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HEALTH IMPACT EVALUATION OF SURAKARTA WATER PROJECT

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I. SUMMARY

The purposes of this consultation were to provide recommendations for the design of a study to evaluate the health impact of the Surakarta Water Project, to recommend ways in which implementation of the Project could be improved, and to suggest areas of the city that should be considered for inclusion in the Project (see Part II, Recommendations, page 3).

Review of surveillance data on several water-related and non-water-related diseases obtained from the city health department and hospital and clinic records provided an estimate of incidence of these diseases. While such data were generally available for the 5 kecamatans in the city, relatively few data were available on these diseases in the 51 kelurahans.

Separate questionnaires were designed for administration to chiefs of the rukun tettangas (RT's) and to adult females in households in the city in an effort to develop information on the prevalence of water-related diseases, water handling practices in the city, and knowledge and attitudes of the people concerning water supply and sanitation and their relationship to health. People queried were generally unaware of the Surakarta Water Project but were aware of a relationship of diarrheal disease to water and sanitation and expressed a desire for improved water services. An insufficient number of questionnaires was completed to develop meaningful information on the prevalence of water-related diseases in the city. However, it appeared that conditions in Surakarta were conducive to the transmission of water-related diseases.

Review of the Project revealed that specific areas of the city to be included had not yet been defined. After review of surveillance data, consideration of the many limitations of these data and observations of conditions in the city, kelurahans that would be appropriate for inclusion in the Project were specified. In addition, it was apparent that the Project was not well integrated into other community development programs in the city, notably the Kampung Improvement Project and programs of the Surakarta City Health Department. Recommendations were formulated for involvement of these groups in future planning and implementation of the project.

For the health impact evaluation, surveillance data as currently collected in Surakarta appeared to be of very limited usefulness. Even appropriate modifications of the current data collecting system would still yield information of relatively limited value. In addition to the planned baseline and follow-up surveys, a longitudinal study design with weekly household visits to randomly selected homes with different levels of water supply and sanitation is strongly recommended for inclusion in the impact study (Part II, page 3). Such a design would provide the opportunity both to obtain and validate information on the change in water utilization that follows implementation of the Project and to document the time course of the effect of the intervention on water-related disease rates. A proposal for a project component on health education is made with the conviction that such a component will lead to a greater health impact of the project (Attachment A). In order to conduct this evaluation, a full-time Project Epidemiologist and a staff of field workers in Surakarta will be required.

II. RECOMMENDATIONS FOR SURAKARTA WATER PROJECT

Recommendations are made both for the design of the health impact evaluation and for the implementation of the entire water project. Recommendations for the design of the evaluation of the impact of the project on water-related diseases, water utilization, and defecation practices are subdivided into manpower requirements and study design categories. In order to utilize the proposed study design, the manpower requirements must be met. In addition, since available data on water-related diseases are inadequate, mechanisms for collection of valid data on suitable indicators of water-related diseases must be developed (Attachment B). The manpower recommendations are each of high priority while the recommendations concerning study design are ranked in priority order. The recommendations concerning implementation of the project are each of high priority.

A. Health Impact Evaluation

1. Manpower

a. Identify an epidemiologist in the Ministry of Health to act as a consultant to the Cipta Karya evaluation team throughout the course of the impact study.

b. Identify a sanitary engineer in Cipta Karya or the Bandung Institute of Technology to act as a consultant to the Cipta Karya evaluation team throughout the course of the impact study.

c. Hire an Indonesian epidemiologist to manage the health impact portion of the evaluation in Surakarta; have the option to

provide this individual with training in practical aspects of field epidemiology if indicated. A "Scope of Work" for such an individual is included (Attachment C).

d. Hire and train field workers to conduct household interviews throughout the course of the health impact study; these individuals should be fluent in Bahasa Indonesia and Javanese and should probably be women.

2. Study Design

a. Identify cohorts of 200 families with at least 1 child 0-4 years of age for interview of the mother weekly concerning the occurrence of indicator illnesses and quarterly concerning water and sanitation facility utilization. This study will supplement the initial and final planned large community surveys which alone may not provide sufficient data to document a health impact of the Surakarta Water Project because of the complexities of interactions between water-related disease incidence, personal hygiene of the people, sociologic factors relating to water use, and operation and maintenance of the water system (See Part III, Indicators of Water-Related Disease, page 8). Family cohorts should be selected on the basis of existing water and sanitation facility usage. Several possible study designs and manpower requirements are summarized in Attachment D. An example of a questionnaire for completion during weekly visits is included (Attachment E). Such a study should begin one year before the water system becomes operational in order to develop baseline data for interpretation of secular trends.

b. Define diarrhea and other indicator conditions (Attachment B) to be monitored during household interviews; a definition of diarrhea should include the concept of a liquid stool (or one more liquid than normal) and a minimum number of stools per day. Verify term by observation of stool specimens in clinic or hospital setting.

c. Conduct an ongoing analysis of the data collected, and review the results of the evaluation semi-annually. If possible, have all permanent project consultants attend this meeting to permit interaction both among themselves and with the evaluation team.

d. Field test a form for the daily recording of the presence or absence of diarrhea in family members, which, if practical, may provide data to supplement the weekly interviews (Attachment F).

e. Conduct a nutritional assessment of children initially 0-4 years of age by measuring heights and weights every 6 months during the course of the study.

f. Develop a simple reporting form for gastroenteritis/dysentery patients to be submitted on a monthly basis by the government polyclinics to the city health department (Attachment G). Such a form should contain information on the number of new patients with diarrhea seen during the month by age and kelurahan of residence which may not coincide with the polyclinic utilized (see VI. B. Interpretation of Surveillance Data, page 26).

g. Work with the city health department to stimulate and standardize reporting by each polyclinic of selected water-related diseases (Attachment H).

h. Develop laboratory capability in Surakarta for the performance of routine water quality examinations (Attachment I). Water sources and storage containers of study and control families should be cultured. The U.S. Naval Medical Research Unit (NAMRU) Detachment in Jakarta has indicated a willingness to provide appropriate training for individuals performing this work.

i. Identify a laboratory capable of identifying intestinal parasites in selected stool specimens from children in study families every 6 months. NAMRU has this capability.

j. Identify a laboratory capable of processing selected stool specimens from study children for etiologic agents. NAMRU has the capability to isolate many of these agents. Arrangements to identify agents requiring more sophisticated techniques will have to be made with other institutions outside Indonesia.

k. Develop observational techniques for field use with selected study families to monitor behavior of young children with reference to water use and sanitation facilities and behavior of adults with reference to use of sanitation facilities.

B. Surakarta Water Project

a. Involve community leaders (lurahs and RT chiefs) and members of the community in decisions regarding the ultimate location of the new system and the types of connections desired (private yard vs public standpipes).

b. Involve representatives from the Surakarta Health Department and the Kampung Improvement Project (Attachment J)

in the monthly Surakarta Water Project meetings.

c. Integrate a health education component on water, sanitation, and water-related diseases into the water project (Attachment A).

d. Use the available data on population density and water-related disease rates to aid in defining areas of the city which have the greatest need for an extension of the water system (Attachment K). The data suggest that Serengan has the highest rate of water-related disease (Table 30, page 68).

e. Develop a mechanism for obtaining routine water quality data which should include chlorine residuals, standard plate counts, and coliform counts (Attachment I).

f. Develop the capability to evaluate and rehabilitate the existing water system.

g. Develop a program for effective operation and maintenance of the existing and new systems.

III. INDICATORS OF WATER-RELATED DISEASES

Water-related diseases were originally divided into four categories (Table 1) (1). This classification has more recently been modified to include a fifth category of diseases related to defective sanitation (2). Diseases transmitted by contaminated drinking water are known as waterborne diseases. All else being equal, the incidence of these diseases, which in the tropical world are primarily intestinal or enteric infections, is usually highest in areas where water quality is poor. Examples of these infections include cholera, typhoid or other enteric fevers and acute diarrhea or acute gastroenteritis of several different etiologies. A second group of diseases, classified as "water-washed", would be expected to have a high incidence in areas where water availability and water utilization are limited. Included among these diseases are those which spread readily from person-to-person in situations where personal hygiene is poor. Examples include diarrhea caused by Shigella and certain skin and eye infections. Diseases in these waterborne and water-washed categories are typically acute in their manifestations. A study to evaluate the impact of a project designed to provide water of reasonable quality and greater availability to a population should focus primarily on diseases in these two categories.

Selected diseases in the third and fourth categories could be considered if impact studies were conducted in an area where these diseases were endemic. Two prototype diseases in category 3, those requiring an animal living in water for

completion of the life cycle of an infectious agent, are schistosomiasis and guinea worm infection (dracunculiasis). Since neither of these diseases are endemic in Central Java, they will not be considered further in this report. Included in the fourth category of diseases (those transmitted by insect vectors that breed in water) are malaria and dengue, both of which are endemic in Java. The fifth category of diseases related to defective sanitation primarily includes intestinal parasite infections acquired either through direct contact of the skin with infectious forms of the parasites present in soil or ingestion of improperly cooked food contaminated with the infectious stage of the parasites.

A number of attempts have been made to evaluate the health impact of water and/or sanitation projects on water-related diseases. Some studies have shown a favorable health impact of projects, while others have failed to demonstrate such a benefit. Problems with these studies have been numerous. Some have lacked baseline information on selected indicators of water-related disease incidence or prevalence prior to implementation of the project, others have lacked an appropriate control group of individuals not served by the project for comparison with the study group, and most have failed to include a health education component and an attempt to assess utilization of the water and sanitation facilities provided.

A variety of indicators of water-related diseases have been monitored in these studies. Indicators of waterborne or water-washed diseases may reflect the frequency (incidence or prevalence) of either infection or disease or may measure

disability resulting from disease. Ideal indicators should be objectively definable, quantifiable with a reasonable degree of precision, sensitive to a specific intervention, specific for the intervention being assessed, and relatively easy to measure (3). Major requirements for suitable indicators of the impact of water supplies or excreta disposal systems on diarrheal disease morbidity have been specified as 1) a visible or otherwise easily and reproducibly detectable abnormality, 2) a high prevalence, 3) a strong correlation with water quality or availability, and 4) a high correlation with other water-related diseases (3). Indicators of diarrheal disease may reflect an impact directly (e.g., incidence of intravenous fluids used for treatment of dehydration resulting from diarreha); the impact may be apparent soon after the system becomes operational (e.g., incidence of waterborne cholera) or months to a few years later (e.g., nutritional status of young children).

The design of most studies attempting to evaluate the health impact of water or sanitation projects has been either cross-sectional in which data on indicators are obtained at one point in time or longitudinal in which indicator data are collected over a period of time (months or years). In both types of study, data on indicators may be obtained in several ways: from review of hospital or clinic records, from interview with residents in study and control communities, from review of hospital or clinic laboratory records, from special laboratory tests conducted as part of the study, and from direct measurements made in hospitals,

clinics or communities (e.g., nutrition surveys). The data obtained from each of these sources have a number of important limitations which will be discussed.

The complex epidemiology of agents transmitted by waterborne and water-washed mechanisms complicates the interpretation of indicator data obtained in studies of this type. Specific agents which cause acute bacterial disease include bacteria, viruses, and parasites which may be transmitted in three different fashions: by food, by water, and by spread from person-to-person. A single agent may be more likely to be transmitted by one of these three mechanisms but all can be transmitted by at least two of the three and most can be transmitted by all three. It is frequently difficult to be certain of the primary mode of transmission of a single agent in a specific locale. For example, Vibrio cholerae, the agent which causes cholera, may be transmitted primarily by seafood in some areas and primarily by water in others. Obviously, the extent to which a water project may benefit the health of members of a community depends on a number of factors including the amount of waterborne and water-washed disease in a community, the relative importance of water-related routes of transmission of specific microbial agents, the acceptability and in turn the utilization of the system provided, the integrity of the system (e.g., maintenance of acceptable water quality throughout the distribution system), the extent to which former contaminated water sources in the community are no longer utilized, the impact of water handling and storage practices in the home on

contamination of water after it leaves the distribution system, and the operation and maintenance of the system. The studies designed to evaluate the impact of a water project must consider each of these additional variables in order to permit an interpretation of the reasons for the success or failure of a system to have a favorable measurable impact on the health of the population served.

IV. BACKGROUND

A. Surakarta Water Project

Surakarta, a city with a population of 443,129 in 1977, is located in the province of Central Java approximately 9 degrees South of the Equator at an altitude ranging from approximately 85 meters to 110 meters. The population of the city is estimated to be increasing at approximately 3-4% per year. In 1977, the birth rate was reported to be 17.5 per thousand population and the death rate 6.2 per thousand population; 19,730 people (4.4%) migrated into the city while 18,415 (4.2%) left.

The Surakarta Water Project had its origin in 1970 when the Indonesian government requested the British government to assist in the planning and implementation of a water supply project for the city. The existing system was built in 1929; there has been a moritorium on additional service connections since 1965. The system currently supplies water to approximately 11% of the population of the city. In 1972, U.S.A.I.D. replaced the British Overseas Development Administration as the provider of loan funds for the project. After completion of the planning and design phases, procurement of the materials for the project was initiated in 1978, and construction began in October 1979. Components of the current existing and planned municipal water system in Surakarta are summarized in Table 2. Specific project components and the proposed timetable presented in November 1979 for their implementation are summarized in Table 3.

In Indonesia, the Ministry of Public Works and Electric Power is responsible for urban water supply while the Ministry of Health is responsible for rural water supply. In the Ministry of Public Works and Electric Power, this responsibility lies in the Directorate of Sanitary Engineering located in the Directorate General of Housing, Urban Development, and Sanitary Engineering (Cipta Karya). As part of the project, a utility, the Surakarta Water Enterprise (SWE or PDAM), has been created as an independent agency in charge of its own finances and responsible for the collection of fees and the operation and maintenance of the existing and new water systems.

In preparation for the evaluation component of the Surakarta Water Project which will attempt to identify health, social, and economic impacts of the project on residents of Surakarta, the U.S. Bureau of Census is training a 4-member evaluation team composed of 3 economists and 1 urban planner from Cipta Karya. Instruction of the team commenced in February 1979.

B. Political Organization of Surakarta

The administrative structure of Surakarta is summarized in Table 4. The municipality of Surakarta is divided into five kecamatans, each headed by an appointed individual called a camat. The location of the five kecamatans is depicted in Figure 1 and the area, total population, and population density of each is summarized in Table 5.

Each kecamatan is subdivided into kelurahans. There are a total of 51 kelurahans, each kecamatan has 7-13 kelurahans. The location and population density of each kelurahan is indicated in Figure 2. A total of 12 kelurahans had population

densities of ≥200 persons per hectare. Five of these kelurahans were located in Serengan, 5 in Jebres, and 1 each in Pasarkliwon and Banjasari. Each kelurahan is headed by a lurah who is an elected official. Kelurahans are subdivided into rukun kelompoks, also known as rukun kampungs. Each rukun kelompok is headed by an elected official known as a ketuah. Each rukun kelompok is divided into a neighborhood unit known as a rukun tettanga (RT) headed by an elected official resident of the neighborhood called the RT chief. The RT is divided into kepala keluarga or households. Each RT chief submits to the kelurahan office each month updated census information for his RT and a variety of socioeconomic data. Yearly, the government statistics office in Surakarta collects these data from all kelurahans and kecamatans and publishes an annual census. The most recent available published census data is for 1977.

Each RK and RT are individually numbered, providing a potential sampling framework for use in selection of a sample survey population.

C. Health Department Organization

The health department in Surakarta maintains a central puskesmas and polyclinic. The puskesmas provides preventive medical services for the kecamatan while the polyclinic provides curative medical care at a charge of 150 rupiahs per visit (visits for tuberculosis are free). There are also one puskesmas and one to three polyclinics in each kecamatan (Figure 4). In addition, each kecamatan has a mobile puskesmas which moves to a different area each week. The organizational

structure of the puskesmas in Pasarkliwon is shown in Figure 4. The staff of this puskesmas consists of one physician, one dentist, and 20 additional individuals. As an extension of each puskesmas, a health post worker is stationed in each rukun kelompok. This individual dispenses some medications and oral rehydration salts.

The staff of each polyclinic records the diagnosis of patients visiting the clinic daily and reports these on a standard form to the health department at the end of each month. Diagnoses for new patients are recorded separately from those of patients making follow-up visits. The manner in which multiple diagnoses are tabulated was not clear. The primary diagnosis is recorded; a second diagnosis may also be reported separately on a different day or not reported at all. Diagnoses are then reported to the Central Java Health Department in Semarang which in turn reports selected illnesses to the Ministry of Health in Jakarta. Cholera which is reported at each level on a weekly basis is an exception to the monthly reporting of illnesses. Typhoid fever is not reported at the national level; however, in Surakarta, the general hospital reports typhoid daily to the health department.

Laboratory facilities at the polyclinics are very limited. Only the Jebres and Central polyclinics have laboratories. Collection of diagnostic laboratory specimens in the polyclinics is limited to blood specimens.

D. Medical Care System

Hospital facilities in Surakarta are summarized in Table 6 and their locations in the city are depicted in Figure 3. The

government hospital consists of a combined maternity and pediatric hospital located in kecamatan Jebres and an adult hospital located in kecamatan Banjasari. The pediatric hospital has a 28-bed gastroenteritis ward. Patients in the government hospital come from both Surakarta and the surrounding areas. There are 8 government polyclinics which will refer patients for hospitalization in either the government or the military hospitals (Table 7). The military hospital cares for military personnel and their dependents. In addition to the government polyclinics, there are a number of private polyclinics and an unknown number of private physicians in Surakarta.

Laboratory facilities in government hospitals are limited. Blood smears can be read for the diagnosis of malaria and Widal serologic tests can be performed for the diagnosis of typhoid fever. Fecal specimens for culture for Vibrio cholerae from individuals with diarrhea are sent to the government laboratory in Semarang in Cary-Blair transport medium. Serum specimens for diagnosis of dengue are processed in Jakarta.

E. Other Water/Sanitation and Related Projects in Surakarta

Several other groups in Surakarta are active in community development projects related to water supply and sanitation. A World Bank funded Kampung Improvement Project (KIP) will provide services to 49,000 people over the next 5 years. Components of this project include public latrine and public bath facilities, pit privies, public toilets, foot paths, drainage, two puskesmases, a primary school, roads, and refuse collection. Existing latrines will also be repaired. The project was initiated in April 1978, and actual construction

work began October 1979. Four hundred households have chosen to pay Rp 75,000 for construction of private pit privies adjacent to their homes. There will be a charge for the use of public latrines and bath houses. The latrine charge has not yet been set; a similar project in Jakarta charges 5-10 rupiahs per person. Income generated from these monies will be used for maintenance of facilities constructed by KIP. Health education will be conducted in the puskesmases and schools. Over the next 3 years, portions of 10 kelurahans identified as the most needy by KIP will be included in the project (Attachment J).

Each government puskesmas has a health education and a hygiene and sanitation section (Figure 4). In Pasarkliwon, the one individual in the hygiene and sanitation section has responsibility for health education directly related to water and sanitation at the schools in the kecamatan.

Another group active in community development is Yayasan Indonesia Sejahtera (YIS), a private organization promoting the Dana Sehat Program (4), a comprehensive community development program which includes a health insurance plan which began in 1972 and became a government program in 1974. This program promotes the concept "gotong royong" (self-help) in which the healthy assist the sick and the well-to-do assist the poor in the community. The group is also active in nutrition with an under-5 weighing program, environmental sanitation, livestock, home improvements, and training of community health workers who are involved in oral rehydration programs. YIS interacts frequently with the Surakarta Health Department, but infrequently with KIP and not at all with the Surakarta Water Enterprise.

The BKKBN is a women's organization active in community development which is effective in reaching families with children under age 5.

V. PURPOSES

1. Prepare recommendations for the design and implementation of the health impact evaluation to assess potential project impacts.

2. Assess available and additional resources necessary for the evaluation.

3. Characterize the epidemiology of water-related diseases in Surakarta.

4. Perform field work to evaluate potential impact study methodology and gain an understanding of water and sanitation facility use patterns.

5. Develop indicators of water-related diseases in Surakarta for use in the evaluation

6. Review the status of the Surakarta Water Project

   a. Engineering

   b. Integration into community health programs

7. Prepare recommendations for the implementation of the water project.

VI. WATER-RELATED DISEASES IN SURAKARTA

This section contains an analysis of surveillance data, the limitations of which are summarized in VI. B., page 26.

A. Surveillance Data

1. Infant and Overall Mortality

Data on births and infant mortality are reported to the city health department by each kelurahan quarterly. The crude infant mortality rate for the 5 kecamatans for 1977-June 1979 (Table 8) was highest in Serengan (29 per thousand), followed by Jebres (25 per thousand) and Pasarkliwon (20 per thousand). These rates are not much higher than those in the United States and suggest that mortality is significantly underreported, a possibility supported by a Ministry of Health project elsewhere in Indonesia which suggested that only about 20% of all deaths were reported (Berlian Siagian, M.D., M.P.H., personal communication). Review of death rates for each kelurahan in 1977 (Figure 5), based on figures reported by each kelurahan to the statistics office, revealed that 13 kelurahans had a death rate of ≥ 7 per thousand. Five were located in Banjasari and 4 each in Jebres and Pasarkliwon.

