,035	88.6
Honduras	1,822	321	200	62.3	1,501	82.4
Mexico	32,348	14,678	6,628	45.2	17,670	54.6
Nicaragua	1,376	451	221	49.0	925	67.2
Panama	995	335	53	15.8	660	66.3
Paraguay	1,672	459	312	68.0	1,213	72.5
Peru	10,213	3,161	983	31.1	7,052	69.0
Uruguay	2,710	1,631	491	30.1	1,079	39.8
Venezuela	6,320	3,660	1,659	45.3	2,660	42.1

- (a) Urban areas usually defined as cities of 2,000 or more inhabitants; 2,500 or more in Mexico.
- (b) Water service is considered to be lacking in houses which have no connection either in the house or in its adjacent courtyard to a community piped water supply.

Table 8

Per Cent of Population Lacking Water Service ^(a) Within City Limits
and in Metropolitan Areas Outside City Limits, in 11 Cities of
Latin America in 1958

Country and city	Population within city limits		Metropolitan population outside city limits	
	Total	Per cent without water service	Total	Per cent without water service
Brazil: Niteroi	260,000	27	140,000	14
Colombia: Bogota	930,000	20	30,000	50
El Salvador: San Salvador	213,000	23	37,000	80
Panama: Panama City	139,000	0	38,000	0
Paraguay: Asuncion	240,000	42	15,000	73
Peru: Lima	1,186,000	5	200,000	100
" Arequipa	122,000	40	40,000	100
" Callao	129,000	9	20,000	100
Uruguay: Montevideo	850,000	18	152,000	67
" Salto	44,000	36	14,500	72
" Paysandu	33,000	18	15,800	54

a) Water service is considered to be lacking in houses which have no connection in either the house or its adjacent courtyard to a piped community water supply.

Table 9

Per Cent of Population with Water Service in Houses or Courtyards and in Courtyard Only in Six Latin American Countries in 1958, by Size of Cities

Country	Cities of 50,000 or grester			Cities of 10,000-49,999			Cities of 2,000-9,999		
	Estimated population (July 1, 1958)	Per cent with water in house or courtyard	Per cent with water in courtyard only	Estimated population (July 1, 1958)	Per cent with water in house or courtyard	Per cent with water in courtyard only	Estimated population (July 1, 1958)	Per cent with water in house or courtyard	Per cent with water in courtyard only
Bolivia	557,000	71	40	118,000	30	15	164,000	25	20
Brazil	12,259,000	75	15	4,973,000	39	20	5,260,000	21	10
Costa Rica	135,000	98	33	92,000	100	36	73,000	99	37
Dominican Republic	429,000	77	53	146,000	51	33	166,000	38	26
El Salvador	289,000	79	58	164,000	64	45	181,000	22	10
Paraguay	240,000	58	48	51,300	0	0	168,000	4	0

Table 10

Number and Per Cent of Population Lacking Water Service in Cities of Four Territories
in the Americas, by Territory and Size of Cities in 1958

Country	Estimated population (July 1, 1958)	Cities of 50,000 or more inhabitants				Cities of 10,000-49,999 inhabitants				Cities of 2,000-9,999 inhabitants						
		No. of cit- ies	Total population		Population without water service		No. of cit- ies	Total population		Population without water service		No. of cit- ies	Total population		Population without water service	
			Number	Per cent	Number	Per cent		Number	Per cent	Number	Per cent		Number	Per cent	Number	Per cent
Barbados	231,000	1	100,000	43.3	61,000	<u>61</u>	3	62,600	27.1	44,500	<u>71</u>	...	...	...	...	...
British Guiana	533,000	1	99,200	18.6	-	<u>0</u>	1	14,700	27.6	-	<u>0</u>	...	...	...	...	...
French Guiana	31,000	0	-	-	-	-	1	15,000	48.4	2,000	<u>13</u>	1	...	...	...	...
Surinam	241,000	1	100,000	41.5	18,200	<u>18</u>	0	-	-	-	-	4	15,200	6.3	7,000	<u>46</u>

... No information.