2. Data Collection

In an effort to characterize the epidemiology of water-related diseases in Surakarta, data on selected diseases (Table 9) reported by the government polyclinics to the city health department from January 1977 through September 1979 were reviewed. During the period, 2 report forms were used; the diagnoses tabulated and their identifying codes on each form are indicated in the table

3. Diarrhea/Dysentery

Because the relative frequency of use of government polyclinics by residents of each kecamatan was not known and because it was not possible to determine the frequency with which residents of various kecamatans utilized the central polyclinic, data for each kecamatan will be presented both as visits for a particular condition as a percentage of total visits and attack rate/1,000 persons/year. Bahasa Indonesia terms for diarrhea include "menceret" for watery diarrhea and "mangsur" for more severe dehydrating diarrhea. The percentage of government polyclinic visits for diarrhea and dysentery was highest in Serengan followed by Pasarkliwon and Jebres (Table 10). The annual case rate calculated from polyclinic visits (Table 11) reveals a similar pattern. Data on age-specific attack rates for each kelurahan could not be readily derived from the available data base. The percentage of total visits to the government polyclinics, excluding the central polyclinic for diarrhea or dysentery by month (Figure 6) reveals a seasonal trend with the greatest percentage of visits occurring in November, December, and January, in 1977 and 1978. The seasonality is less apparent in 1979. This seasonal peak roughly coincides with the onset of the rainy season (Figure 6). The total number of patients visiting the government central polyclinic for diarrhea or dysentery by month (Figure 6) also indicates a seasonal trend in total number of visits with a peak from November-February.

The age distribution of all patients admitted to the government pediatric hospital during 4 selected months in 1978 and 1979 (Table 12) indicates that nearly half with severe acute

gastroenteritis or dysentery were less than 1 year of age and over 75% were under 5 years of age. The age distribution of 50 consecutive patients with acute diarrhea visiting a government polyclinic (Table 13) indicates that the age distribution of these patients with presumably milder disease was skewed towards the older age groups; only 26% of these patients seen at the outpatient clinic were less than 1 year of age.

4. Cholera

Cholera case rates by kecamatan (Table 14) for 1977-September 1979, were highest in Pasarkliwon followed by Serengan and Jebres. Data permitting calculation of kelurahan-specific attack rates for cholera were available only for May-July 1979 (Figure 7). For this 3-month period, during which data on kelurahan residence was available for only 18% of all reported cases, 9 kelurahans had a rate of >.49 per thousand. Five of these kelurahans were located in Pasarkliwon, 2 in Jebres, and 1 each in Serengan and Banjasari. Over 50% of these hospitalized children were less than 5 years of age, and the attack rate was highest also in this age group (Table 15). The age distribution and the age-specific attack rates for an approximate 20% sample of hospitalized cholera patients of all ages who were residents of Surakarta and were hospitalized from January-October 1979 (Table 16) indicate that <25% of hospitalized patients with cholera during this period were <10 years of age. The age-specific attack rate was highest in the 15-24 year old age group. The monthly distribution of cholera cases (Figure 8) indicates dramatic variation between the 3 years with a large epidemic occurring

in 1979. Data for 1979 rainfall are lacking, but cholera cases appear to increase after onset of the rainy season in 1977 and 1978.

5. Enteric Fever

Attempts are made to confirm the diagnosis of enteric fever cases in hospitalized patients by serology. The attack rates by kecamatan for hospitalized patients with enteric fever (Table 17) for 1977, 1978, and the first 9 months of 1979 were similar in Serengan, Pasarkliwon, Jebres, and Banjasari, and lowest in Laweyan. Cases classified as enteric fever include those reported to the health department as typhoid, paratyphoid, and "typhus abdominalis". The kelurahan-specific attack rates for patients diagnosed as having typhoid fever and reported to the city health department by the government pediatric hospital for the period May-October 1979, are shown in Figure 9. During this period, data on kelurahan residence were available for 93% of the 45 reported cases. Seven kelurahans had attack rates of ≥20 per thousand; 3 of these were located in Pasarkliwon, and 1 in each of the other 4 kecamatans. The age-specific attack rates for hospitalized enteric fever patients of all ages living in Surakarta (Table 18) reveal the highest rates in the 5-9 year old age group. However, a large number of cases occurred in individuals 10-19 years of age, but data were not tallied in a manner permitting calculation of age-specific attack rates for this age group. The number of hospitalized patients of all ages with enteric fever by month (Figure 8) does not reveal any consistent seasonal pattern.

6. Scabies, Related Skin Conditions and Eye Infections

Scabies and related skin conditions and eye infections reported by government polyclinics were selected for analysis as disorders related to water availability and utilization rather than water quality. The percentage of total visits to government polyclinics for scabies and related skin conditions (Table 19) was highest in Serengan followed by Banjasari and Laweyan. Kecamatan-specific case rates revealed a slightly different pattern, the rates being highest in Serengan followed by Laweyan and Pasarkliwon (Table 20). The percentage of total visits for eye infections (Table 21) was comparable in all kecamatans; however, the attack rates were highest in Serengan followed by Jebres and Pasarkliwon (Table 22).

7. Dengue

Data on dengue, a disease transmitted by a water-related insect vector, were analyzed by kecamatan of residence. For patients with dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) admitted to the government pediatric hospital, between May and October 1979, the attack rate was highest in Laweyan (Table 23). The age-specific attack rates for patients with DHF or DSS were comparable in children age 5-9 and 10-14 and were lower in children <5 (Table 24). Kecamatan-specific attack rates for January 1977-August 1979 (Table 25) revealed similar rates in all kecamatans for patients of all ages residing in Surakarta. The monthly distribution of reported cases of DHF and DSS (Figure 10) revealed a seasonal trend with peaks in March of each year and a tendency for cases to increase after the beginning of the rainy season.

8. Upper Respiratory and Throat Infections

Data on upper respiratory and throat infections including influenza were analyzed as representative non-water-related conditions. The percentage of government polyclinic visits for these ailments for 1977 (Table 26) was highest in Banjasari. Analysis of case rates by kecamatan (Table 27) revealed the highest rates in Serengan followed by Jebres and Pasarkliwon. Data for 1978 and 1979 are not presented because of inconsistency of reporting during this period. The number of visits for these conditions by month for patients seen at the central government polyclinic revealed no definite seasonal trend although there was a tendency for the greatest number of patients to be seen during the first few months of the year.

9. Anemia

Data on anemia, a condition which might indirectly reflect hookworm prevalence which might in turn be influenced more by improvements in sanitation than improvements in water quality or availability, were reviewed. For the period 1977-1979, the percentage of government polyclinic visits for anemia was highest in Banjasari followed by Pasarkliwon and Jebres (Table 28). The case rates were highest in Pasarkliwon followed by Jebres and Serengan (Table 29). No seasonality was apparent.

B. Interpretation of Surveillance Data

Analysis of these surveillance data suggests that the kecamatans of Serengan, Pasarkliwon and Jebres have the greatest morbidity associated with acute diarrheal diseases including cholera, enteric fever and skin infections, observations which may reflect inadequate water quality and utilization in these

areas. A summation of ranks of frequency for these diseases by kecamatan (Table 30) provides some quantitation to these observations. However, there are a number of definite limitations to these data which must be considered in interpreting their significance. With the exception of some cholera and typhoid fever cases, all diagnoses were clinical. As different physicians and paramedical personnel work in the different government polyclinics, diagnostic criteria are not uniform. Techniques of reporting multiple illnesses in an individual patient may differ. In addition, a change in the type of forms used by the polyclinics for reporting of illnesses monthly to the city health department was made during the study period and diseases classified in one category on one form may have been classified in a different category on the other form. Data are obtained essentially only from government hospitals and polyclinics; only the government pediatric hospital consistently reports cases. It was not possible to evaluate the completeness of reporting by the government polyclinics. Patients who see private practitioners, visit private polyclinics or seek traditional medical care are not included in any of these statistics. The currently available data base makes it difficult to develop age-specific and kelurahan-specific attack rates for these illnesses; limited age-specific and kelurahan-specific data were available only for cholera, typhoid fever, and dengue.

Data on the other diseases evaluated (Table 9) are not presented because the number of reported cases was small and reporting by individual polyclinics was inconsistent.

C. Field Work

Two questionnaires were designed, one for administration to RT chiefs (Attachments L and M) and the other to female household heads (Attachments N and O). These questionnaires were pretested on a limited basis, and considerable modification will be required. Suggested coded revisions which will also require pretesting are included in Attachments P and Q.

1. RT Chief Questionnaire

Permission for administration of the questionnaire in selected areas was obtained from the appropriate lurah and the chief of the RT. Approval of the lurah was essential in order to obtain cooperation from RT residents. Interview sites were not selected randomly. An attempt was made to visit poor areas of the city and to select households with children less than 6 years of age where diarrheal illness had occurred during the last week. Questionnaires were administered in a total of 8 households located in 4 RT's. Three of the RT's were in Pasarkliwon (Sangkrah, Joyosuran, and Semanggi) and 1 was in Jebres (Jagalan). An informal visit was also made to a second, very poor and crowded area in Sangkrah before the questionnaire was developed.

Results of the questionnaire administered to RT chiefs in 3 of the 4 RT's are summarized in Table 31; the questionnaire required 30-40 minutes for completion. Questions focused primarily on the RT chief's perceived needs for services in his RT and his impressions concerning water quality, water availability, and desires of residents of his RT for water and sanitation facilities. The RT chiefs were also questioned concerning the most common illnesses in the RT and childhood

deaths over the past year. All 3 RT chiefs perceived water as an essential government service and felt that quality, cost, taste, and accessibility were each considered by families in their selection of a drinking water source. They felt that most families would be willing to pay for more water, better quality water, and easier access to water and indicated that diarrhea and influenza were the two most common illnesses experienced by residents of their RT; the 4 children under age 6 years who died during the past year in these RT's all died of diarrhea. RT chiefs felt that most families would seek treatment for a child with diarrhea from traditional medical sources. This observation obviously has significance for interpretation of the surveillance data previously presented.

2. Household Questionnaire

a. Illness

The female household head in 8 households was interviewed using a questionnaire which required approximately 45 minutes to administer by interviewers who had had only a brief period of training. The illness experience of these 8 families is summarized in Table 32. Three of the 10 children <6 years of age had had diarrhea during the past 24 hours. However, in interpreting these data, it must be remembered that an attempt was made to identify such families for pretesting the questionnaire. Data were not sufficient to permit evaluation of longer recall periods. Two of the 10 children in the same age group had also experienced skin infection during the past week. Only 1 adult had experienced diarrhea during the past month; that episode lasted only 2 days.

b. Water Use

Water handling practices of these 8 families are summarized in Table 33. In summary, water was fetched 1-3 times a day by a female member of the household from a well or handpump located 7-115 meters from the house and stored in the home only for drinking and cooking. Water was generally boiled before drinking.

c. Defecation Practices

Defecation practices are summarized in Table 34. A variety of sites at varying distances from the house were utilized.

d. Knowledge, Attitudes, and Practices

The results of several questions to assess knowledge, attitudes and practices are summarized in Table 35. Women had a general understanding of the relationship of water and sanitation practices to diarrheal disease and desired improved water quality and availability but were unaware of the Surakarta Water Project. One of the 2 mothers who received health education regarding prevention of diarrhea did so at a government puskesmas while the other saw a Ministry of Information film in her neighborhood. In interpreting the results of questions on type of connection desired, it should be noted that cost considerations were not a part of the question.

e. Lessons from Administration of the Questionnaire

A number of problems were encountered during the pretest of this questionnaire which should be anticipated in the design of future studies to evaluate water-related disease in Surakarta. A specific definition for diarrhea should be developed which incorporates both a consideration of stool frequency and stool consistency. The term "menceret" was generally acknowledged

by both medical and lay individuals to be the appropriate term to use for acute watery diarrhea in Central Java. However, a number of other possible terms, including "mangsur," and "berak berak air," were also proposed for consideration. Many of the women in Surakarta work during the day and may be unavailable for itnerview. Although these interviews were conducted by males, the facts that females were the interviewees and that most of the interviews were conducted inside the houses suggest that female interviewers may be more appropriate for use in a longer study. In addition, since most of the women interviewed spoke Javanese, it will be essential to have bilingual interviewers and questionnaires developed in both Bahasa Indonesia and Javanese. Finally, the seasonality of diseases noted during a review of the surveillance data suggests the importance of conducting surveys in different years at the same time of the year and preferably on multiple occasions.

One additional issue that will need to be considered in the design of the impact study which was not addressed by these questionnaires was the frequency with which families continue to use old sources of water once new and presumably more potable sources are provided.

VII. WATER PROJECT STATUS

A. Management of Water System

1. Planning and Coordination

In the past, SWE has attempted to cope with shortages in water, pressure, manpower, and funds in order to serve most customers for portions of every 24-hour period. They presently manage this by manually operating over 40 valves in the distribution system daily to direct the water to different areas according to the schedule shown on the map (Attachment U).

The Project will most likely serve significant parts of Pasarkliwon, Serengan and Jebres initially. Emphasis will be placed on those kelurahans nearest the rivers and canals in the southeastern portions of the city (Attachment J).

In order to effectively plan and accommodate the majority of the population in need of water supply and sanitation services, the cooperation with the municipal health department and community groups must be continued and in some cases initiated. The Surakarta Health Department is currently responsible for drinking water quality surveillance and analyses. Various other departments, including urban planning, city council, public works, and private groups such as YIS and BKKBN are active in related areas. In addition, the regional and central offices of government agencies such as Cipta Karya support national development activities and must therefore participate in and be kept abreast of activities.

Planning to reliably and gradually meet the water supply needs of the entire Surakarta population should develop

concurrently with the improvements proposed by the local urban planning office. Secondary feeders to the most needy areas can be sized to permit expansion as adjacent neighborhoods request similar services.

2. Fiscal Issues

During 1978, the total municipal revenues for Surakarta were about 1.1 billion rupiahs. The revenues from SWE amounted to 1 million rupiahs or approximately 10% of the total. Only with the guarantee of additional millions in development funds for the water improvements did the city council approve the establishment of a separate fund for a balanced water budget with reinvestment capability. This dependence on available revenues from water to support other needed municipal operations is typical of most urban areas today. As the budget is stressed by population growth and increased population density, the maintenance of the physical system suffers first, especially such non-visible portions as the distribution system.

Although these water supply system improvements are projected to benefit only an additional 20 to 30% of the population, water rates are scheduled to triple in a few years. However, it appears that the "social" rate will continue to be reasonable to most of the low-income and most needy customers who will receive the new services. For example, in an average RT of 30 households, the monthly rate for the use of a public hydrant for the first 5 years is projected to be 200-300 rupiahs per household (see Part VII. C., Service Options, page 39).

Since the 85% of the population without access to the existing water system currently use contaminated shallow wells or surface water, the new services must be designed to serve the maximum number of people with the available funds. For these purposes, further consideration must be given to the selection of types of service connections, i.e., public vs yard hydrant (see Part VI. C., Service Options, page 39).

3. Operation and Maintenance

In support of SWE, training programs for fiscal management, meter repair, and leak detection have begun. With the sizeable increase in pressure which will occur when the new system is completed, the current problems with leakage, interconnection, pressure, and water quality will almost certainly worsen unless the distribution system is strengthened and rehabilitated properly and a sound maintenance program is established. If local laboratory capability is developed, routine surveillance of pressures, metered flows, pH, chlorine residual, turbidity, and tuberculation will improve awareness of distribution system problems. Such activities of SWE should be coordinated with and supplemented by the available community work force found throughout the city. The residents and their respective RT chiefs are responsive when community development activity is stimulated to improve their neighborhood conditions. The term, "gotong royong," which means "with the spirit of community participation," reflects the desire to work for better living conditions.

B. Physical Components of Water Supply (Attachment R)

1. Sources of Water Supply

Residents of Surakarta have access to at least four sources of water for their daily needs: SWE, private artesian and deep wells, shallow hand-dug and driven wells, and surface water. The sale of water by vendors has been prohibited by city statute for several years.

SWE has been allotted an additional 150 lps from the Cokrotolung Spring by the Government of Central Java. This will increase the present 110 lps Surakarta receives (the community of Delanggau receives 40 lps of the current 150 lps) to 260 lps. Competing regional demands for irrigation waters caused a decrease of 100 lps from the original total additional allotment request of 250 lps. To supplement this flow, well fields have been chosen for exploration (six well points to the west and four to the northeast of Surakarta) to provide an estimated yield of 200-300 lps under half-day operation. Therefore, a total projected water supply of 400-500 lps would serve a population of about 500,000 at the rate of 70-85 lpcd. These figures represent current thinking and the proposal to increase service from 11 to 35% in 1981 and on up to 80% by 2000 may change considerably. The type of service connection will be critical, but there appears to be considerable flexibility.

2. Transmission

The existing transmission line from Cokrolotung enters the Kartosuro underground reservoir after which the water is marginally chlorinated at about 0.1 mg/l (2kg/day liquid). It then splits and proceeds to Delanggau and Surakarta. The new

transmission main from Kartosuro will flow to the old Jebres Reservoir which will need rehabilitation if it is to play an integral role in the proposed modified flow schemes. The initial estimated manpower requirements of 400 men for 210 days may need to be revised to ensure adherence to the proposed schedule.

Development of the 10 deep wells will necessitate additional planning for storage, pumping, valving, and pressure increases to the distribution system. The location of the northeast field will provide capability for fulfilling the pressure needs for the higher elevations in Jebres.

3. Distribution System

Upon entering the existing distribution system, most of the flow is withdrawn by the central district where many cross-connections and electric pumps exist. Restricted flows are directed to 10 service areas by daily manual valve operations (Attachment I). The Jebres Reservoir, at the northeast end of the system, is filled once weekly and primarily serves a chronic disease hospital. This isolated flow should be eliminated.

About 50 kilometers of new lines are proposed for interconnection with the 100 kilometers of existing distribution system. Looping to close the system will enable more reliable service pressures and flows to most of the densely populated areas if the distribution system is rehabilitated adequately and secondary feeders are sized for staged connections.

4. Sewerage and Drainage

Inadequate maintenance, the lack of water at existing latrines, the traditional practices of defecating alongside and into flowing waters, and the lack of paved surfaces in most of the densely populated RT's all lead to blockage in the outdated drainage system of rivers, canals, runoff ditches, and pipes. Average water consumption rates will probably at least double when additional piped water becomes available. The reduction of the time and effort required to draw the family's dail, water needs and the possible effects of members of an RT dividing a monthly minimum charge for a public hydrant will influence water consumption patterns. Increased spillage, waste and equipment damage from vandalism or heavy use may result in more standing water and drainage problems. The probability of increased flooding resulting from greater daily flow and paved surfaces should be evaluated.

The Surakarta Water Project is to provide an estimated 1 m^3/day of water for anal cleansing to each of the 147 public latrines. Ten MCK's (public bath and latrine) are to be rehabilitated at a cost of 54 million rupiahs ($90,000). The present maintenance effort by the city Department of Public Works and SWE is practically nonexistant and has a low priority in the stressed urban budget. A program for permanent operation and maintenance of these sanitation systems must be initiated.

Since 1975, the KIP has initiated drainage and other sanitation improvements through annual stimulus grants of 1 million rupiahs ($16,000) to selected neighborhoods with a history of community participation ("gotong royong"). KIP will continue

this support to a projected 27,000 households, 25% of Surakarta's population, under its current five-year integrated basic services program. The programs and plans of various agencies and city departments for drainage, roadway and related improvements should be consulted to ensure coordination and prevent possible problems such as trenching newly surfaced roads for the laying of water mains. The status and current validity of the drainage recommendations originally made for Surakarta by Howard Humphrey and Sons, Ltd., should be investigated.

C. Service Options: Costs and Consumption

In this section, an estimate of costs for alternative levels of service is presented.

1. Assumptions

Surakarta population = 450,000

Average household (HH) = 6 persons

35-40 HH/RT, 230 persons/RT

300 persons/public hydrant

therefore, 1 public hydrant/RT and 50 HH/RT since SWE project will benefit densely populated areas.

2. Public Hydrants

Installation Costs:

Assume: Rp 125,000 and 5-year payback period

$$\frac{\text{Rp } 125{,}000}{60 \text{ mos.}} \times \frac{\text{RT}}{50\text{HH}} = \text{Rp } 42/\text{HH/mo}$$

Consumption Costs:

Assume: 30 lpcd from range of 15-50 lpcd

Rp 35/m^3 from range of Rp 25-40/m^3

$$\frac{6 \text{ persons}}{\text{HH}} \times 30 \text{ lpcd} \times \frac{30 \text{ days}}{\text{mo}} \times \frac{m^3}{1000 \text{ l}} \times \frac{\text{Rp } 35}{m^3} = \text{Rp } 189/\text{HH/mo}$$

Total Costs: Rp 231/HH/mo for first five years

An increase in reliability and availability of the water supply will most likely cause current SWE users to significantly increase their consumption. The projected Rp 231/HH/mo is within the survey of "willingness to pay" range of Rp 150-350/HH/mo. However, the new lower income users should be cost sensitive and likely to utilize available shallow well waters for many purposes, especially, if there are longer lines and wells are conveniently located. The shallow ground water table fluctuates with seasonal rainfall and may cause variation in monthly SWE water usage practices.

3. Yard Hydrants

a. Private

Installation Costs:

Assume: Rp 75,000 and individual HH of 5 persons

5-year payback period

$$\frac{\text{Rp } 75{,}000}{60 \text{ mos}} = \text{Rp } 1250/\text{HH/mo}$$

Consumption costs:

Assume: 150 lpcd and Rp 35/m^3

$$150 \text{ lpcd} \times \frac{5 \text{ persons}}{\text{HH}} \times \frac{30 \text{ days}}{\text{mo}} \times \frac{m^3}{1000 \text{ l}} \times \frac{\text{Rp } 35}{m^3} =$$

Rp 787/HH/mo

Total: 2037/HH/mo for first five years

This cost is practically prohibitive for a single family in the lower income brackets. Therefore, yard hydrants, if desired, would most likely be shared by several households with reduction in per capita consumption and costs. The probability of many workable clusters is low, and considerable problems of disproportionate convenience, usage and group payments may result.

b. Shared

Installation Costs:

Assume: Rp 75,000 and 6 HH

5-year payback pariod

$$\frac{\text{Rp } 75{,}000}{60 \text{ mos}} \times \frac{1 \text{ cooperative}}{6 \text{ HH}} = \text{Rp } 208/\text{HH/mo}$$

Consumption Costs (cooperative yard hydrant):

Assume: 50 lpcd, Rp 35/m^3, 6HH of 6 persons

$$50 \text{ lpcd} \times \frac{36 \text{ persons}}{6 \text{ HH}} \times \frac{30 \text{ days}}{\text{mo}} \times \frac{m^3}{1000 \text{ l}} \times \frac{\text{Rp } 35}{m^3} =$$

Rp 315/HH/mo

Total: Rp 523/HH/mo for first five years

This lower cost is still above the expressed willingness to pay of many households.

4. Demand and Revenues

A potential target population of an estimated 175,000-200,000 persons is located in about 20 kelurahans in the southeastern quarter of Surakarta near the contaminated rivers and other surface waters (Attachment K). Six hundred public hydrants will be needed to serve this current non-user population which represents about 45% of the population of the city.

If SWE installs one public hydrant in each of 200-600 RT's using an average of 30 lpcd:

Public Hydrant Consumption Revenues:

$$\begin{matrix}(200\ RT's) \\ (600\ RT's)\end{matrix} \times \frac{300\ persons}{RT} \times 30\ lpcd \times \frac{m^3}{1000\ l} \times \frac{30\ days}{mo} \times \frac{Rp\ 35}{m^3} =$$

Rp 1,890,000 to Rp 5,670,000 per month serving 60,000 to 180,000 persons, or 15-45% of current non-users.

Public Hydrant Consumption Demands:

$$\frac{300\ persons}{RT} \times 30\ lpcd \times \frac{day}{86{,}400\ sec} = 0.1\ lps/RT$$

$$\begin{matrix}\text{for } 200\ RT) \\ 600\ RT)\end{matrix} \times \frac{0.1\ lps}{RT} = 20 \text{ to } 60\ lps \text{ average daily demand rate}$$

Comparison with Current Water Usage in Surakarta

User Category	Usage
SWE	110 lps
Private and public deep wells for industry, pools, MCK's, estimate 15 wells 15 lps	225 lps
Shallow hand-dug and driven wells used throughout city by 85% of non-users, i.e., 340,000 persons in 1500 RT's (at 230 persons/RT) drawing 40 liters of water 3 times daily for a HH of 6, is 20 lpcd. There are 2-3 wells per RT, thus about 4000 wells.	

$$4000 \text{ Wells} \times \frac{\text{RT}}{2 \text{ wells}} \times 120 \text{ lpHHd} \times 40 \frac{\text{HH} \times \text{day}}{86{,}400 \text{ sec}} \qquad 111 \text{ lps}$$

14% of non-users rely on neighbors for water at 20 lpdc 13 lps

Total estimated current city water usage from all sources sources 459 lps

5. SWE Costs

Comparison of installation costs of public and cooperative yard hydrants for a target population of 180,000:

Rp 125,000 for public hydrant serving 25-50 HH and 150-300 persons

Rp 75,000 for cooperative yard hydrant serving 6 HH; 36 persons

SWE project specifies 13,000 yard hydrants and 200 public hydrants

Public Hydrants: 200 at Rp 125,000 = Rp 25 million for 60,000 persons, Rp 417/person

180,000-60,000=120,000 persons remaining to be served by cooperative yard or public hydrants. There are 2 options for serving the remaining 120,000 people.

Option 1: Cooperative yard hydrants for remaining 120,000 people

$$\frac{120{,}000}{36} \times \text{Rp } 75{,}000 = \text{Rp } 250 \text{ million}$$

for 120,000 persons: Rp 2083/person

Option 2: Public hydrants for remaining 120,000 people

$$\frac{120{,}000}{300} \times 125{,}000 = \text{Rp } 50 \text{ million}$$

Total cost to serve 180,000 people:

200 public hydrants and option 1 = Rp 275 million

200 public hydrants and option 2 = Rp 75 million

VIII. IMPACT EVALUATION OF A RURAL WATER PROJECT

A study designed to assess the impact of a rural water supply system under the supervision of Dr. Kawengian of the Ministry of Health and is currently in progress in Sumedang in Western Java. Local interviewers are making household visits weekly for a 3-month period to assess the incidence of acute gastrointestinal disease, skin infections, and eye infections. There are 2 study villages which include approximately 200 study households each and 2 control villages which also include approximately 200 study households each. Improved water supply was introduced to the study villages approximately 2 years ago. This study also includes an attempt to assess the economic impact of increased water availability on fish production in fishponds. Unfortunately, this study does not have a laboratory component because of funding limitations. This study was apparently designed in collaboration with Dr. Olaf Ringertz, a Swedish microbiologist formerly assigned to the WHO Regional Office in Jakarta, and should be completed by March 1980.

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XI. CONTACTS AND COMMENTS

JAKARTA

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- Ferdinand Okada, Program

Ministry of Health

Communicable Disease Control (CDC)
- Dr. Adhyatma, Director General
- Dr. Brotowasisto, Director, Epidemiology & Quarantine--MPH from Tulane, debriefed prior to departure
- Dr. Karyadi--MPH from Tulane, debriefed prior to departure
- Mr. Rujito--worked on household interviews, Surakarta

National Institute of Health, Research and Development
- Dr. Setiady, Head of Institute--formerly worked at CDC, Atlanta
- Dr. B.A. Kawengian--responsible for West Java impact study
- Dr. Berlian Siagian--MPH from Univ of Michigan, worked on household interviews, Surakarta

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- Dr. Sihono
- Dr. Makmuddin
- Mrs. Rani Hertono

NAMRU
- Dr. Patrick Carney, Officer in Charge) Potential source of laboratory
- Dr. Rockhill, Head, Microbiology Dept.) and training support

SEMARANG

Central Java Ministry of Health

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- Dr. Setiawar
- Dr. Budi, Water Quality Laboratory--knowledgeable regarding water quality testing

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Mr. Daliyono) Interested in health impact evaluation; debriefed prior to departure
Ms. Kuswandari)

Government Pediatric Hospital
Dr. Sabdo Waluyo, Director--willing to make hospital records available for review

Statistics Office
Mr. Suharjo, Director--extremely helpful in providing census data

Cipta Karya
Mr. Kasti--field worker on household interviews

Surakarta Water Enterprise
Mr. Soedarto, Director -- very cooperative
Mr. Sularno, Technical Director
Mr. Hariyanto Santosa, Staff Director--field worker on household interviews, extremely competent and knowledgeable regarding the city and the water project; involve him in the evaluation study if possible

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Rockefeller Foundation
Dr. Joseph Black, Director
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XIII. TABLES

Table 1 Water-Related Diseases

1. Waterborne--Water Quality

   a. diarrhea--agents with high infectious doses
   b. typhoid and other enteric fevers
   c. hepatitis A

2. Water-Washed--Water Quantity and Utilization

   a. diarrhea--agents with low infectious doses
   b. skin infections, e.g., scabies, pyoderma
   c. eye infections, e.g., trachoma, conjunctivitis

3. Water-Based--Organism living in water required for completion of life-cycle of infectious agent

4. Water-Related Insect Vector--Vector breeding in surface water

Table 2 Components of Surakarta Municipal Water System

	Existing	Planned
Source	Cokrotulung Spring (150 lps)	Cokrotulung Spring (300-400 lps) Well field development (200-300lps)
Transmission	~27km steel pipe/lead joints	27.3km ductile iron pipe
Storage	Jebres Reservoir (2700m^3)	Jebres Reservoir (2700m^3) Kartosuro Reservoir (4679m^3)
Distribution	106km castiron pipe/lead joints	51.5km plastic or asbestos cement pipes
Service Connections	Galvanized pipe	Plastic pipe
Flow	Gravity	Gravity
Chlorination	Yes	Yes
Percent of Population Served	~11%	~35% (higher if ground water developed)

Table 3 Surakarta Water Project Components and Proposed Time Table

13,000 Metered yard hydrants	1981-84
200 Public taps	1981-82
10 Public bath houses	1981-82
147 Public latrines upgraded	1981
10 Wells	1980-81

Table 4 Administrative Structure of Surakarta

Unit	Total	Range of Number of Units per Kecamatan
kecamatan	5	--
kelurahan	51	7-13
rukun kelompok	174	23-55
rukun tettanga	2015	318-603

Table 5 Area, Population, and Population Density of Kecamatans, Surakarta, 1977*

	Area(km^2)	Population	Persons/km^2
Serengan	3.15	62,373	19,801
Pasarkliwon	4.82	70,062	14,536
Laweyan	8.55	90,444	10,578
Banjasari	14.44	128 565	8,903
Jebres	12.55	91,685	7,306

Table 6 Hospital Facilities in Surakarta

	Number of Beds
Government Adult Maternity/Pediatric	850
Private	168
Army	99

Table 7 Government Polyclinics by Kecamatan, Surakarta

	Number
Laweyan	3
Jebres	2
Pasarkliwon	1
Serengan	1
Banjasari	1
Mobile polyclinics	5
Central polyclinics	1

Table 8 Crude Infant Mortality Rate per Thousand Live Births by Kecamatan and Year, Surakarta, 1977-1979

	1977			1978			1979*			30 Month Period		
	Births	Deaths	Rate	Births	Deaths	Rate	Births	Deaths	Rate	Births	Deaths	Rate
Serengan	907	42	46	841	15	18	312	3	10	2,060	60	29
Jebres	2,699	54	20	2,722	102	37	1,375	11	8	6,796	167	25
Pasarkliwon	1,459	50	34	1,592	26	16	775	2	3	3,856	78	20
Laweyan	2,103	27	13	2,471	27	11	1,102	2	2	5,676	56	10
Banjasari	3,104	50	16	3,798	23	6	1,856	9	5	8,758	82	9

*First 2 quarters

Table 9 Diagnostic Classifications on Report Forms Used by Puskesmases and Polyclinics

NEW FORM		OLD FORM	
I.D.#	Item	I.D.#	Item
1	Typhoid/paratyphoid	7,8	Typhoid/paratyphoid
2	Dysentery/diarrhea	5,6,65	Dysentery/diarrhea
6	URI/throat infection*	56-59,61	Nasopharyngitis/tonsillitis*
8	Measles	15	Measles
9	Contagious hepatitis	35	Infectious hepatitis
10	Malaria	18-20	Malaria
12	Filariasis	---	Not reported
13	Hookworm & other internal parasites	21-22	Hookworm/other internal parasites
14	Cholera	9	Cholera
18	Dengue	—	Not reported
20	Trachoma	30	Trachoma
22	Scabies & other parasitic skin infections	31	Scabies
24	Malnutrition	44	Malnutrition
25	Anemia	45	Anemia
27	Eye infection	48	Eye infection

*Definitions don't correspond

Table 10 Total Government Polyclinic Visits and Visits for Diarrhea and Dysentery by Kecamatan and Year, Surakarta, 1977-1979

Kecamatan (Polyclinics)	1977			1978			1979*			Total Period		
	DD Visits	Total Visits	%	DD Visits	Total Visits	%	DD Visits	Total Visits	%	DD Visits	Total Visits	%
Serengan (1)	1,207	11,703	10.3	2,413	15,818	15.3	2,308	12,987	17.8	5,928	40,508	14.6
Pasarkliwon (1)	742	6,799	10.9	1,177	9,935	11.8	1,449	10,132	14.3	3,368	26,866	12.5
Jebres (2)	1,336	11,422	11.7	1,172	12,736	9.2	1,712	14,648	11.7	4,220	38,806	10.9
Laweyan (3)	632	7,077	8.9	1,186	11,722	10.1	1,231	13,474	9.1	3,049	32,273	9.4
Banjasari (1)	348	3,358	10.4	383	5,733	6.7	480	5,412	8.9	1,211	14,503	8.3

*First 9 months

Table 11 Diarrhea and Dysentery Case Rate,* by Kecamatan, Surakarta, 1977-1979**

Kecamatan	Population+	Diarrhea/Dysentery Visits	Visits/1000/Year
Serengan	62,373	5,928	34.2
Pasarkliwon	70,062	3,368	17.3
Jebres	91,685	4,220	16.6
Laweyan	90,444	3,049	12.1
Banjasari	128,565	1,211	3.4

*Calculated from polyclinic visits
**Data available for first 9 months of 1979
+1977 Census

Table 12 Age Distribution of Patients with Diarrhea/Dysentery Admitted to Government Pediatric Hospital, Surakarta, 1978-1979 (4 Selected Months)

Age Group	Number of Patients	Percent of Total	
<1 month	35	14.9	44.8
1-11 months	70	29.9	
1-4 years	79	33.8	
5-9 years	31	13.2	
≥10 years	19	8.2	
Total	234	100	

Table 13 Age Distribution of Fifty Consecutive Patients with Acute Diarrhea Visiting Jebres Subpolyclinic, Surakarta, 1979

Age Group	Number of Patients	Percent of Total
<1 year	13	26
1-4 years	15	30
5-9 years	6	12
≥10 years	16	32

Table 14 Reported Cholera Case Rate/1000 Persons by Kecamatan and Year, Surakarta, 1977-1979

		1977		1978		1979*		Total Period		
	Total Pop+	Total Cases	Cases 1,000	Total Cases	Cases 1,000	Total Cases	Cases 1,000	Total Cases	Cases 1,000	Cases/1000 Year
Pasarkliwon	70,062	101	1.4	33	0.5	189	2.7	323	4.6	1.7
Serengan	62,373	67	1.1	14	0.2	118	1.9	199	3.2	1.2
Jebres	91,685	84	0.9	15	0.2	164	1.8	263	2.9	1.1
Banjasari	128,565	128	1.0	25	0.2	150	1.2	303	2.4	0.9
Laweyan	90,444	57	0.6	26	0.3	118	1.3	201	2.2	0.8

*First 9 months
+1977 Census

Table 15 Age Distribution and Age-specific Case Rates for Cholera Patients Residing in Surakarta Hospitalized at Government Pediatric Hospital, May-July, 1979

Age Group	Number of Persons*	Number Patients	Percent of Total	Cases per 1,000 Population
0-4	64,900	48	51.6	.74
5-9	56,921	28	30.1	.49
10-14	48,650	17	18.3	.35
Total	170,471	93	100.0	.55

*1977 Census

Table 16 Age Distribution and Age-specific Case Rates for an Approximate 20% Sample of Hospitalized Cholera* Patients Residing in Surakarta, January-October, 1979

Age Group	Number of Persons**	Number of Patients	Percent of Total	Cases per 1,000 Population
0-4	64,900	14	10.3	.22
5-9	56,921	18	13.2	.32
10-14	48,650	9	6.6	.18
15-24	66,279	29	21.3	.44
25-34	59,709	17	12.5	.28
35-44	53,071	14	10.3	.26
45-54	44,465	17	12.5	.38
55-64	33,936	12	8.8	.35
≥65	18,763	6	4.5	.32
Total	446,694	136	100.0	.30

*46 (33.8%) confirmed by culture
**July 1978 Census Data

Table 17 Reported Enteric Fever Case Rate/1000 Persons by Kecamatan and Year, Surakarta, 1977-1979

	Total Pop+	1977 Total Cases	1977 Cases 1,000	1978 Total Cases	1978 Cases 1,000	1979* Total Cases	1979* Cases 1,000	Total Period Total Cases	Total Period Cases 1,000	Total Period Cases/1000 Year
Jebres	91,685	27	.29	30	.33	18	.20	75	.82	.30
Serengan	62,373	12	.19	22	.35	13	.21	47	.75	.27
Banjasari	128,565	39	.30	33	.26	24	.19	49	.75	.27
Pasarkliwon	70,062	9	.13	25	.36	15	.21	96	.70	.25
Laweyan	90,444	10	.11	16	.18	15	.17	41	.45	.16

*First 9 months
+1977 Census

Table 18 Age-specific Case Rates for Hospitalized Enteric Fever Patients Residing in Surakarta, 1977-1979*

	0-4 Years (N=64,900)** Total Cases	0-4 Years Cases/1000	5-9 Years (N=56,921)** Total Cases	5-9 Years Cases/1000	≥10 Years (N=324,873)** Total Cases	≥10 Years Cases/1000	Total (N=446,694)** Total Cases	Total Cases/1000
1977	9	.14	37	.65	52	.16	98	.22
1978	13	.20	33	.58	79	.24	125	.28
1979	12	.18	21	.37	50	.15	83	.19
Total	34	.52	91	1.60	181	.55	306+	.25++

*First 9 months of 1979
**July 1978 Census Data
+Age unknown for 8 cases
++Cases/1000/year

Table 19 Total Government Polyclinic Visits and Visits for Scabies and Related Skin Infections, by Kecamatan and Year, Surakarta, 1977-1979

Kecamatan (Polyclinics)	1977			1978			1979*			Total Period		
	Skin Visits	Total Visits	%	Skin Visits	Total Visits	%	Skin Visits	Total Visits	%	Skin Visits	Total Visits	%
Serengan (1)	126	12,623	1.0	1,740	15,818	11.0	1,720	12,987	13.2	3,586	30,161	11.9
Banjasari (1)	10	3,358	0.3	673	5,733	11.7	921	5,983	15.6	1,604	14,984	10.7
Laweyan (3)	51	7,077	0.7	1,078	11,722	9.1	1,775	13,474	13.2	2,904	39,350	7.4
Pasarkliwon (1)	6	6,799	0.1	802	9,935	8.1	1,083	10,132	10.7	1,891	26,866	7.0
Jebres (2)	47	11,422	0.4	460	15,493	3.0	1,142	15,318	7.5	1,649	42,233	3.9

*First 9 months

Table 20 Scabies and Related Skin Infection Rate,* by Kecamatan, Surakarta, 1977-1979**

Kecamatan	Population+	Scabies/Related Skin Infection Visits	Visits/1000/Year
Serengan	62,373	3,586	20.7
Laweyan	90,444	2,904	11.6
Pasarkliwon	70,062	1,891	9.7
Jebres	91,685	1,649	6.5
Banjasari	128,565	1,604	4.5

*Calculated from polyclinic visits
**Data available for first 9 months of 1979
+1977 Census

Table 21 Total Government Polyclinic Visits and Visits for Eye Infections, by Kecamatan and Year, Surakarta, 1977-1979

Kecamatan (Polyclinics)	1977			1978			1979*			Total Period		
	Eye Visits	Total Visits	%	Eye Visits	Total Visits	%	Eye Visits	Total Visits	%	Eye Visits	Total Visits	%
Serengan (1)	442	12,623	3.5	491	15,818	3.1	326	12,987	2.5	1,259	41,428	3.0
Jebres (2)	285	11,422	2.5	542	15,493	3.5	367	15,318	2.4	1,194	42,233	2.8
Pasarkliwon (1)	229	6,799	3.4	247	9,935	2.5	257	10,132	2.5	733	26,866	2.7
Laweyan (3)	198	7,077	2.8	302	11,722	2.6	301	13,474	2.2	801	32,273	2.5
Banjasari (1)	76	3,358	2.3	144	5,733	2.5	124	5,893	2.1	344	14,984	2.2

*First 9 months

Table 22 Eye Infection Rate,* by Kecamatan, Surakarta, 1977-1979**

Kecamatan	Population+	Eye Infection Visits	Visits/1000/Year
Serengan	62,373	1,259	7.3
Jebres	91,685	1,194	4.7
Pasarkliwon	70,062	733	3.8
Laweyan	90,444	801	3.2
Banjasari	128,565	344	1.0

*Calculated from polyclinic visits
**Date available for first 9 months of 1979
+1977 Census

Table 23 Attack Rates by Kecamatan for Patients with Dengue Hemorrhagic Fever or Dengue Shock Syndrome Admitted to Government Pediatric Hospital, Surakarta, May-October, 1979

	Population 0-14 Years*	Number of Cases	Cases/1,000
Laweyan	27,107	11	.41
Pasarkliwon	23,397	5	.21
Serengan	21,808	3	.14
Jebres	38,183	5	.13
Banjasari	59,976	6	.10

*July 1978 Census

Table 24 Age-Specific Attack Rates for Patients with Dengue Hemorrhagic Fever or Dengue Shock Syndrome Admitted to Government Pediatric Hospital, Surakarta, May-October, 1979

	Total Population*	Number of Cases	Cases/1000
0-4	64,900	8	.12
5-9	56,921	12	.21
10-14	48,650	10	.21
Total	170,471	30	.18

*July 1978 Census

Table 25 Dengue Hemorrhagic Fever and Dengue Shock Syndrome Case Rate/1000 Persons, by Kecamatan and Year, Surakarta, 1977-1979

	Total Pop+	1977 Total Cases	1977 Cases 1,000	1978 Total Cases	1978 Cases 1,000	1979* Total Cases	1979* Cases 1,000	Total Period Total Cases	Total Period Cases 1,000	Total Period Cases/1000 Year
Jebres	91,685	37	0.4	64	0.7	28	0.3	129	0.5	.19
Banjasari	128,565	74	0.6	75	0.6	32	0.2	181	0.5	.19
Pasarklivon	70,062	24	0.3	28	0.4	24	0.3	76	0.4	.15
Laweyan	90,444	35	0.4	50	0.6	15	0.2	100	0.4	.15
Serengan	62,373	34	0.5	35	0.6	5	0.1	74	0.4	.15

*First 8 months
+1977 Census

Table 26 Total Government Polyclinic Visits and Visits for Upper Respiratory and Throat Infections Including Influenza, by Kecamatan, Surakarta, 1977

	URI/Throat Visits	Total Visits	%
Banjasari	1,521	3,358	45.3
Serengan	4,486	11,703	38.3
Laweyan	2,600	7,077	36.7
Jebres	4,064	11,422	35.6
Pasarklivon	2,320	6,799	34.1

Table 27 Upper Respiratory and Throat Infection Rate,* by Kecamatan, Surakarta, 1977

Kecamatan	Population+	Upper Respiratory/Throat Infection Visits	Visits/1000/Year
Serengan	62,373	11,703	187.6
Jebres	91,685	11,422	124.6
Pasarkliwon	70,062	6,799	97.0
Laweyan	90,444	7,077	78.2
Banjasari	128,565	3,358	26.1

*Calculated from polyclinic visits
+1977 Census

Table 28 Total Government Polyclinic Visits and Visits for Anemia, by Kecamatan and Year, Surakarta, 1977-1979