Table 11

Total Estimated Population and Per Cent of the Population without Water Service in Cities of 50,000 or More Inhabitants in Latin American Countries for a Recent Year

Country, city and year of population estimate	Estimated population (thousands)	Per cent without water service	Country, city and year of population estimate	Estimated population (thousands)	Per cent without water service
Argentina: 1958			Brazil: 1959 (cont.)		
Buenos Aires	3,805	0	Niteroi	260	27
Rosario	566	12	Santos	250	16
Cordoba	472	20	Curitiba	200	20
General San Martin	420	77	Santo Andre	180	33
Avellaneda	375	7	Campinas	150	13
La Plata	350	11	Maceio	150	53
Lanus	332	13	Juiz de Fora	150	47
Mar del Plata	305	17	Natal	120	33
Tucuman	264	18	Manaus	120	25
Quilmes	242	15	João Pessoa	120	33
Vicente Lopez	210	13	Duque de Caxias	120	17
Santa Fe	204	15	Campina Grande	120	67
Moron	198	59	Ribeirão Preto	120	25
Lomas de Zamora	185	19	Pelotas	116	31
Bahia Blanca	173	19	São Luis	115	35
San Isidro	165	23	Petropolis	110	9
San Justo	160	100	Sorocaba	102	29
Mendoza	136	0	Aracajú	100	30
San Juan	113	0	Campos	100	5
Parana	104	2	Rio Grande	94	23
Salta	94	19	Nova Iguaçu	90	11
Resistencia	81	38	São Caetano do Sul	80	25
Godoy Cruz	76	13	Teresina	80	60
Santiago del Estero	75	6	Neves	78	14
Corrientes	71	7	Bauru	70	29
Concordia	64	19			
Bolivia: 1959			Chile: 1958		
La Paz	345	20	Santiago (a)	1,580	16
Cochabamba	95	30	Valparaiso (a) and Viña del Mar (a) }	380	26
Oruro	70	...	Concepcion	150	20
Santa Cruz	50	86	Antofagasta	78	...
Brazil: 1959			Talco	69	26
Rio de Janeiro	3,000	23	Talcahuano	68	28
São Paulo	3,400	15	Chillan	66	33
Recife	700	29	Temuco	65	30
Salvador	500	40	Colombia: 1958		
Porto Alegre	500	10	Bogota	930	20
Belo Horizonte	500	40	Medellin	497	10
Fortaleza	400	60	Cali	428	6
Belém	300	33	Barranquilla	388	25

(cont.)

Table 11 (cont.)

Country, city and year of population estimate	Estimated population (thousands)	Per cent without water service	Country, city and year of population estimate	Estimated population (thousands)	Per cent without water service
Colombia: 1958			Honduras: 1957		
Bucaramanga	159	31	Tegucigalpa	94	54
Cartagena	140	59	Mexico (b): 1958		
Manizales	110	18	Mexico City (a)	4,700	11
Pereira	109	17	Nicaragua: 1957		
Cucuta	93	36	Managua	167	36
Palmira	76	14	Panama: 1957		
Armenia	73	9	Panama City	139	0
Ibague	71	49	Colon	58	0
Pasto	64	30	Paraguay: 1958		
Buenaventura	51	49	Asuncion	240	42
Costa Rica: 1957			Peru: 1958		
San Jose	134	2	Lima	1,186	5
Dominican Republic: 1950			Arequipa	122	40
Ciudad Trujillo	182	20	Callao	129	9
Santiago	57	32	Uruguay: 1958		
Ecuador: 1958			Montevideo	850	18
Guayaquil	427	10	Venezuela: 1958		
Quito	380	20	Caracas (a)	977	29
Cuenca	50	20	Maracaibo	332	58
El Salvador: 1957			Barquisimeto	148	41
San Salvador	213	23	Valencia	117	33
Santa Ana	67	17	Maracay	91	24
Guatemala: 1950			San Cristobal	73	22
Guatemala City	284	38	Cumana	64	57
Haiti: 1959			Cabimas (c)	69	100
Port-au-Prince	200	44	Maiquetia	58	49

a) Includes metropolitan area outside city limits. b) For remaining cities of 50,000 or more inhabitants in Mexico the data were not given by city. c) System under construction.