	1977			1978			1979*			Total Period (1977-1979)		
	Anemia Visits	Total Visits	%	Anemia Visits	Total Visits	%	Anemia Visits	Total Visits	%	Anemia Visits	Total Visits	%
Banjasari	280	3,358	8.3	872	5,733	15.2	898	5,893	15.2	2,050	14,984	13.7
Pasarkliwon	417	6,172	6.8	1,018	9,935	10.2	1,000	10,132	9.9	2,435	26,239	9.3
Jebres	775	11,422	6.8	882	15,493	5.7	1,212	14,476	8.4	2,869	41,391	6.9
Laweyan	484	7,077	6.8	725	11,722	6.2	625	13,474	4.6	1,834	39,350	4.7
Serengan	701	13,543	5.2	658	15,818	4.2	264	12,987	2.0	1,623	42,348	3.8

*First 9 months

Table 29 Anemia Rate,* by Kecamatan, Surakarta, 1977-1979**

Kecamatan	Population+	Anemia Visits	Visits/1000/Year
Pasarkliwon	70,062	2,435	12.5
Jebres	91,685	2,869	11.3
Serengan	62,373	1,623	9.4
Laweyan	90,444	1,834	7.3
Banjasari	128,565	2,050	5.7

*Calculated from polyclinic visits
**Data available for first 9 months of 1979
+1977 Census

Table 30 Summary of Rates for Selected Diseases, by Kecamatan, Surakarta, 1977-1979

	Cholera	Enteric Fever	Diarrhea/Dysentery		Scabies and Related Skin Infections		Eye Infections		Sum of Ranks
	Cases/1000/Year	Cases/1000/Year	Cases/1000/Year	% Clinic Visits	Cases/1000/Year	% Clinic Visits	Cases/1000/Year	% Clinic Visits	
Serengan	1.2 (2)	.3 (2.5)	34.2 (1)	14.6 (1)	20.7 (1)	11.9 (1)	7.3 (1)	3.0 (1)	10.5
Pasarkliwon	1.7 (1)	.3 (2.5)	17.3 (2)	12.5 (2)	9.7 (3)	7.0 (4)	3.8 (3)	2.7 (3)	20.5
Jebres	1.1 (3)	.3 (2.5)	16.6 (3)	10.9 (3)	6.5 (4)	3.9 (5)	4.7 (2)	2.8 (2)	24.5
Laweyan	0.8 (5)	.2 (5)	12.1 (4)	9.4 (4)	11.6 (2)	7.4 (3)	3.2 (4)	2.5 (4)	31
Banjasari	0.9 (4)	.3 (2.5)	3.4 (5)	8.3 (5)	4.5 (5)	10.7 (2)	1.0 (5)	2.2 (5)	33.5

( ) Indicates rank by kecamatan

Table 31 Summary of Results of Questionnaire Administered to 3 RT Chiefs

	No. Making Response
Government Services Most Needed in RT	
Water	3
Latrine	2
Determinants of Drinking Water Source	
Quality	3
Cost	3
Taste	3
Accessibility	3
Most Families Boil Drinking Water	
Always	1
Sometimes	2
Adequate Quantity of Water Available	
Yes	1 (during rainy season)
No	2
Most Families Willing to Pay More for	
More water	3
Better quality water	3
Easier access to water	3
Two Most Common Diseases in RT	
Diarrhea	3
Influenza	3
Number of Children <6 Years Old Died in Last Year	4
Number Died of Diarrhea	4
Most Families Seek Therapy for Diarrhea in Children <6 Years Old From	
Traditional Medicine	3
Public Clinic	2
Private Physician or Clinic	2
Health Post	1

Table 32 Summary of Water-Related Illnesses Determined by Questionnaire Administered to 8 Selected Households, Surakarta, November, 1979

Age Group (Years)	Number of Persons	Number With Diarrhea			Number With Skin Infection in Last Week	Number With Eye Infection in Last Week
		Last Day (Number of Stools)	Last Week (Number of Days)	Last Month (Number of Days)		
0-5	10	3 (1,3,10)	3 (3,3,5)	3 (5,5,5)	2	0
6-14	13	0 (--)	0 (--)	0 (--)	0	0
>14	20	0 (--)	0 (--)	1 (2)	0	0
Total	43	3 (--)	3 (--)	4 (--)	2	0

Table 33 Summary of Water Handling Practices Determined by Questionnaire Administered to Selected Households, Surakarta, November, 1979

Number of Households (Individuals)	8 (43)
Number with Piped City Water	0
Drinking Water Sources (Distance from House)	
Shallow well only	4 (7-115 meters)
Hand pump only	1 (25 meters)
Shallow well and hand pump	3 (10-90 meters) (12-70 meters)
Frequency of (and Reason for) Boiling Drinking Water	
Always	6 (4 prevent disease, 2 hot water)
Sometimes	2 (2 prevent water)
Storage of Water in Home	
Drinking	8
Cooking	8
Bathing	0
Washing dishes or clothes	4
Home Storage Containers (Volume)	
Plastic Buckets	7 (5-40 liters)
Jugs	6 (20-100 liters)
Frequency of Fetching Water	1-3 times/day
Characteristics of Person Fetching	
Female Adult	6
Female Teenager	2
Time Requirements for Fetching Trip	
1-15 minutes	2
16-30 minutes	4
31-60 minutes	1
>60 minutes	1
Fetching Container (Volume)	
Plastic Bucket	8 (10-20 liters)
Bathing Location (Distance from House)	
Outside House	8 (7-115 meters)
Number of Families Using Location	1-80

Table 34 Summary of Defecation Practices Determined by Questionnaire Administered to Selected Households, Surakarta, November, 1979

Number of Households (Individuals)	8 (43)
Defecation Sites (Distance from House)	
River	2 (55-100 meters)
Public latrine over river	2 (45-75 meters)
Public latrine on land	1 (5 meters)
Public latrine on land and river	3 (20-125 meters) (30-35 meters)
Frequency Used by Children <6 Years Old	
Always	3
Sometimes or Never	3

Table 35 Summary of Knowledge, Attitudes and Practices Determined by Questionnaire Administered to Selected Households, Surakarta, November, 1979

Cause of Diarrhea in Children <6 Years Old (N=6)	
Food	4
Flies	2
Water	1
Ice	1
Air	1
Poor Health	1
Flu	1
Contaminated Water Causes	
Diarrhea	7/7
Skin infections	6/6
Eye infections	5/6
Flu	5/5
Tuberculosis	4/5
Ear infections	2/2
Feces of Children <6 Years Old More Infectious Than Adults	
Yes	5
No	1
Don't know	2
Disposal of Feces of Children <6 Years Old	
Family Latrine	5
River	1
Health Education Re Diarrhea Prevention Last Year	
Yes	2
No	6
Aware of Surakarta Water Project	
Yes	1
No	7
Want Access to Public Water System	
Yes	8 (2 only if low cost)
No	0
Connection Desired	
Public tap near house	5
Private tap inside house	2
Private yard tap	1
With Easier Access, would use more water for	
Drinking	7
Cooking	7
Bathing	8
Washing clothes	8
Washing dishes	8
Need Better Quality Water	
Yes	7
Not sure	1

XIV. FIGURES

Fig. 1 LOCATION OF KECAMATANS, SURAKARTA, 1979

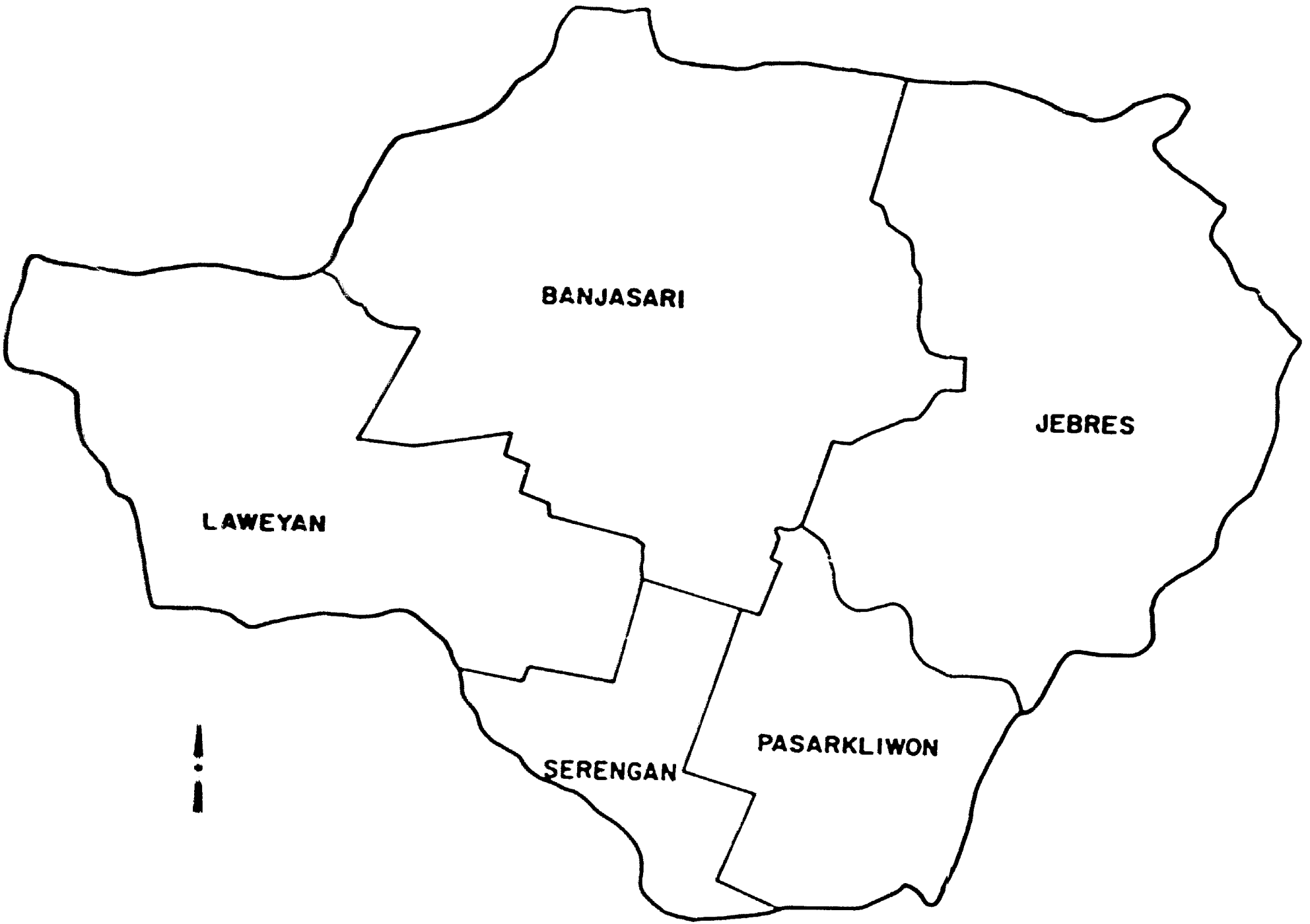


Fig.2 POPULATION DENSITIES OF KELURAHANS, SURAKARTA, 1977

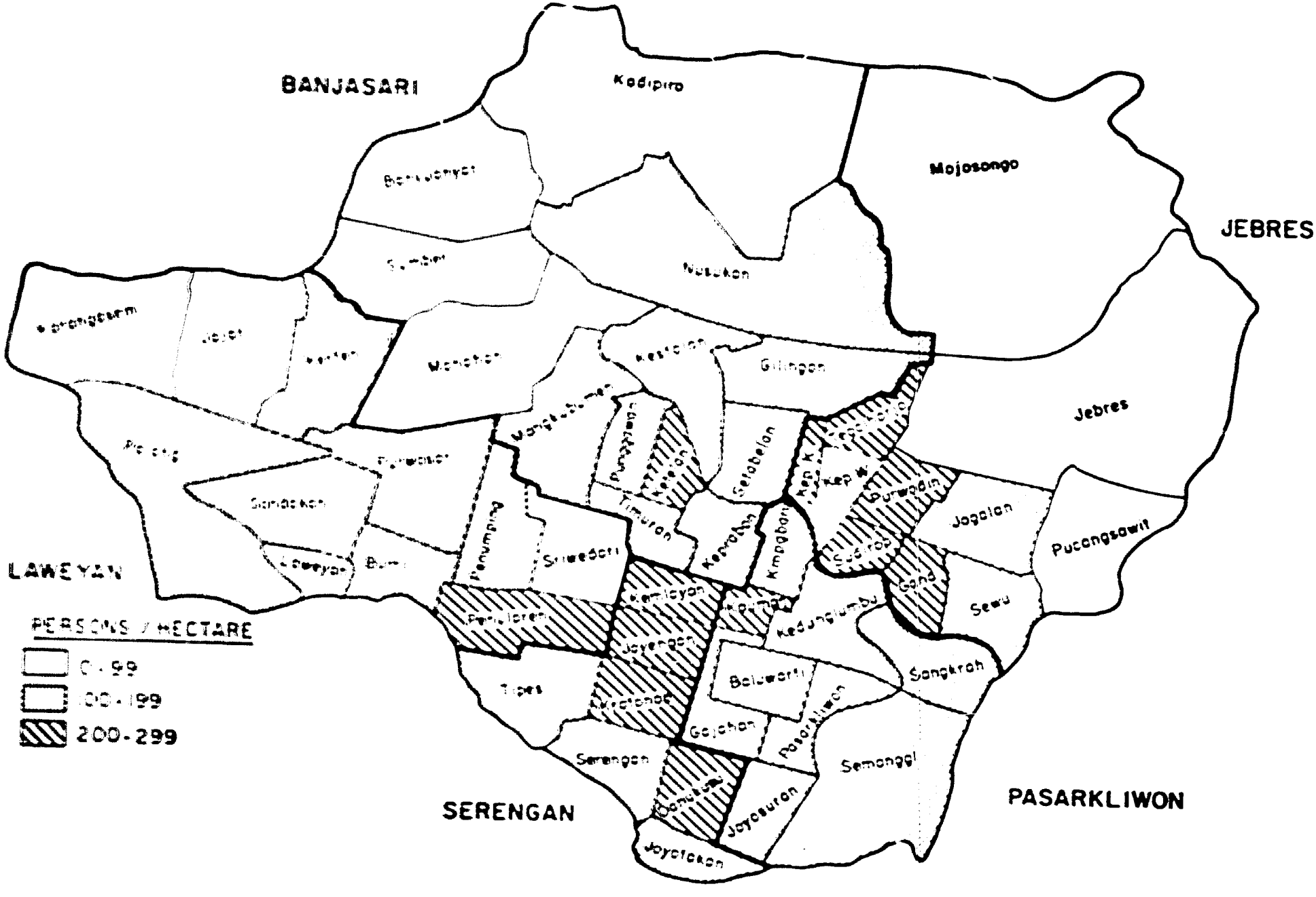


Fig.3 LOCATIONS OF KELURAHANS, HOSPITALS, AND GOVERNMENT PUSKESMAS, SURAKARTA, 197

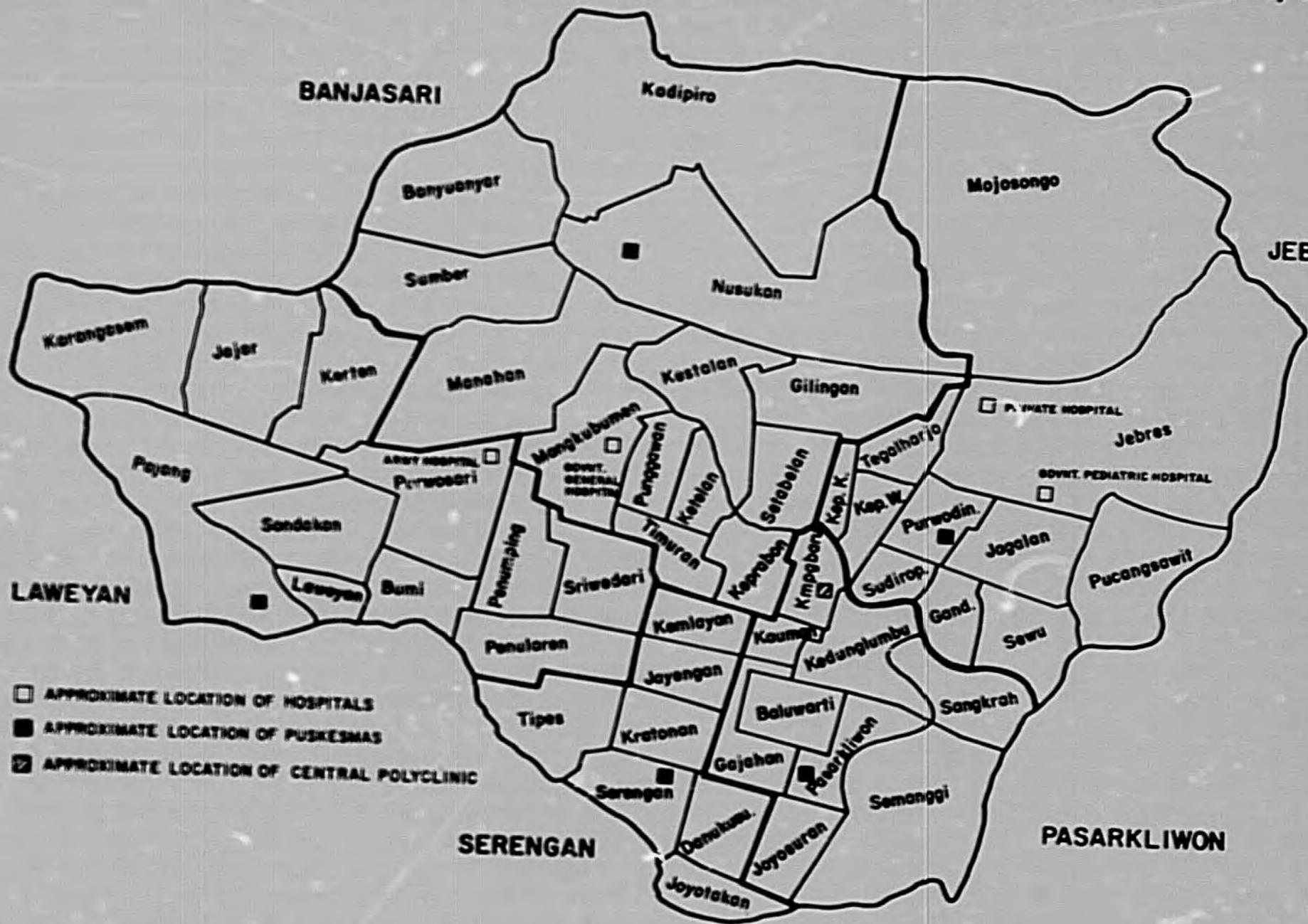


FIGURE 4

PUSKESMAS ORGANIZATION

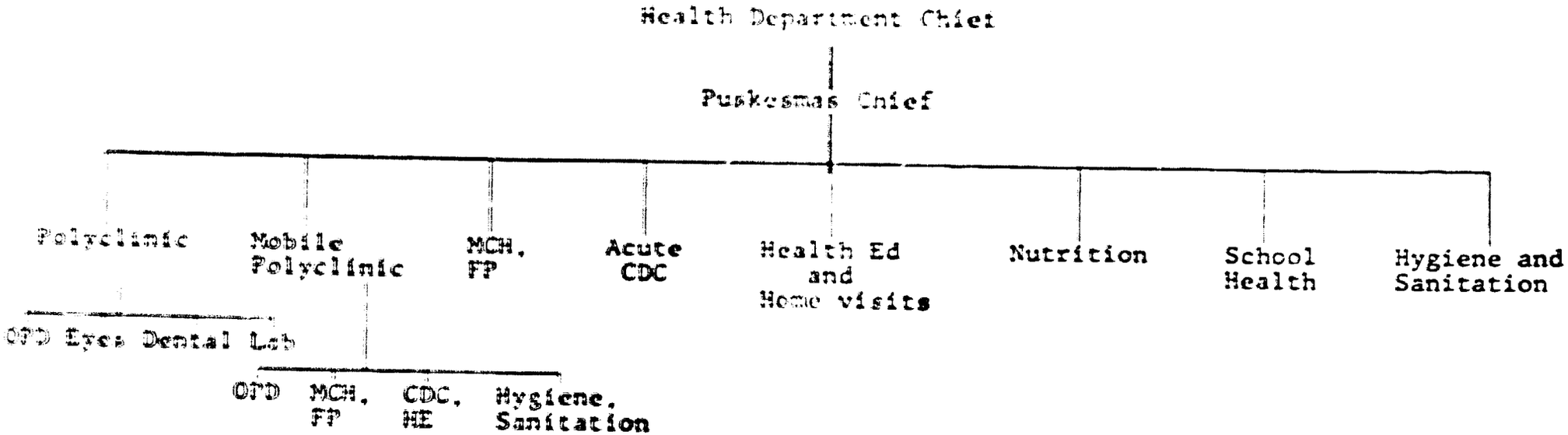
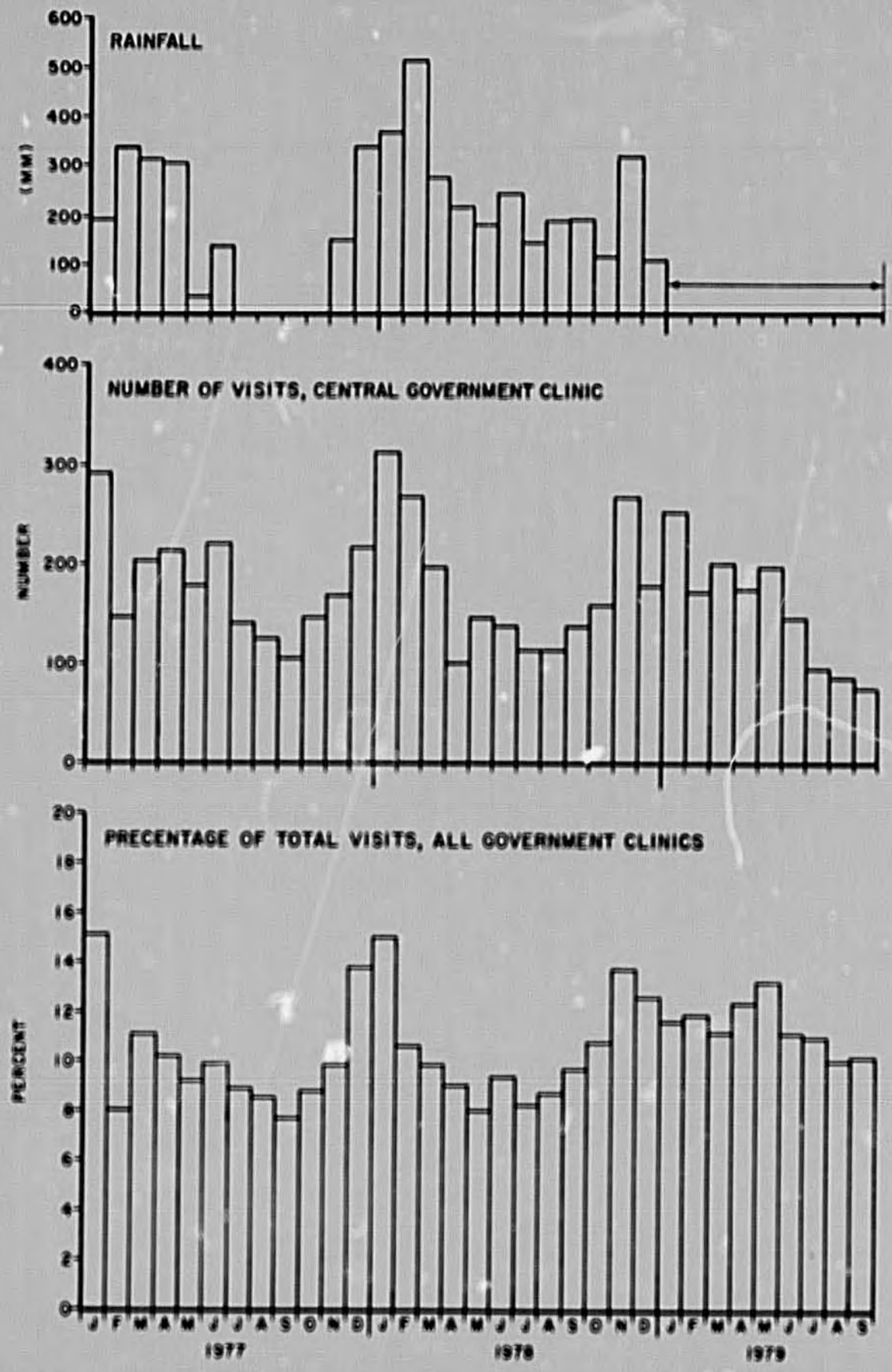


Fig. 5 **DEATHS PER 1,000 POPULATION, BY KELURAHAN, 1977**

Fig. 6 NUMBER AND PERCENTAGE OF PATIENT VISITS TO GOVERNMENT OUTPATIENT CLINICS, FOR DIARRHEA OR DYSENTERY AND RAINFALL, BY MONTH, SURAKARTA, 1977–1979*



*THROUGH SEPTEMBER 1979

⟷ DATA NOT AVAILABLE

Fig. 7 CHOLERA CASES PER 1000 POPULATION*, BY KELURAHAN, MAY-JULY, 1979†

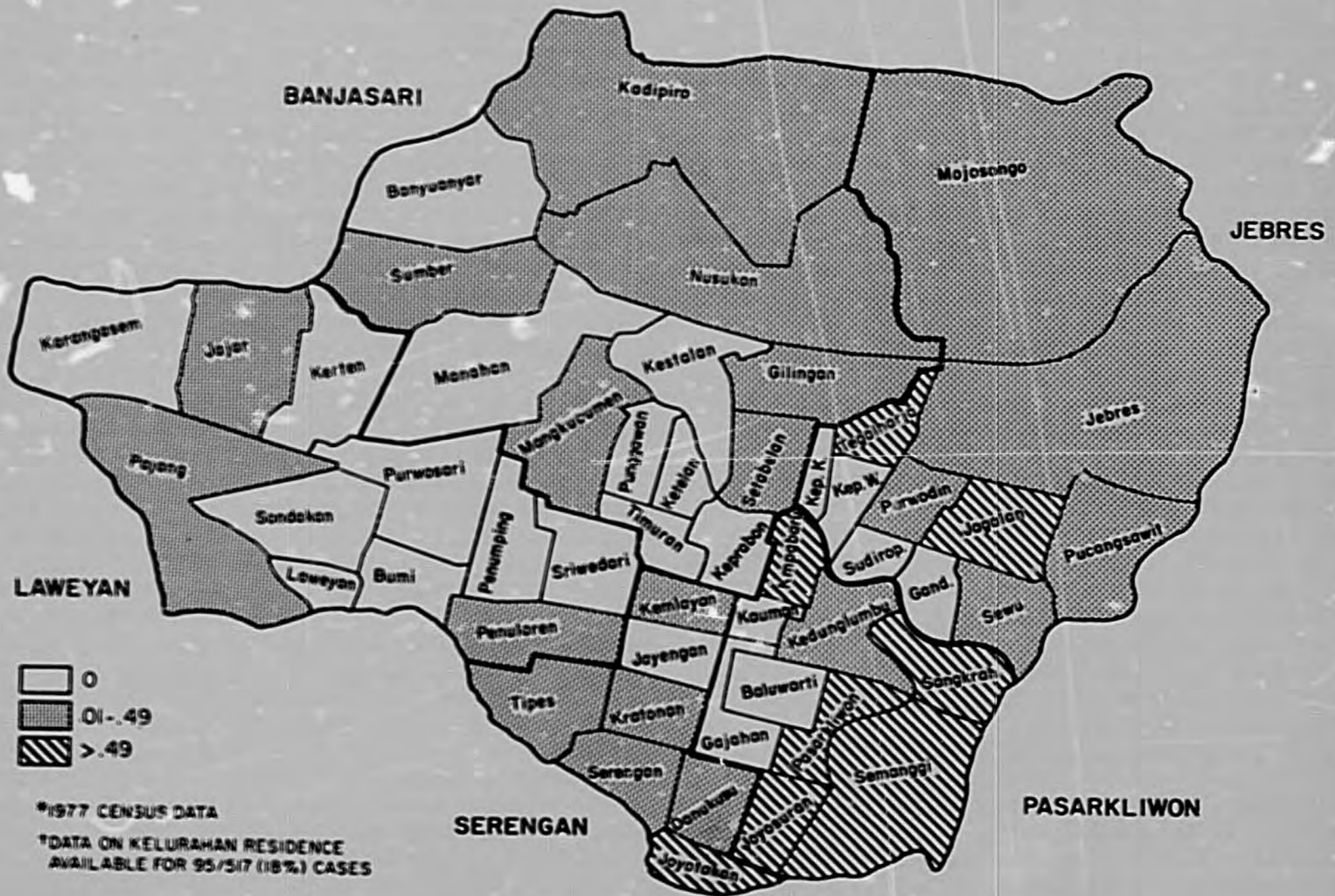


Fig. 8 CHOLERA AND ENTERIC FEVER CASES* IN RESIDENTS OF SURAKARTA, AND RAINFALL, BY MONTH, 1977 – 1979**

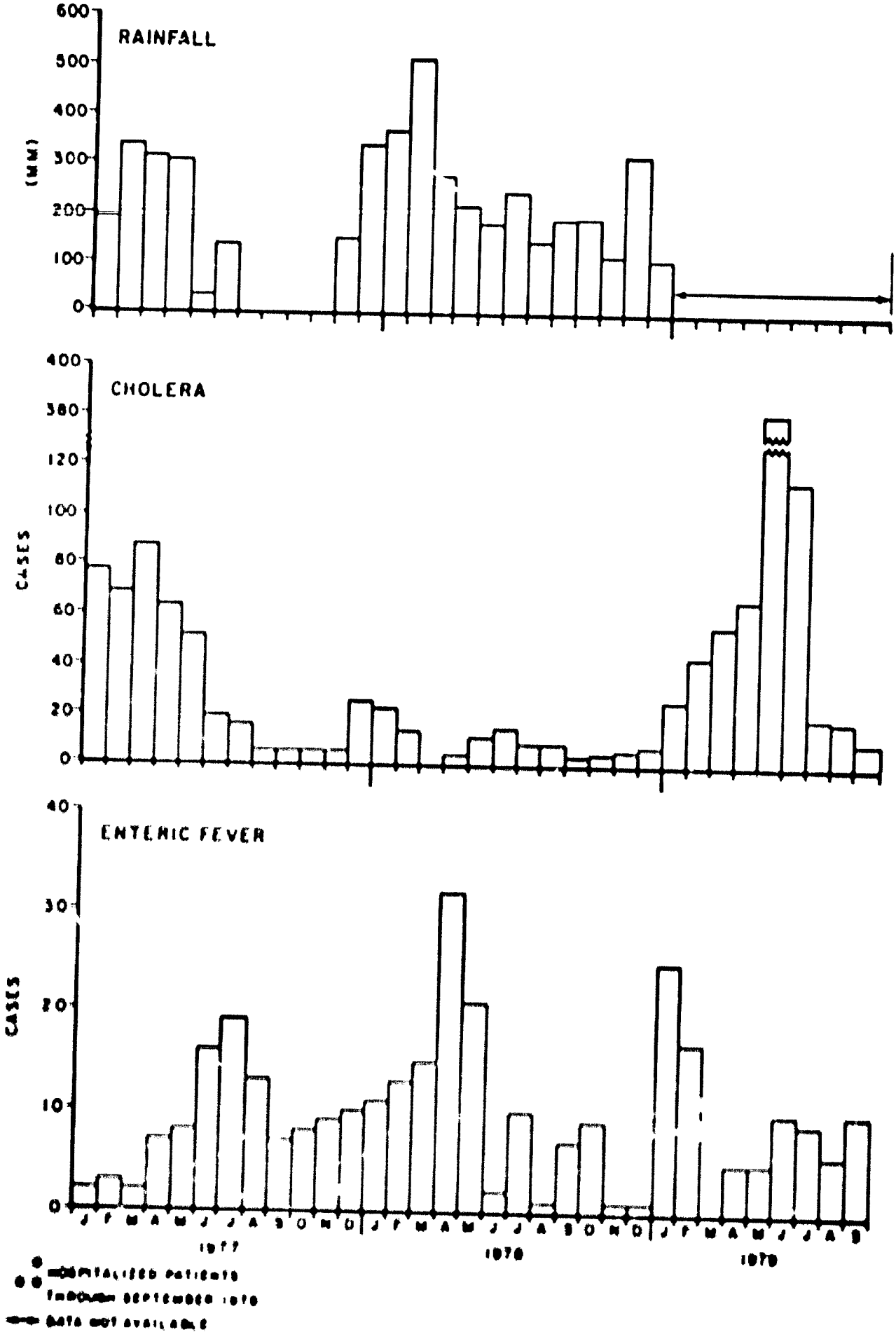


Fig.9 ENTERIC FEVER CASES PER 1000 POPULATION,* BY KELURAHAN, MAY-OCTOBER, 1979†

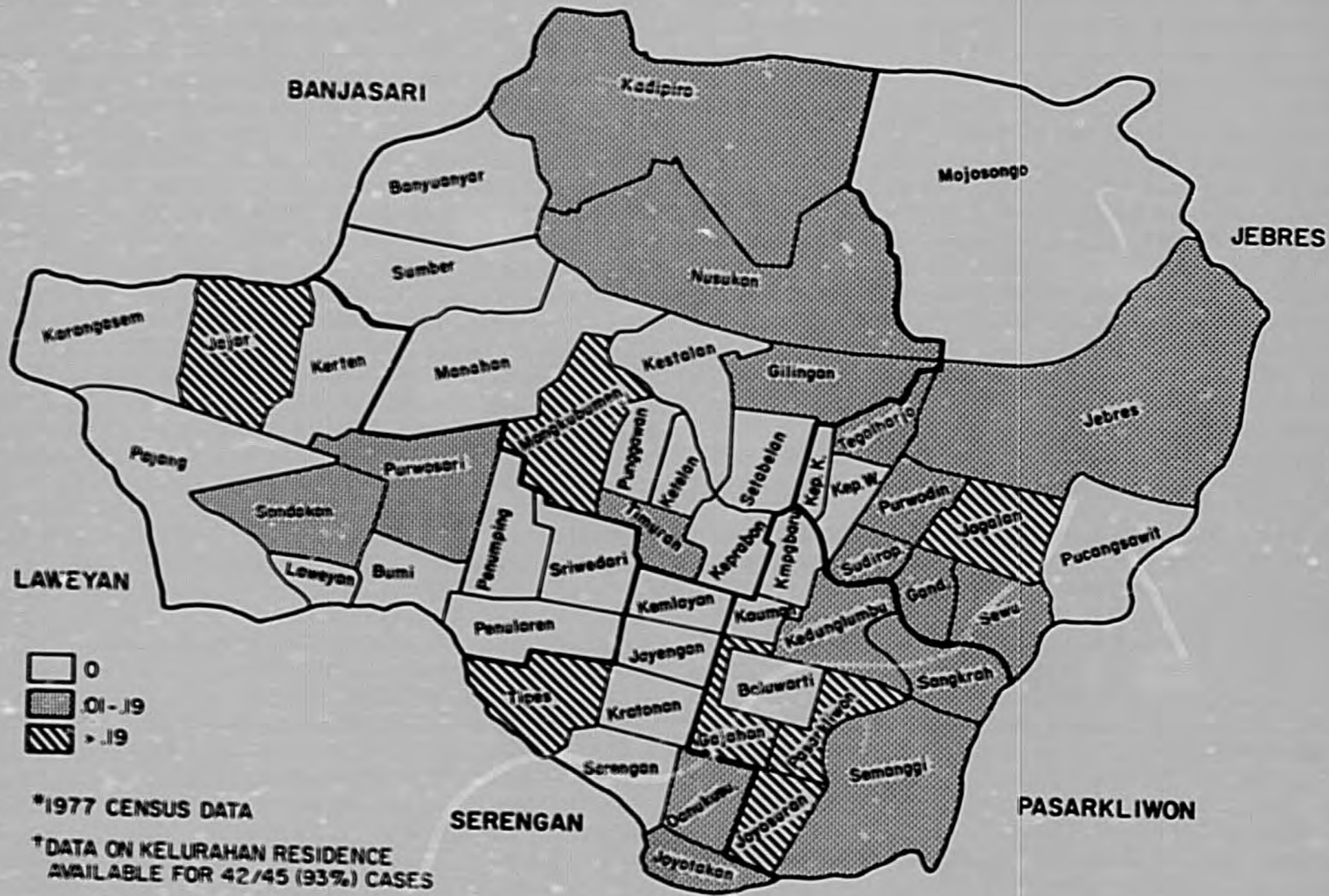
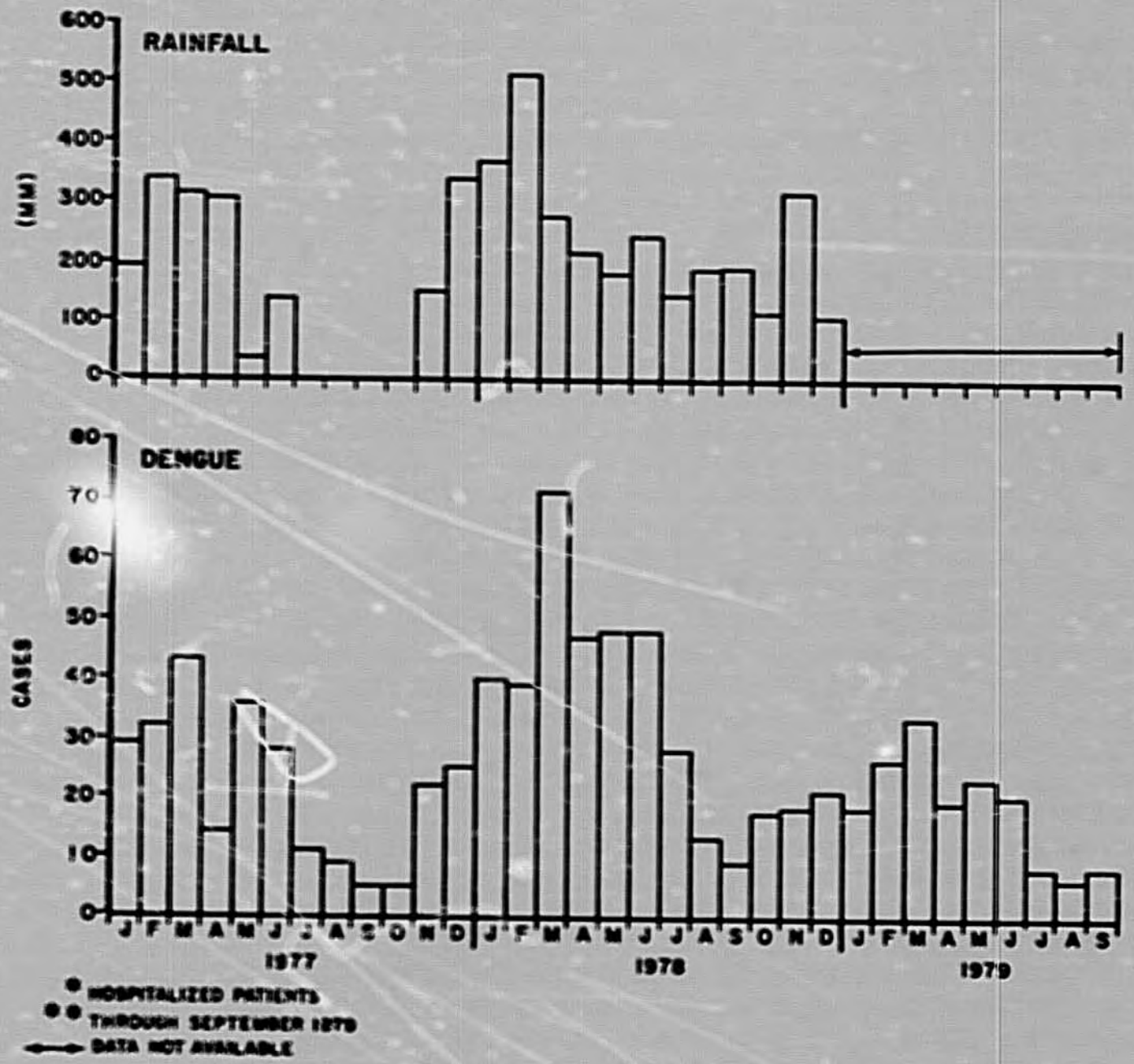


Fig. 10 DENGUE HEMORRHAGIC FEVER AND DENGUE SHOCK SYNDROME CASES* IN RESIDENTS OF SURAKARTA AND SURROUNDING AREA, AND RAINFALL, BY MONTH, 1977–1979**



XV. ATTACHMENTS

ATTACHMENT A

HEALTH EDUCATION

In order to attempt to ensure utilization of water provided by the Surakarta Water Project, the Project should include a health education component. The purpose of such a component would be to alert residents of the service areas to the causes of diarrhea and other water-related diseases and their relationship to water and sanitation practices. The objectives of the campaigns should be to emphasize both the convenience and health benefits related to the project, to increase the use of piped water for drinking and cooking, to eliminate the use of currently available sources of water for these purposes, to stress the use of latrines for defecation, to urge care in the handling of feces deposited by small children outside the latrines, and to encourage improvements in personal hygiene and food handling practices.

Such a campaign could be conducted in part through several mechanisms currently available in the city:

1. Each government puskesmas has a health education unit which could be involved in education of mothers who visit the main puskesmas, the mobile puskesmas, and the polyclinics.

2. Lurahs and RT chiefs could be utilized. A "Water Board" could be formed which would be composed of lurahs, RT chiefs or other elected members from the community. A training session conducted by personnel of the puskesmas with the aid of appropriate graphic materials developed after consultation with senior health department personnel could apprise the lurahs and RT chiefs of the points mentioned above; these individuals could

in turn disseminate the information to women in their RT. Follow-up sessions wtih RT chiefs could be held on a regular basis in the puskesmas in each kecamatan involved in the water project. Board members could also serve as a liaison with SWE to facilitate operation and maintenance.

3. The women's group (BKKBN) should be involved in the health education program and should provide an effective mechanism for reaching mothers of young children. School teachers could also be utilized in attempts to reach children.

4. Markets and public baths may be used as locations from which to disseminate information to large groups of people.

5. Consideration should be given to the use of drama (wayang orang) and puppet (wayang kulit and wayang golek) show formats as educational devices. Disease or water use situations can be depicted and the performance interrupted for discussion and interpretation.

6. A series of concise promotional announcements for radio broadcast could be developed in consultation with health department personnel which could be effective in dissemination of information on water, sanitation and health throughout the community.

7. Films produced by the Ministry of Information could possibly be utilized.

Whichever approaches are utilized in the project, efforts should be made during household visits to evaluate the extent to which the efforts to reach individual families are successful in altering previous behavior patterns.

Dr. Jon Rohde in Yogyakarta could provide valuable consultation on the design of a health education program.