Table 12

Per Cent of Population without Water Service in Cities of 100,000
 or More Inhabitants Included in Greater Buenos Aires, 1958

City	Estimated population in 1958 (in thousands)	Per cent without water service
Buenos Aires	3,805	0
Avellaneda	375	7
General San Martin	420	77
Lanus	332	13
Quilmes	242	15
Vicente Lopez	210	13
Moron	198	59
Lomas de Zamora	185	19
San Isidro	165	23
San Justo	160	100

Table 13

Main Source of Capital for Water System in Cities of Latin American Countries by Country and City Size

Country	Cities with 50,000 or more inhabitants	Cities with 10,000-49,999 inhabitants	Cities with 2,000-9,999 inhabitants
Argentina	National	National	National
Bolivia	National - Municipal	National - Municipal	National
Brazil	...	...	...
Chile	National	National	National
Colombia	Municipal	...	...
Costa Rica	National - Municipal	National	National
Dominican Republic	National	National	National
Ecuador	Municipal	Municipal	Municipal
El Salvador	Municipal	Municipal	Municipal
Guatemala	Municipal - Private	National, Municipal or Private	National
Haiti	National	...	...
Honduras	National - Municipal	Municipal	Municipal
Nicaragua	National	Municipal	National - Municipal
Panama	National - Private	National	National
Paraguay	National - Municipal	None	Private
Peru	National	National	National
Uruguay	National	National	National
Venezuela	National	National	National or State

... No information

Table 14

Method of Establishing Payment Scales for Water Consumers in Cities of 18 Latin American Countries by Size of City

Country	Cities of 50,000 or greater							Cities of 10,000-49,999							Cities of 2,000-9,999							General payment scale (U.S. dollars)				
	No. with water	Flat rate	Meter	Meter and flat rate	Rate per faucet	Proportion of rent	No charge	Not stated	No. with water	Flat rate	Meter	Meter and flat rate	Rate per faucet	Proportion of rent	No charge	Not stated	No. with water	Flat rate	Meter	Meter and flat rate	Rate per faucet		Proportion of rent	No charge	Not stated	
Argentina	25					25			...						a)		...							a)	19	6.75 per cent of monthly house rent. Payable every 6 months.
Bolivia	4	2	1	1					4	a)							...	a)								\$.90 to \$1.50 per year. Very little revenue collected.
Brazil	33							33	...						a)	...								a)		Not stated.
Chile	9		9						...	a)							...	a)								Not stated.
Colombia	14			9				5	30							30	180							180		Range from \$.014 to \$.031 per cubic meter.
Costa Rica	1			1					6	2	2	2					16	12	3	1						Not stated.
Dominican Republic	2			2					...	a)							...	a)								\$3.50 for the first 20 cubic meters and \$0.10 for each additional cubic meter.
Ecuador	3			1				2	9	2						7	...	3								\$.026 to \$.033 per cubic meter.
El Salvador	2			2					10	9		1					4	2	37					5		Not stated.
Guatemala	1			1					4	4							6	2	61	1						Not stated.
Haiti	1				1				...				a)				5									\$.80 to \$8.00 per month depending on number and size of faucets.
Honduras	1			1					5				4		1		22							19		\$.04 to \$.075 per cubic meter or \$.050 to \$1.50 per faucet per month.

(cont.)

Table 14 (cont.)

Country	Cities of 50,000 of greater								Cities of 10,000-49,999								Cities of 2,000-9,999								General payment scale (U.S. dollars)
	No. with water	Flat rate	Meter	Meter and flat rate	Rate per faucet	Proportion of rent	No charge	Not stated	No. with water	Flat rate	Meter	Meter and flat rate	Rate per faucet	Proportion of rent	No charge	Not stated	No. with water	Flat rate	Meter	Meter and flat rate	Rate per faucet	Proportion of rent	No charge	Not stated	
Nicaragua	1		1					8	5	2	1						9	7	2						Flat rate \$1.42 to \$2.13 per month.
Panama	2		2					3	1	2							20	1	2	13			4		\$.10 to \$.12 per cubic meter. Flat rate \$1.00 per month per connection.
Paraguay	1		1					0									...					a)			1) Monthly minimum \$5.00 for 40 cubic meters, or 2) Included in rent.
Peru	3	1	2					...	a)								...	a)							Not stated.
Uruguay	1		1					...	a)								...	a)							Each month: \$.054 per m ³ for first 10 m ³ ; \$.11 per m ³ for 2nd 10; \$.13 per m ³ for next 80; \$.14 per m ³ for next 100; \$.16 per m ³ for next 300; and \$.18 per m ³ for all over 500 m ³ .
Venezuela	8		6	2				39	13	23					3		112	93	11				8		Not stated.

... Information not available.

a) General statement as to basis for payment - number of cities using this basis not specified.