ATTACHMENT B

POTENTIAL INDICATORS

(*First Priority)

A. Water-Related Diseases

1. Clinic/Hospital/Health Department Records

a. Diarrhea dysentery case rates by kelurahan
b. Typhoid fever rates by kelurahan
c. Skin infection rates by kelurahan
d. Eye infection rates by kelurahan
e. Dengue rates by kelurahan
f. Control condition rates by kelurahan, e.g., upper respiratory infection, influenza
g. Infant mortality rates by kelurahan

2. Household Visits

*a. Diarrhea incidence or prevalence; diarrhea days
*b. Skin infection incidence or prevalence
*c. Eye infection incidence or prevalence
*d. Control condition incidence or prevalence, e.g., upper respiratory infection, middle ear infection, influenza
*e. Nutritional status (heights and weights of children every 3-6 months)
*f. Prevalence of intestinal parasites

3. Miscellaneous

a. Oralyte utilization (packages/month/RT)
b. Incidence or prevalence of diarrhea by specific etiology

B. Water Quality

1. Total plate counts
*2. Fecal coliform counts
3. Chemical analyses

C. Water Quantity

*1. Volume delivered (water meter records)
*2. Percentage of time water unavailable

D. Water Utilization

*1. Distance from source
*2. Volume and times fetched per day
*3. Time required for water collection journey
4. Estimate from calculated volume fetched per day
*5. Estimate from volume of household storage container and frequency of filling

E. Sanitation Facility/Bathing Facility Utilization

*1. Water volume delivered (water meter records)
2. Frequency of use of selected facilities (observation)
3. Frequency of required emptying of septic tanks

ATTACHMENT C

SCOPE OF WORK FOR SURAKARTA EPIDEMIOLOGIST

An epidemiologist hired to reside in Surakarta and coordinate the health impact evaluation on a full-time basis would have a number of duties and responsiblities:

1. Work closely with the Surakarta Health Department to improve and standardize the current surveillance system of water-related diseases in Surakarta.

2. Modify the existing surveillance system in ways which would make the available data more appropriate for the analysis of the impact of the water project. For example, he could work with government polyclinics to develop a standard reporting form to be completed on a monthly basis for selected water-related diseases on which patients would be identified by age, sex, kelurahan and RT. These data could then be related to level of water service in the kelurahans and RT's.

3. Assist in the selection and training of interviewers for the community surveys. Based on our experience in field testing of questionnaires, this task will be difficlt and time-consuming.

4. Work closely with interviewers to ensure uniformity and completeness of data collection.

5. Supervise a smaller group of interviewers conducting the ongoing family studies which will focus weekly on the incidence of selected water-related diseases and quarterly on water and sanitation facility utilization patterns.

6. Supervise the systematic collection of water specimens for water quality testing in order to detect changes in

water-related disease incidence related to transient deterioration of water quality.

7. Conduct ongoing analysis of data collected by the family study and assist in the analysis of data collected during the large community surveys.

8. Meet with members of the evaluation team and the Indonesian epidemiology and engineering consultants monthly to keep them abreast of the results of the ongoing family studies and to discuss overall project status.

ATTACHMENT D

PROPOSED STUDY DESIGN, SAMPLE SIZES AND MANPOWER REQUIREMENTS FOR LONGITUDINAL STUDY OF COHORTS OF FAMILIES WITH CHILDREN 0-4 YEARS OF AGE*

This table was prepared in an attempt to summarize various options for design of the longitudinal study of cohorts of families and an estimate of manpower requirements for each study design. Calculations are based on assumptions of 1 child per family, 2 episodes of diarrhea per child per year, recall periods of 1 week for use in interviews, and 10 interviews per interviewer per day. Six study designs are presented and manpower estimates made based on weekly household visits and visits every 4 weeks.

These designs yield a 90% chance of detection of a 30% reduction in diarrheal disease rates in this age group.

Study Design	Sub-group	Baseline	Intervention	Surveillance Frequency	Family Visits Per Group Per Week†	Number of Interviewers*	Comparison Interval⊖
I	A	1) piped water, good latrines	None	Weekly	200	4	
		2) piped water, poor latrines	None	Weekly	200	4	
		3) piped water, poor latrines	Improved latrines	Weekly	200	4	
	B	1) no water, poor latrines	Piped water	Weekly	200	4	
		2) no water, poor latrines	Piped water, improved latrines	Weekly	200	4	
	C	1) no water, poor latrines	None	Weekly	200	4	
		2) no water, poor latrines	Improved latrines	Weekly	200	4	
Subtotal					1400	28	3 mos.
II	Same	Same	Same	Every 4 weeks	50	1	
Subtotal					350	7	12 mos.
III	B&C only	Same	Same	Weekly	200	4	
Subtotal					600	16	3 mos.
IV	B&C only	Same	Same	Every 4 weeks	50	1	
Subtotal					200	4	12 mos.
V	B only	Same	Same	Weekly	200	4	
Subtotal					400	8	3 mos.
VI	B only	Same	Same	Every 4 weeks	50	1	
Subtotal					100	2	12 mos.

*Assumes 1 child 0-4 per family
†Based on assumption of 2 episodes of diarrhea/child/year; 90% chance of detection of 30% reduction in diarrheal disease at p=.05 level if change occurs.
*Assumes 10 interviews/person/day
⊖Time frame for rate comparisons

COMMENT: Study designs III and IV should yield meaningful data which should permit the identification of a health impact of piped water with or without latrine improvement. Study design III would be preferable as it would permit an assessment of seasonal trends. The requirement of 16 interviewers for study design III is probably excessive. With the exception of the quarterly water use survey (Attachment Q) interviewers should be able to perform 20 interviews per day (Attachment E); therefore, only 8 interviewers may be required for this approach.

ATTACHMENT E

PROPOSED REVISION: SURAKARTA DIARRHEAL DISEASE QUESTIONNAIRE (Weekly Administration) (1-3) Date _____ (4-9)

1. Kecamatan _____ (10) Kelurahan _____ (11-12) RW# _____ (13) RT# _____ (14-15) House# _____ (16-17) Mother# _____ (18)

Visit# _____ (19-21)

2. Interview: Completed Not home Dropped from study Refusal Other (specify) _____ (22)

3.

Person Code	Diarrhea* Last 24 Hours	# Watery Stools	Last 7 Days	# of Days Of Last 7
a	Yes No Not sure (23)	_____ (34)	Yes No Not sure (45)	_____ (56)
b	Yes No Not sure (24)	_____ (35)	Yes No Not sure (46)	_____ (57)
c	Yes No Not sure (25)	_____ (36)	Yes No Not sure (47)	_____ (58)
d	Yes No Not sure (26)	_____ (37)	Yes No Not sure (48)	_____ (59)
e	Yes No Not sure (27)	_____ (38)	Yes No Not sure (49)	_____ (60)
f	Yes No Not sure (28)	_____ (39)	Yes No Not sure (50)	_____ (61)
g	Yes No Not sure (29)	_____ (40)	Yes No Not sure (51)	_____ (62)
h	Yes No Not sure (30)	_____ (41)	Yes No Not sure (52)	_____ (63)
i	Yes No Not sure (31)	_____ (42)	Yes No Not sure (53)	_____ (64)
j	Yes No Not sure (32)	_____ (43)	Yes No Not sure (54)	_____ (65)
k	Yes No Not sure (33)	_____ (44)	Yes No Not sure (55)	_____ (66)

	Skin Infection Last 7 Days	Eye Infection Last 7 Days	Sore Throat Last 7 Days
a	Yes No Not sure (67)	Yes No Not sure (78)	Yes No Not sure (89)
b	Yes No Not sure (68)	Yes No Not sure (79)	Yes No Not sure (90)
c	Yes No Not sure (69)	Yes No Not sure (80)	Yes No Not sure (91)
d	Yes No Not sure (70)	Yes No Not sure (81)	Yes No Not sure (92)
e	Yes No Not sure (71)	Yes No Not sure (82)	Yes No Not sure (93)
f	Yes No Not sure (72)	Yes No Not sure (83)	Yes No Not sure (94)
g	Yes No Not sure (73)	Yes No Not sure (84)	Yes No Not sure (95)
h	Yes No Not sure (74)	Yes No Not sure (85)	Yes No Not sure (96)
i	Yes No Not sure (75)	Yes No Not sure (86)	Yes No Not sure (97)
j	Yes No Not sure (76)	Yes No Not sure (87)	Yes No Not sure (98)
k	Yes No Not sure (77)	Yes No Not sure (88)	Yes No Not sure (99)

*3 or more liquid stools/24 hours

ATTACHMENT F

C A T A T A N D I A R E

HOUSEHOLD DIARRHEA SURVEILLANCE FORM

HARI :

Orang							

Menceret/Mangsur Ya 1

Tidak 0

ATTACHMENT G

PROPOSED LINE LISTING FORM FOR USE IN DAILY SURVEILLANCE OF SELECTED DISEASES IN GOVERNMENT POLYCLINICS

Disease _____

Polyclinic _____

Date	Name	Age	Sex	Kecamatan	Kelurahan	RK	RT

ATTACHMENT H

PROPOSED MONTHLY SUMMARY OF
SELECTED DISEASES REPORTED BY
GOVERNMENT POLYCLINICS

Polyclinic_____ Month_____ Year_____

Disease	Number of New Visits
Diarrhea	_____
Dysentery	_____
Skin Infections	_____
Eye Infections	_____
Upper Respiratory/Throat Infections	_____
Influenza	_____

ATTACHMENT I

WATER QUALITY

I. WATER QUALITY INDICATORS

A. Physical

1. Temperature
2. Taste
3. Color
4. Turbidity

B. Bacteriological

1. Coliform and other bacteria live and grow in many different media and hosts, including soil, water, food, people and other animals.

2. Fecal coliform bacteria grow in the intestines of humans and other animals. Their presence in drinking water indicates fecal contamination and possible presence of "pathogenic" bacteria from the feces of infected persons.

3. Total plate count is designed to demonstrate the presence of any bacteria. Natural waters are rarely sterile or free of all bacteria.

4. Microscopic examination for other organisms larger than most bacteria; e.g., amoeba, protozoa, worms, and other undesirable organisms resulting from contamination.

5. Specific tests for pathogenic bacteria, viruses, and parasites require more sophisticated analyses and controls.

C. Chemical

1. pH--ranges from acid-base. Most waters are near neutral (6-8). If outside this range, they can be corrosive, attacking iron pipe, or form deposits on the inside of the pipe eventually stopping the flow.

2. Fe, Mn, Ca, are related to the above.

3. Cl or chlorides indicate salty water generally when above 500-1000 mg/l.

4. NH_4 (ammonia) often indicates fecal contamination, or anaerobic (no-oxygen) conditions but is difficult to detect because it is not usually stable.

5. NO_3 (nitrate) and PO_4 (phosphate) are high when fertilizers are heavily used. High nitrates (>40/mg/l) can cause "blueblood" or methemeglobinemia in children.

6. Other chemical indicators often relate to specific causes or sources of industrial and other contamination.

7. Chlorine is used for disinfection of water and a free chlorine residual in a water sample indicates that the water is safe bacteriologically.

D. Relative Health Significance of Various Indicators

1. The fecal coliform test is the most commonly performed and currently is the best indicator for fecal contamination of water.

2. Since most natural waters are not sterile or free from bacteria, even when the fecal coliform test is negative, the total plate count test should demonstrate the presence of any bacteria, which may be harmful, beneficial, or of no consequence.

3. Microscopic examination after concentration of the water sample may provide information about the presence of other organisms causing water-related disease.

4. Since SWE adds chlorine solution at the Kartosuro Reservoir, it is possible that a chlorine "residual" will reach the first sampling point and others in the distribution system of Surakarta. Testing for free residual chlorine is a very simple procedure.

5. A more detailed discussion of these parameters and their significance is presented in Standard Methods for Water and Wastewater published by American Public Health Association, Water Pollution Control Federation, and American Water Works Association and available for approximately $40.00. Dr. Rockhill at NAMRU and Mr. Soeripto in Yogyakarta both have a copy; pertinent sections on these analyses should be reviewed and translated into Bahasa Indonesia.

E. Water Quality Sampling Program

1. Routine Surveillance of Bacteriologic and Physical Quality

a. Using the sample points recommended for the November 30 water quality survey supplemented by additional locations as familiarity with system pressures and differing water quality zones increases and as the distribution system rehabilitation and additions are completed:

1) Analyze 5 samples (capacity of existing autoclave) every 2 weeks, rotating locations around the city. Expand, only if necessary, depending on results, workload, interest, cost of program, and available manpower.

2) Training for Mr. Daliyono and/or co-worker(s) could be provided by Dr. Rockhill of NAMRU.

b. Consider offering service to businesses and citizens who wish their water analyzed for a fee which could cover costs for time and materials.

c. Investigate requirements for minor additions to equipment for other chemical capabilities.

2. Impact Evaluation

a. When studying families within an RT, sample on a regular basis throughout the year:

1) Well(s) -- hand drawn
2) Well(s) -- hand pump
3) From storage container in HH
4) From container used for drinking

b. "Extensive" sampling of existing distribution system before rehabilitation in various service areas and from different types of connections (similar to the survey of November 30 performed by Mr. Daliyono and his staff of the City Health Department but at different times of the day and during wet and dry periods). Include some duplicate samples to ensure or check the accuracy of analytical methods and handling.

F. Locations for Annual Water Quality Survey in Surakarta

Sites recommended November 30, 1979 (see map after next page)

a. Within SWE System

1) Cokrotolung Spring
2) Delanggau - R.S. Bersalin Fativial Hospital
3) Kartosuro Reservoir
4) Jebres Reservoir

b. Artesian Wells

5) Sangkrah (MCK)
6) Kepatihan wetan (MCK)

c. Ten City Service Districts

7) I Malang Restaurant or City Health Laboratory
8) IA House connection - Jalan Bromo
9) II Toko Mas - Sriwedari
10) IIA House connection - Bumi
11) IV House connection - Setabelan
12) IIIA Jalan Margoudan
13) IV House connection - Samanggi
14) IVA House connection - Sangkrah
15) V House connection - Sudiroprajan
16) VA House connection - Purwodiningratan

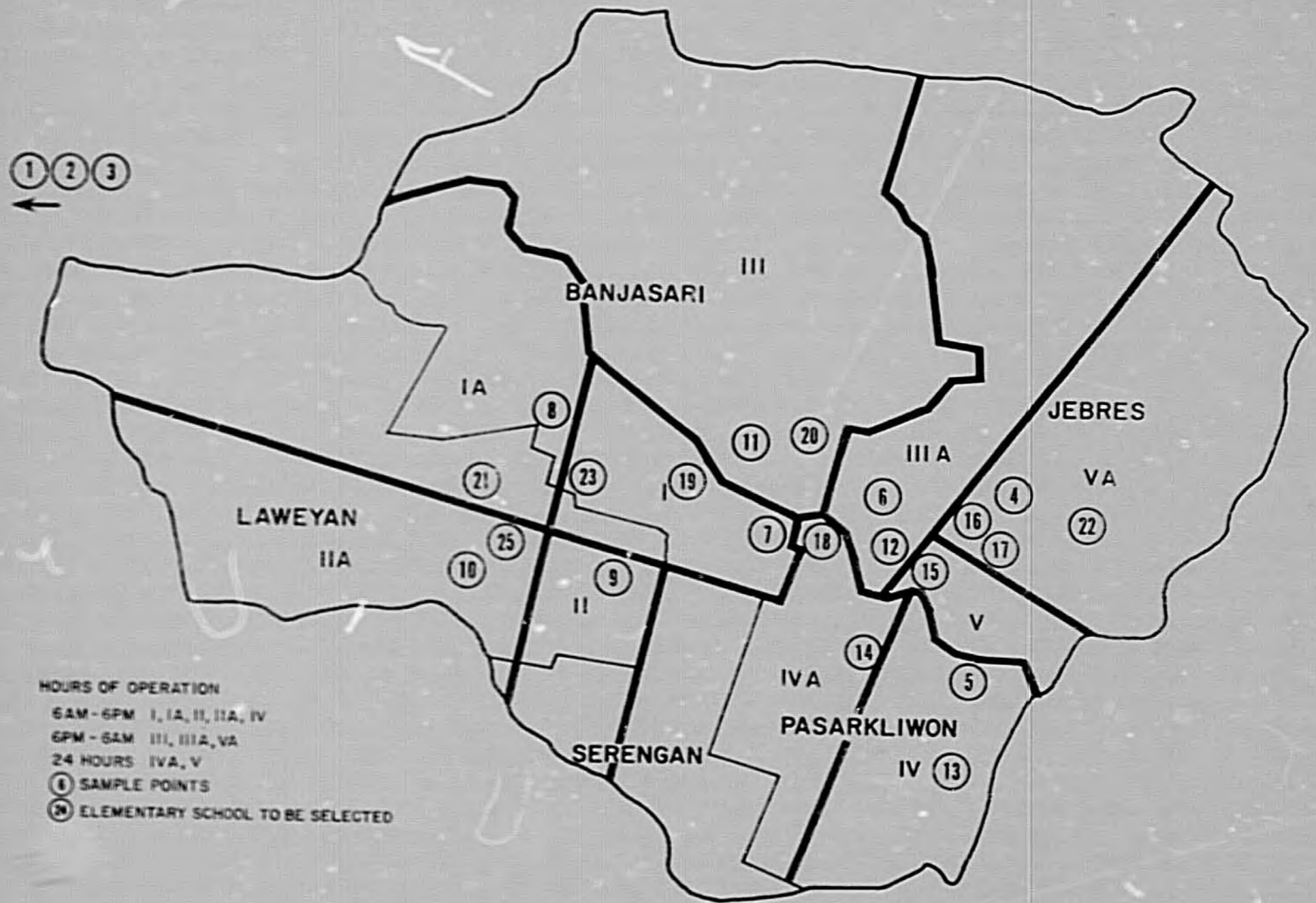
d. Swimming Pools

17) Tintomoyo (SWE - VA)
18) Mangkunagaran Palace Hotel (well)
19) Kusumo Sahid Hotel (well)
20) Jurug Hotel (well)
21) Balekambang (SWE - IA)

e. Private Wells

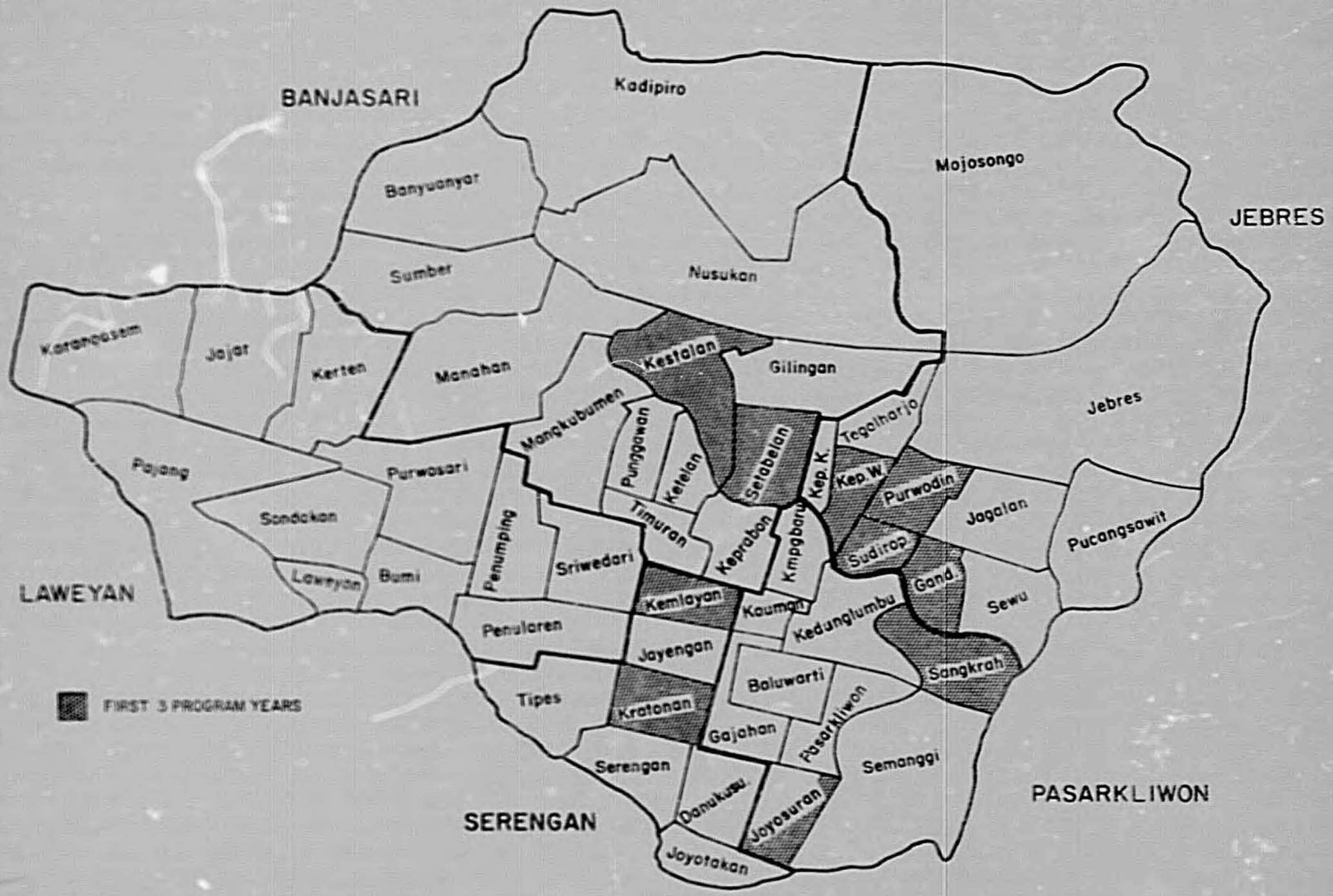
22) Jebres Hospital
23) Central Hospital
24) Elementary School (at Ranoom)
25) Pabrik ES, Ice Factory - Purwosari (SWE IIA)

APPROXIMATE LOCATIONS OF SERVICE DISTRICTS, SURAKARTA WATER ENTERPRISE, AND RECOMMENDED SAMPLING POINTS FOR WATER QUALITY DETERMINATIONS, SURAKARTA



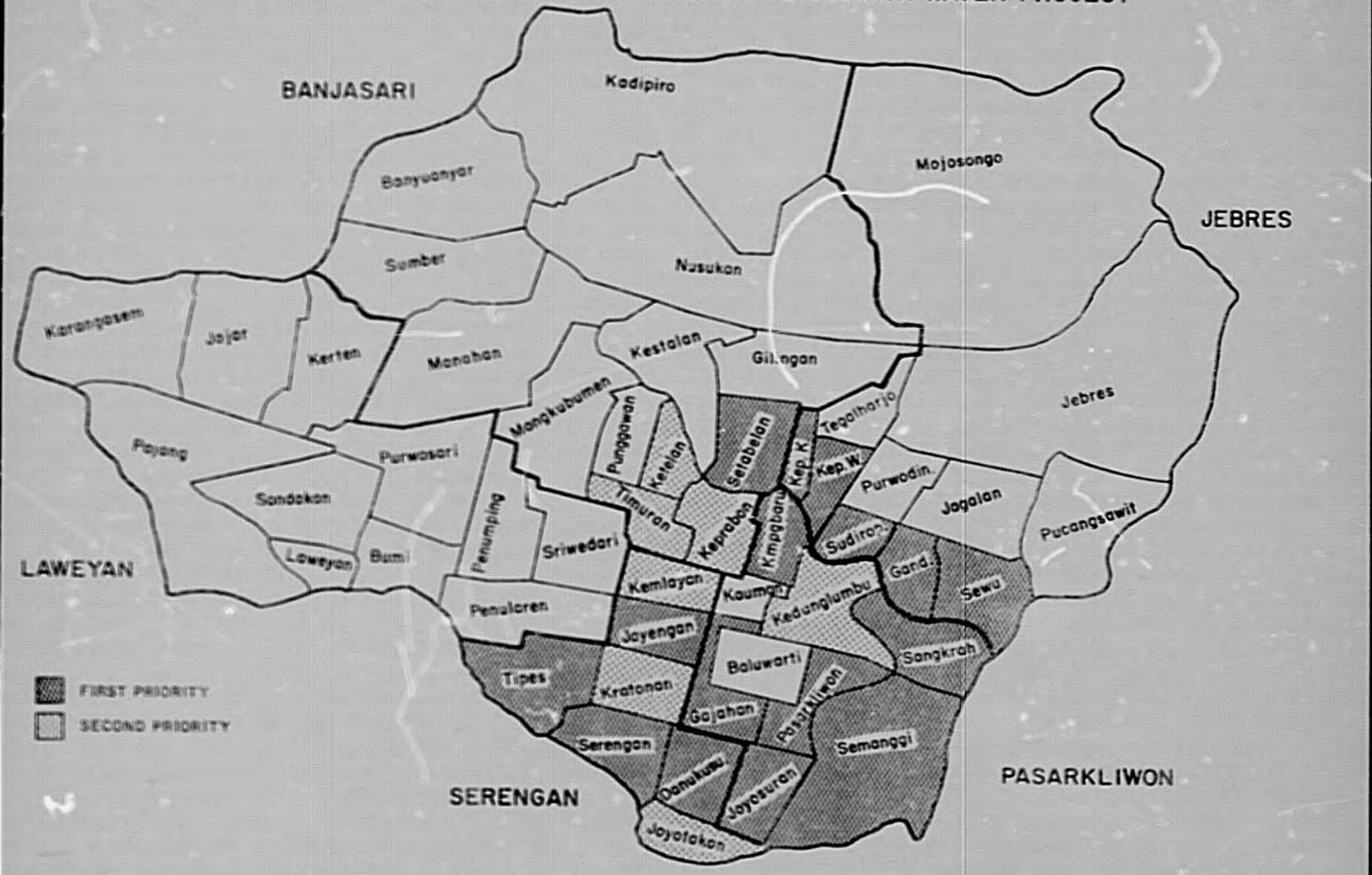
ATTACHMENT I

KELURAHANS INCLUDED IN KAMPUNG IMPROVEMENT PROJECT, SURAKARTA



ATTACHMENT J

LOCATION OF KELURAHANS PROPOSED FOR INCLUSION IN SURAKARTA WATER PROJECT



ATTACHMENT K

ATTACHMENT L

QUESTIONNAIRE FOR CHIEF OF RT

Kecamatan _____ Kelurahan _____ RK/RT _____

---

1. How long have you been chief of this RT?

   _____ years _____ months

2. How many families are in your RT? _____

3. How many people are in your RT?

   _____ total _____ males _____ females

4. How many children under six years of age are in your RT?

   _____ total _____ males _____ females

5. How many houses are in your RT?

   total _____

   bamboo walls with dirt floor _____

   ½ bamboo / ½ brick walls with cement floor _____

   brick walls with tile floor _____

   other _____

6. How many places of business are in your RT?

   _____ permanent stores _____ stalls

7. How many households rent houses? _____

8. How much is the average rent? _____ rupiah/month/year

9. Which of these public services do you receive and use in your RT?

   electricity
   rat control
   mosquito control
   foot paths/roads
   health post
   street lights
   garbage collection
   drainage
   food supplements
   public water supply
   public bath/latrine
   other

10. What two services are needed most in your RT?

    a. _____ b. _____

11. How much water does the average family use per day?

    _____ l/m3

12. What types of water sources are available in your RT?

	No. used	No. not used
private shallow well	_____	_____
public deep well	_____	_____
public shallow well	_____	_____
private deep well	_____	_____
public hand pump	_____	_____
private hand pump	_____	_____

13. Do any houses in your RT get water form SWE? Yes/No

14. How many house and yard connections are in your RT?

    house _____ yard _____

15. Is there a public standpipe or tap? Yes/No

16. What is the source of water for the public bath house/latrine?

    piped water well pump river/stream

17. How many latrines are there in your RT?

18. Do any families buy water from vendors? Yes/No _____ Total _____

19. What do you think determines selection of a water source for drinking in your RT?

quality		yes	no
cost	installation	yes	no
	monthly	yes	no
taste		yes	no
access		yes	no
other		yes	no

20. How often do most families boil the water before using it for drinking?

always sometimes never

21. Is there a person designated as a health post worker in your RT? Yes/No

22. Is someone designated or paid to maintain the latrines, drains, and baths in your RT? Yes/No

23. Does your RT have enough water? Yes/No

24. What is the religion of most of the families in your RT? _____

25. Do you think that most families would be willing to pay more for

more water	yes	no
better quality water	yes	no
more accessible water	yes	no

26. What are the two most common diseases in your RT?

_____ _____

27. How many children less than 6 years of age have died in the last year? _____

How many children less than 6 years of age have died of diarrhea in the past year? _____

28. When a child less than 6 years of age is sick, where do most families go for treatment?

health post _____

puskesmas/polyclinic _____

private doctor/private polyclinic _____

traditional medicine _____

other _____

_____

Date of Interview

_____

Interviewer

ATTACHMENT M

DAFTAR PERTANYAAN UNTUK

KETUA R.T.

QUESTIONNAIRE FOR CHIEF OF RT

Kecamatan :..... Kelurahan :..... RK/RT :.....

1. Sudah berapa lamakah menjadi Ketua RT disini ?
   .....tahun ..... bulan

2. Berapa rumah tanggakah di dalam wilayah RT anda ?
   ..... rumah tangga.

3. Berapa jiwakah di dalam wilayah RT anda ?
   ..... jiwa ..... laki-laki ..... wanita.

4. Berapakah jumlah anak-anak dibawah umur 6 tahun ?
   ..... jiwa ..... laki-laki ..... wanita.

5. Berapa rumahkah ada di wilayah anda ?
   ..... rumah.
   - dinding bambu lantai tanah ..... rumah
   - dinding 1/2 batu lantai semen ..... rumah
   - dinding bata lantai tegel ..... rumah
   - Lain-lain . . . . . rumah

6. Berapa toko/warungkah di wilayah anda ?
   ..... toko ..... warung.

7. Berapa keluarga yang menyewa rumah dari warga anda ?
   ..... orang.

8. Berapakah rata-rata sewa rumah mereka ?
   ..... Rp./bulan/tahun.

9. Manakah dari fasilitas umum yang anda terima dan dipergunakan di wilayah anda ?
   - Perlistrikan
   - Pemberantasan tikus
   - Pemberantasan nyamuk
   - Jalan kaki/jalan kendaraan
   - Pos Kesehatan
   - Lampu jalanan
   - Pengumpulan sampah
   - Pembuangan air limbah

- Penyediaan makanan
- dan lain-lain

- Penyediaan ledeng umum
- Penyediaan jamban dan kamar mandi umum
- dan lain-lain.

10. Dua dari pelayanan umum yang manakah yang sangat dibutuhkan di wilayah RT anda ?
    a ..... b .....

12. Berapa jeniskah sumber air yang ada di wilayah anda ?

	masih dipergunakan	tidak dipergunakan
Sumur dangkal pribadi	..... sumur	..... sumur
Sumur dangkal umum	..... sumur	..... sumur
Pompa tangan umum	..... sumur	..... sumur
Pompa tangan pribadi	..... sumur	..... sumur
Air Kali	_____	_____

13. Apakah ada dari wilayah anda yang mendapat sambungan air dari P.A.M. ?
    Ya / Tidak.

14. Berapa banyakkah sambungan rumah/sambungan halaman di wilayah anda ?
    Sambungan rumah ...../ sambungan halaman .....

15. Apakah ada ledeng umum ?
    Ya/Tidak

16. Apakah ada sumber air ke jamban/kamar mandi umum ?
    ledeng sumur pompa sungai/kali.

17. Berapa banyakkah jamban di wilayah anda ?

18. Apakah ada keluarga yang beli air dari tukang pikul ? Ya/tidak ..... jumlah.

19. Apakah menurut anda penentuan dari pemilihan dari pelayanan air minum ?

Kwalitas air	.....	ya/tidak
Biaya: sambungan	.....	ya/tidak
Biaya: bulanan	.....	ya/tidak
Rasa	.....	ya/tidak
Jarak	.....	ya/tidak
dan yang lain	.....	ya/tidak

20. Apakah kebanyakan dari keluarga anda memasak air mereka sebelum dipergunakan untuk minum ?
Selalu/kadang-kadang/tidak pernah.

21. Apakah ada seseorang dari warga anda yang ditunjuk atau digaji sebagai petugas kesehatan di RT anda ? Ya/tidak.

22. Apakah ada seseorang dari warga anda yang ditunjuk atau digaji untuk mengawasi jamban umum di wilayah anda ? Ya/tidak.

23. Apakah di wilayah RT anda cukup air ?
Ya / tidak.

24. Agama apakah dari warga anda yang terbanyak ?

25. Apakah menurut anda keluarga wilayah anda mau membayar untuk :
- Air yang lebih banyak ..... ya/tidak
- Air yang lebih bersih ..... ya/tidak
- Air yang lebih dekat ..... ya/tidak

26. Penyakit apakah dari dua jenis yang lebih umum di wilayah anda ?
penyakit .....
penyakit .....

27. Berapakah anak-anak yang meninggal dalam tahun yang lalu ?
..... anak-anak (dibawah 6 tahun)
Berapa diantaranya yang meninggal karena mencret?
..... anak-anak.

28. Jika seseorang anak dibawah 6 tahun sakit, ke - manakah kebanyakan warga anda pergi berobat ?
Ke
- Pos Kesehatan
- Puskesmas/Poliklinik
- Dokter praktek/Poliklinik partikulir
- Meminum obat tradisionil/jamu
- Lain-lain

Tgl..... 197....
Yang menginterview

(Nama)

ATTACHMENT N

SURAKARTA DIARRHEAL DISEASE/WATER UTILIZATION QUESTIONNAIRE

1. Kecamatan _____ Kelurahan _____ RK # ____ RT # ____ House # ____ Mother # ____ School Grades Completed _____

2. Interview: Completed Not home Vacant Refusal Other _____

3.

	Name	Sex	Relation to Household Head	Age Last Birthday	If 0-5 yrs Birth date	Applicable to children only: Breast Fed as Infant	If yes, until what age (mos)
a.		M F				Yes No ?	
b.		M F				Yes No ?	
c.		M F				Yes No ?	
d.		M F				Yes No ?	
e.		M F				Yes No ?	
f.		M F				Yes No ?	
g.		M F				Yes No ?	
h.		M F				Yes No ?	
i.		M F				Yes No ?	

4.

Person code	Diarrhea * Last 24 Hrs	# Watery Stools	Last 7 Days	# of Days of Last 7	Last 7 Days Skin Infection	Eye Infection	Last Month Diarrhea	# of Days of last 30
a	Yes No ?		Yes No ?		Yes No ?	Yes No ?	Yes No ?	
b	Yes No ?		Yes No ?		Yes No ?	Yes No ?	Yes No ?	
c	Yes No ?		Yes No ?		Yes No ?	Yes No ?	Yes No ?	
d	Yes No ?		Yes No ?		Yes No ?	Yes No ?	Yes No ?	
e	Yes No ?		Yes No ?		Yes No ?	Yes No ?	Yes No ?	
f	Yes No ?		Yes No ?		Yes No ?	Yes No ?	Yes No ?	
g	Yes No ?		Yes No ?		Yes No ?	Yes No ?	Yes No ?	
h	Yes No ?		Yes No ?		Yes No ?	Yes No ?	Yes No ?	
i	Yes No ?		Yes No ?		Yes No ?	Yes No ?	Yes No ?	

* 3 or more liquid stools/24 hours

5. If one of your children 0-5 years of age develops diarrhea, where do you go for treatment ?

Health post	Government Puskesmas/Polyclinic
Private Puskesmas/Polyclinic	Traditional medicine (jamu)
Other	

6. How do you treat diarrhea in children 0-5 years of age ?

Antibiotics	Stop breast feeding
Oralyte	Continue breast feeding
Withhold food	Don't know
Home remedies	Other

7. Do you have piped water from the city system in your home ? Yes No
(if no, skip to question # 10)

8. How many faucets do you have ? _____

9. On the average, how often are you without water ? _____ hours/day _____ days/week

10. If you do not have piped water in your home, answer the following questions with reference to the past month.

main water source for	shallow well	handpump	river/stream	public both	vendor	rain	Used all year
drinking	_____( )	_____( )	_____( )	_____( )	_____	_____	Yes No
cooking	_____( )	_____( )	_____( )	_____( )	_____	_____	Yes No
bathing	_____( )	_____( )	_____( )	_____( )	_____	_____	Yes No

11. If you buy water from a vendor, what is your average water bill ? _____ daily _____ weekly

12. How often do you boil water before drinking it ? Always Sometimes Never

13. If always, why ? _____

14. If you have children 0-5 years of age, how often do they drink boiled water ?

always sometimes never not applicable

15. Do you have a baby who is bottle feeding ? Yes No
If yes, how often do you boil the water for the formula? always sometimes never

16. Do you use a water filter for your drinking water? Yes No

17. Do you store water in your home ? Yes No
If yes, do you use this water for drinking
cooking
bathing
washing dishes/clothes

What type of containers do you use ?

type	volume (litres)	Number
____	_____	_____
____	_____	_____
____	_____	_____

How often do you fill the containers ? more than once a day

once a day

once every two days

not regularly

Who gets the water most often ? _____ name
_____ relation to head of household

How long does it take to fetch the water ? 1 - 15 minutes
16 - 30 minutes
31 - 60 minutes
61 + minutes

What type of container is used ? volume _____ (litres)

type _____

18. Where does your family usually go for defecation ?

river
public latrine over river
private latrine over river
private latrine on land
pour flush toilet
automatic flush toilet
public latrine on land

How far is the latrine from the house ? inside outside _____ meters from house (measure)

How often do your children 0-5 years of age use this site ?

always
never
sometimes
not applicable

If sometimes or never, what is the most common site they use ?

bucket
toilet outside house
other
toilet in house
latrine

19. Where do members of your family usually bathe ?

inside your house
outside adjacent to your house
outside ____ meters from house (measure)

How many families share the site ? _____

20. What is the occupation of the household head ?

farmer
small retailer
factory worker
becak driver
civil service
military
merchant/manager

retired yes no

21. Type of house:

bamboo walls/earth floor
half bamboo, half brick walls/cement floor
brick walls/tile floor
other _____

22. Approximate dimensions of house: _____ meters (length) _____ meters (width)

23. Do you rent your house ? Yes No

Do you rent your land ? Yes No

24. Does your house have electricity ? Yes No
If no, do you have a generator ? Yes No
If no, do you have a battery ? Yes No

25. Which of these do you own ?

radio
bicycle
motorcyle
TV
refrigerator

26. What is your religion ? Moslem Christian Catholic Hindu Buddhist Other

27. What do you think is the cause of diarrhea in children 0-5 years of age ?

28. Drinking water contaminated with human feces can cause:

influenza	Yes	No	Don't know
tuberculosis	Yes	No	Don't know
diarrhea	Yes	No	Don't know
ear infections	Yes	No	Don't know
eye infections	Yes	No	Don't know
skin infections	Yes	No	Don't know

29. Are the feces of small children more likely to cause disease than those of adults? Yes No Don't know

30. Where do you dispose of small children's feces ? Family latrine Other

31. In the past year, have you received teaching from anyone concerning the prevention of diarrhea ? Yes No Don't know
If yes, where ? Mobile Puskesmas
Health Post
Puskesmas/Polyclinic
Other

32. Did you know that the existing city water system in Surakarta is being expanded? Yes No
If yes, from whom did you learn this ? Friend Polyclinic/Puskesmas
Relative KKI
Chief of RT Other _____

33. If you do not now have access to piped city water, would you like to have access to it ? Yes No
If yes, which of these would you prefer ? Private tap inside
Private yard tap
Public tap nearby

34. If you had easier access to water, would you use more for

drinking	Yes	No
cooking	Yes	No
bathing	Yes	No
washing clothes	Yes	No
washing dishes	Yes	No

35. Do you feel you need better quality water ? Yes No Not sure

Signature: _____
Name

Date : _____

ATTACHMENT O

PENYAKIT DIARE DAN

PENELITIAN PENGGUNAAN AIR DI SURAKARTA

SURAKARTA DIARRHEAL DISEASE/WATER UTILIZATION QUESTIONNAIRE

1. Kecamatan _____ Kelurahan _____ No. RK. ____ No. Rumah _____ No. Ibu ____ Tingkat pendidikan Ibu _____
   No. RT ____

2. Hasil Tanya-jawab : Lengkap Tidak di rumah Kosong Ditolak Lain-lain

3.

Nama	Kelamin	Hub. Kel. dng. Kep. Kel.	Umur pd. tgl lahir terakhir	Jika 0 - 5 Thn. Umur	Semasa bayi dng. ASI	Jika masih dgn. ASI/masuk umur berapa Jika ya, sampai umur berapa ___ bulan
	L P	Kepala Keluarga				
	L P					
	L P					
	L P					
	L P					
	L P					
	L P					
	L P					
	L P					

4.

Nama	Dlm. 24 jam terakhir menceret/mangsur	Jl. Berak	Dlm. 7 hari terakhir menceret/mangsur	Jl. Hari	Dlm. 7 Hr. Terakhir Sakit kulit	Sakit mata	Dlm. Bln. Terakhir Mencret/mangsur	Jl. Har
	Ya/tidak/tidak tahu		Ya/tidak/tidak tahu		Ya/tidak/tt	Ya/tidak/tt	Ya/tidak/tt	
	Ya/tidak/tidak tahu		Ya/tidak/tt		Ya/tidak/tt	Ya/tidak/tt	Ya/tidak/tt	
	Ya/tidak/tidak tahu		Ya/tidak/tt		Ya/tidak/tt	Ya/tidak/tt	Ya/tidak/tt	
	Ya/tidak/tidak tahu		Ya/tidak/tt		Ya/tidak/tt	Ya/tidak/tt	Ya/tidak/tt	
	Ya/tidak/tidak tahu		Ya/tidak/tt		Ya/tidak/tt	Ya/tidak/tt	Ya/tidak/tt	
	Ya/tidak/tidak tahu		Ya/tidak/tt		Ya/tidak/tt	Ya/tidak/tt	Ya/tidak/tt	
	Ya/tidak/tidak tahu		Ya/tidak/tt		Ya/tidak/tt	Ya/tidak/tt	Ya/tidak/tt	
	Ya/tidak/tidak tahu		Ya/tidak/tt		Ya/tidak/tt	Ya/tidak/tt	Ya/tidak/tt	
	Ya/tidak/tidak tahu		Ya/tidak/tt		Ya/tidak/tt	Ya/tidak/tt	Ya/tidak/tt	

5. Jika anak anda umur 0 - 5 tahun mendapat sakit diare, kemanakah anda pergi mengobatinya?

- Pos Kesehatan
- Puskesmas/Poliklinik
- Dokter partikulir/Poliklinik Partikulir
- Obat tradisionil/jamu
- lain-lain

6. [illegible] anda mengobati anak anda umur 0 - 5 tahun yang menderita diare (mencret/mangsur)?

- obat antibiotika . . . . . ya/tidak
- oralit . . . . . ya/tidak
- tidak diberi makan . . . . . ya/tidak
- pengobatan dirumah . . . . . ya/tidak
- diberhentikan menyusui . . . . . ya/tidak
- dilanjutkan menyusui . . . . . ya/tidak
- tidak tahu/lain . . . . . ?

7. Apakah anda mendapat sambungan ledeng dari PAM? Ya/tidak.
(jika tidak lihat pertanyaan No. 10)

8. Jika ya, berapa kran anda miliki? . . . . . jumlah.

9. Rata-rata, berapa kalikah anda tidak mendapat air? . . . . jam/hari . . . . . hari/minggu.

10. Jika anda tidak mendapat sambungan ledeng dirumah, jawablah pertanyaan berikut untuk bulan yang lalu.

apakah sumber utama air anda untuk :	sumur	pompa tangan	kali/sungai	KM umum	Tk pikul	air hujan	lain[2]	dipakai sepanjang tahun?
AIR MINUM	( )	( )	( )	( )	( )	( )	( )	
MEMASAK	( )	( )	( )	( )	( )	( )	( )	
MANDI	( )	( )	( )	( )	( )	( )	( )	

(untuk masing-masing, sebutkan jarak masing-masing dari rumah anda dengan meter).

11. Jika anda beli air, berapa rupiah rata-rata anda bayar dalam sehari . . . . . Rp seminggu . . . . . Rp.

12. Berapa kalikah anda memasak air untuk minum?
    - selalu
    - kadang-kadang
    - tidak pernah

13. Kalau air tersebut dimasak, kenapa? . . . . . .

14. Jika anda mempunyai anak umur 0 - 5 tahun, berapa kali mereka diberi minum air masak?
    - selalu
    - kadang-kadang
    - tidak ada anak 0 - 5 tahun
    - tidak pernah

15. Apakah anda mempunyai bayi yang disusui dengan botol? Ya/tidak
    Jika ya, berapa kali anda memasak air/susunya ?
    - selalu
    - kadang-kadang
    - tidak pernah

16. Apakah anda memakai air yang disaring/filter untuk minum? Ya/tidak

17. Apakah anda menyimpan air dirumah? Ya/tidak
    - jika ya,apakah anda pergunakan air tersebut untuk
    - minum
    - masak
    - mandi
    - mencuci piring/pakaian
    - apa kah tempat air tersebut anda simpan ? - jenis . . . l(±) . . . . jumlah
    ____ ____ - " - _____ - " -
    ____ ____ - " - _____ - " -
    ____ ____ - " - _____ - " -
    - berapa kalikah tempat tersebut anda isi?
    - lebih dari sekali sehari
    - sekali sehari
    - satu kali dua hari
    - tidak tentu

- Siapakah diantara anggota keluarga anda yang sering mengambil air ? . . . . . nama
  . . . . . hubungan keluarga
- Berapa lamakah anda mengambil air tersebut? 0 - 15 menit
  16 - 30 menit
  31 - 60 menit
  61..... menit
- Dengan apakah anda mengambil air tersebut? - isinya l
  - dengan . . . . .

18. - Kemanakah keluarga anda pergi untuk buang air besar?
  - ke kali
  - jamban umum diatas kali
  - jamban pribadi diatas kali
  - jamban pribadi ditanah
  - WC pribadi otomatis
  - WC pribadi yang disiram
  - jamban umum ditanah
- berapa meter jaraknya dari rumah anda? . . . . . dirumah/ . . . . . m dari rumah
- berapa kalikah anak (2) anda berumur 0 - 5 tahun mempergunakan WC tersebut?
  - selalu
  - tidak pernah
  - kadang-kadang
  - tidak ada anak dibawah umur 5 tahun
- jika kadang-kadang/tidak pernah, kemana umumnya buang air besar?
  - pispot
  - WC diluar rumah
  - lain-lain
  - WC dirumah
  - Jamban tanah diluar rumah

19. - Dimanakah keluarga anda mandi ?
  - dirumah anda
  - diluar rumah dekat dari rumah anda
  - diluar rumah . . . . m dari rumah
- Berapa keluarga mempergunakannya (yang diluar rumah)? . . . . keluarga.

20. Apakah pekerjaan dari kepala keluarga? - petani - Pensiunan Ya/tidak
- pedagang eceran
- buruh pabrik
- tukang becak
- pegawai negeri
- tentara
- pedangang/swasta

21. Apakah jenis rumah anda ? - rumah dengan dinding bambu & lantai tanah
- rumah dengan dinding ½ bata & lantai semen
- rumah dengan dinding bata dan lantai tegel
- lain-lain

22. Berapa luas rumah anda ? . . . m panjang . . . m lebar

23. Apakah anda menyewa rumah ini? Ya/tidak
Apakah anda pemilik tanah ini? Ya/tidak

24. Apakah rumah anda memakai listrik PLN? Ya/tidak
- jika tidak apakah anda pakai generator? Ya/tidak
- jika tidak apakah anda pakai accu? Ya/tidak

25. Perlengkapan dibawah ini yang mana anda miliki ? - radio
- sepeda
- sepeda motor
- T.V.
- lemari pendingin

26. Apakah agama anda? - Islam - Kristen - Katholik - Hindu - Budha - lain-lain

27. Apakah menurut pendapat anda yang menyebabkan sakit mencret untuk anak umur 0 - 5 tahun?

28. Air minum yang tercemar dengan kotoran manusia dapat menyebabkan :

- influensa	ya	tidak	tidak ingat
- T.B.C.	ya	tidak	tidak ingat
- diare (mencret)	ya	tidak	tidak ingat
- sakit telinga	ya	tidak	tidak ingat
- sakit mata	ya	tidak	tidak ingat
- sakit kulit	ya	tidak	tidak ingat

29. Apakah anda mengetahui, bahwa kotoran anak kecil kelihatannya lebih banyak menyebabkan penyakit daripada kotoran orang dewasa? Ya/tidak/tidak tahu

30. Dimanakah anda membuang kotoran dari anak kecil? - jamban keluarga
- atau lain-lain

31. - Selama tahun yang lalu apakah anda pernah mendapat pendidikan/penerangan dari siapa saja untuk pemberantasan/pengawasan mencret? Ya/tidak/tidak ingat
- jika ya, dimana: - Puskesmas keliling
- Pos kesehatan
- Puskesmas/Poliklinik
- lain-lain . . . .

32. - Apakah anda mengetahui, bahwa air minum Surakarta yang sekarang sedang diperluas? Ya/tidak
- kalau ya, dari siapa anda ketahui ? - teman - Poliklinik/ Puskesmas
- famili - P.D.A.M.
- ketua RT - lain-lain

33. - Jika sekarang anda tidak mempunyai sambungan air minum, apakah anda ingin mendapat sambungan tersebut? Ya/tidak
- Jika ya, apakah anda menginginkan sambungan pipa tersebut : - berada didalam rumah anda
- sambungan halaman rumah anda
- ledeng umum yang dekat

34. Jika anda mendapat sambungan yang dekat air tersebut, apakah anda mempergunakan lebih banyak air?

- untuk minum ya/tidak
- untuk memasak ya/tidak
- untuk mandi ya/tidak
- untuk mencuci pakaian ya/tidak
- untuk mencuci piring ya/tidak

35. Apakah anda menginginkanmutu air yang lebih baik? Ya/tidak/terserah

Pewawancara : _____
(n a m a)

Tanggal : _____

ATTACHMENT P

PROPOSED REVISION: QUESTIONNAIRE FOR CHIEF OF RT

Date _____ (1-5)

Kecamatan _____ (6) Kelurahan _____ (7-8) RT _____ (9-10)

1. How long have you been chief of this RT? _____ (11-12) years _____ (13-14) months
2. How many families are in your RT? _____ (15-17)
3. How many people are in your RT? _____ (18-20)
4. How many children under 5 years of age are in your RT? _____ (21-22)
5. How many houses are in your RT? _____ (23-24)
6. How many places of business are in your RT? _____ (25-26) Total

   _____ (27) Permanent stores

   _____ (28) Stalls

7. Which of the following public services do you receive and use in your RT?

	Yes	No	Don't know		Yes	No	Don't know
Electricity	___	___	_____ (29)	Public water supply	___	___	_____ (34)
Rat Control	___	___	_____ (30)	Public bath/latrine	___	___	_____ (35)
Mosquito control	___	___	_____ (31)	Drainage	___	___	_____ (36)
Health post	___	___	_____ (32)	Other (specify)			
Garbage collection	___	___	_____ (33)	_____	___	___	_____ (37)
				_____	___	___	_____ (38)

8. Of those government services which you don't receive, which two are needed most in your RT?

   _____ (39) _____ (40)

9. What types of water sources are available in your RT?

	Total	No. Used	No. Not Used
Private shallow well	_____ (41)	_____ (42)	_____ (43)
Public shallow well	_____ (44)	_____ (45)	_____ (46)
Private hand pump	_____ (47)	_____ (48)	_____ (49)
Public hand pump	_____ (50)	_____ (51)	_____ (52)

10. Do any houses in your RT get water from SAE? Yes _____ No _____ Don't know _____ (53)
11. How many public latrines are there in your RT? _____ (54)

IF 0, GO TO QUESTION 13

Proposed Revision: Questionnaire for Chief of RT (Attachment P) (Continued)

12. If there is at least one public latrine, what is the source(s) of water for it?

	Yes	No	Don't know	
Piped water	____	____	____	(55)
Well	____	____	____	(56)
Pump	____	____	____	(57)
River/stream	____	____	____	(58)

13. How many public baths are there in your RT? ____ (59)

IF 0, GO TO QUESTION 15

14. What is the source(s) of water for it?

	Yes	No	Don't know	
Piped water	____	____	____	(60)
Well	____	____	____	(61)
Pump	____	____	____	(62)
River/stream	____	____	____	(63)

15. Which of these considerations do you think determines selection of a water source for drinking by families in your RT?

	Yes	No	Don't know	
Quality	____	____	____	(64)
Installation Cost	____	____	____	(65)
Monthly Cost	____	____	____	(66)
Taste	____	____	____	(67)
Access	____	____	____	(68)
Other (specify)	____			(69)
	____			(70)

16. How often do you think that most families boil water used for drinking? (71)

Always Sometimes Never

17. Is there a person designated as a health post worker for your RT? (72)

Yes No Not sure

18. If yes, is he paid for his services? (73) Yes No Not sure

19. Is someone designated to maintain the latrines, drains, and/or baths in your RT? (74)

Yes No Not sure

20. If yes, is he paid for his services? (75) Yes No Not sure

Proposed Revision: Questionnaire for Chief of RT (Attachment P) (Continued)

21. Does your RT have enough Water? (76) Yes No Not sure

22. What is the religion of most of the families in your RT? _____ (77)

IF OTHER THAN ISLAM, GO TO QUESTION 24

23. How many times per day do most families pray? _____ (78)

24. Of the following diseases, which are the two most common diseases in your RT? (79-80)

1. Influenza
2. Malaria
3. Dengue
4. Diarrhea
5. Skin infections
6. Eye infections
7. Ear infections
8. Tuberculosis
9. Malnutrition

25. How many children less than 5 years of age have died in the last year? _____ (81-82)

26. How many children less than 5 years of age have died of diarrhea in the last year? _____ (83-84)

_____ (85-86)
Interviewer

PROPOSED REVISION: SURAKARTA DIARRHEAL DISEASE/WATER UTILIZATION QUESTIONNAIRE ATTACHMENT Q Date _____ (1-6)
(Administered Quarterly)

1. Kecamatan _____ (7) Kelurahan _____ (8-9) RW# _____ (10-11) RT# _____ (12-13) House# _____ (14-15) Mother# _____ (16)

School Grades Completed _____ (17)

2. Interview: Completed Not home Vacant Refusal Other (specify) _____ (18)

3.

	Name	Sex	Relation to Household Head	Age Last Birthday; If 0-4 Years, Give Birthdate	Breast Fed as Infant	If Yes, Breast Fed Until What Age (Mo)	For Children 0-4 Years, Still Breast Feeding
a.	_____	M F (19)	_____ (30)	_____ (41-46)	Yes No Not sure (107)	_____ (118-119)	Yes No Not sure (140)
b.	_____	M F (20)	_____ (31)	_____ (47-52)	Yes No Not sure (108)	_____ (120-121)	Yes No Not sure (141)
c.	_____	M F (21)	_____ (32)	_____ (53-58)	Yes No Not sure (109)	_____ (122-123)	Yes No Not sure (142)
d.	_____	M F (22)	_____ (33)	_____ (59-64)	Yes No Not sure (110)	_____ (124-125)	Yes No Not sure (143)
e.	_____	M F (23)	_____ (34)	_____ (65-70)	Yes No Not sure (111)	_____ (126-127)	Yes No Not sure (144)
f.	_____	M F (24)	_____ (35)	_____ (71-76)	Yes No Not sure (112)	_____ (128-129)	Yes No Not sure (145)
g.	_____	M F (25)	_____ (36)	_____ (77-82)	Yes No Not sure (113)	_____ (130-131)	Yes No Not sure (146)
h.	_____	M F (26)	_____ (37)	_____ (83-88)	Yes No Not sure (114)	_____ (132-133)	Yes No Not sure (147)
i.	_____	M F (27)	_____ (38)	_____ (89-94)	Yes No Not sure (115)	_____ (134-135)	Yes No Not sure (148)
j.	_____	M F (28)	_____ (39)	_____ (95-100)	Yes No Not sure (116)	_____ (136-137)	Yes No Not sure (149)
k.	_____	M F (29)	_____ (40)	_____ (101-106)	Yes No Not sure (117)	_____ (138-139)	Yes No Not sure (150)

4.

Person Code	Diarrhea* Last 24 Hours	# Watery Stools	Diarrhea* Of Last 7	# of Days Of Last 7
a.	Yes No Not sure (151)	_____ (162)	Yes No Not sure (173)	_____ (184)
b.	Yes No Not sure (152)	_____ (163)	Yes No Not sure (174)	_____ (185)
c.	Yes No Not sure (153)	_____ (164)	Yes No Not sure (175)	_____ (186)
d.	Yes No Not sure (154)	_____ (165)	Yes No Not sure (176)	_____ (187)
e.	Yes No Not sure (155)	_____ (166)	Yes No Not sure (177)	_____ (188)
f.	Yes No Not sure (156)	_____ (167)	Yes No Not sure (178)	_____ (189)
g.	Yes No Not sure (157)	_____ (168)	Yes No Not sure (179)	_____ (190)
h.	Yes No Not sure (158)	_____ (169)	Yes No Not sure (180)	_____ (191)
i.	Yes No Not sure (159)	_____ (170)	Yes No Not sure (181)	_____ (192)
j.	Yes No Not sure (160)	_____ (171)	Yes No Not sure (182)	_____ (193)
k.	Yes No Not sure (161)	_____ (172)	Yes No Not sure (183)	_____ (194)

*3 or more liquid stools/24 hours

	Skin Infection Last 7 Days	Eye Infection Last 7 Days	Sore Throat Last 7 Days
a.	Yes No Not sure (195)	Yes No Not sure (206)	Yes No Not sure (217)
b	Yes No Not sure (196)	Yes No Not sure (207)	Yes No Not sure (218)
c	Yes No Not sure (197)	Yes No Not sure (208)	Yes No Not sure (219)
d	Yes No Not sure (198)	Yes No Not sure (209)	Yes No Not sure (220)
e	Yes No Not sure (199)	Yes No Not sure (210)	Yes No Not sure (221)
f	Yes No Not sure (200)	Yes No Not sure (211)	Yes No Not sure (222)
g	Yes No Not sure (201)	Yes No Not sure (212)	Yes No Not sure (223)
h	Yes No Not sure (202)	Yes No Not sure (213)	Yes No Not sure (224)
i	Yes No Not sure (203)	Yes No Not sure (214)	Yes No Not sure (225)
j	Yes No Not sure (204)	Yes No Not sure (215)	Yes No Not sure (226)
k	Yes No Not sure (205)	Yes No Not sure (216)	Yes No Not sure (227)

5. What is the occupation of the household head? (228) Farmer Small retailer Factory worker Becak worker Civil service Military Merchant/manager

6. Is the household head currently employed? (229) Yes No

IF YES, GO TO QUESTION 8

7. If no, is the household head retired? (230) Yes No

8. Type of floor of house (circle all that apply): Earth Cement Tile Other (specify)_____(231-234)

9. Types of walls of house (circle all that apply): Bamboo Wood Brick Other (specify)_____(235-239)

10. Approximate dimensions of house: Length:_____meters (240-241) Width:_____meters (242-243)

11. Do you rent your house? (244) Yes No

12. Do you rent your land? (245) Yes No

13. Does your house have electricity? (246) Yes No

IF YES, GO TO QUESTION 16

14. Do you have a generator? (247) Yes No

15. Do you have a battery? (248) Yes No

16. Which of these do you own?

Radio	Yes	No (249)	TV	Yes	No (252)
Bicycle	Yes	No (250)	Refrigerator	Yes	No (253)
Motorcycle	Yes	No (251)			

17. What is your religion? Moslem Christian Catholic Hindu Buddhist Other_____(254)

18. Do you have piped water from the city system in your home? (255) Yes No

IF NO, GO TO QUESTION 21

19. How many faucets do you have? _____(256)

20. On the average, how long are you without water? _____(257-258)hours/day _____(259)days/week SKIP TO QUESTION 22

21. Answer the following questions with reference to the past month. (Check all sources used for each purpose. Indicate measured distance in meters from door of house.)

Water Sources for	Well	Handpump	River/Stream	Vendor	Rain	Other	Used All Year
Drinking	____ (____) (261) (262-264)	____ (____) (265) (266-268)	____ (____) (269) (270-271)	____ (____) (272) (273-274)	____ (____) (275) (276-277)	____ (____) (278) (279-280)	Yes No (281)
Cooking	____ (____) (281) (282-284)	____ (____) (285) (286-288)	____ (____) (289) (290-292)	____ (____) (293) (294-296)	____ (____) (297) (298-300)	____ (____) (301) (302-304)	Yes No (305)
Bathing	____ (____) (306) (307-309)	____ (____) (310) (311-313)	____ (____) (314) (315-317)	____ (____) (318) (319-321)	____ (____) (322) (323-325)	____ (____) (326) (327-329)	Yes No (330)

22. How frequently do you boil water before your family drinks it? (331) Always Sometimes Never

IF MOTHER HAS CHILDREN 0-4 YEARS OF AGE, GO TO QUESTION 23. IF NOT, GO TO QUESTION 27.

23. If one of your children 0-4 years of age develops diarrhea, where do you go for treatment?

Health Post (332) Private Puskesmas/Polyclinic (333) Government Puskesmas/Polyclinic (334) Traditional Medicine (jamu) (335) Other (336) _____

24. How frequently do your children 0-4 years of age drink boiled water? (337) Always Sometimes Never Not applicable

25. Do you have a child who is currently bottle feeding? (338) Yes No

If yes, how often do you boil the water for the formula? (339) Always Sometimes Never

26. How do you treat children 0-4 years of age with diarrhea?

	Yes	No	Don't Know	Don't Understand		Yes	No	Don't Know	Don't Understand
Antibiotics (340)	___	___	___	___	Stop breast feeding (345)	___	___	___	___
Oralyte (341)	___	___	___	___	Continue breast feeding (346)	___	___	___	___
Fluids by mouth (342)	___	___	___	___	Other (specify) (347)	_____			
Withhold food (343)	___	___	___	___	(348)	_____			
Home remedies (344)	___	___	___	___					

27. Do you use a water filter for your drinking water? (349) Yes No Not sure Don't understand

28. Do you store water in your home? (350) Yes No

IF NO, GO TO QUESTION 37

29. Do you use water stored in the home for drinking? (351) Yes No
Cooking? (352) Yes No
Bathing? (353) Yes No
Washing dishes? (354) Yes No
Washing clothes? (355) Yes No

30. What type of containers do you use to store the water?

Type	Volume (liters)	Number
Metal Plastic Ceramic (356)	_____ (357-358)	_____ (359)
Metal Plastic Ceramic (360)	_____ (361-362)	_____ (363)
Metal Plastic Ceramic (364)	_____ (365-366)	_____ (367)

31. On the average, how many times a day do you fill the containers? (368)

More than once a day (specify number of times ____ (369)) Once a day Less often Not regularly

32. How old is the person who gets the water most often? _____ Years (370-371)

33. What is this person's relation to the head of the household? (372) _____

34. On the average, how long does it take to make one trip to fetch the water? (373)
1 - 15 minutes
16 - 30 minutes
31 - 60 minutes
61+ minutes

35. What type of container is used to carry the water? (374) Metal Plastic Ceramic Other

36. What is the volume of the container? _____ liters (375-376)

37. Where do members of your family usually bathe? (377) Inside the house Outside adjacent to the house

38. If outside, indicate measured distance in meters from door of house. _____ (378-380)

39. Is the facility private? (381) Yes No

IF YES, GO TO QUESTION 41

40. If no, how many families use the facility? _____ (382-384)

41. How many meals does your family eat each day? _____ (385)

42. On the average, how many times each day is rice cooked for your family? _____ (386)

43. On the average, how many times each day do you wash your hands with soap? _____ (387)

44. How frequently do you wash your hands with soap before preparing food? (388) Always Sometimes Never

45. Where does your family usually go for defecation? (389)

River/stream
Public latrine over river
Public latrine on land
Private latrine over river
Private latrine on land
Pour flush toilet
Automatic flush toilet

46. How far is the latrine from the house? (390) Inside Outside

IF INSIDE, GO TO QUESTION 48

47. If outside, indicate measured distance in meters from door of the house. _____(391-393)

48. How often do your children 0-4 years of age use this site? (394) Always Sometimes Never Not applicable

IF ALWAYS OR NOT APPLICABLE, GO TO QUESTION 50

49. If sometimes or never, what is the most common site they use? (395) River/stream Latrine Other(specify)_____
Toilet Yard

50. Indicate which of the following you think can lead to diarrhea in children 0-4 years of age.

Bad air (396)	Yes	No	Don't know	Malnutrition (400)	Yes	No	Don't know
Crowded living conditions (397)	Yes	No	Don't know	Flies (401)	Yes	No	Don't know
Bad water (398)	Yes	No	Don't know	Ice (402)	Yes	No	Don't know
Bad food (399)	Yes	No	Don't know	Other (specify) (403)	_____		

51. Drinking water contaminated with human feces can cause:

Influenza (404)	Yes	No	Don't know	Don't understand	Ear infections (407)	Yes	No	Don't know	Don't understand
Tuberculosis (405)	Yes	No	Don't know	Don't understand	Eye infections (408)	Yes	No	Don't know	Don't understand
Diarrhea (406)	Yes	No	Don't know	Don't understand	Skin infections (409)	Yes	No	Don't know	Don't understand

52. Are the feces of children 0-4 years old more likely to cause disease than those of adults? (410) Yes No Don't know Don't understand

53. Where do you dispose of small children's feces? (411) Family latrine Other

IF IN FAMILY LATRINE, GO TO QUESTION 55

54. If other, specify where. _____(412)

55. In the past 3 months have you received any teaching concerning the prevention of diarrhea? (413) Yes No Don't know

IF NO, GO TO QUESTION 59

56. If yes, where? (414) Mobile Puskesmas Health Post Puskesmas/Polyclinic Other (specify)_____

57. Did you understand the instruction? (415) Yes No Not sure

58. Was the instruction helpful to you? (416) Yes No Not sure

59. Did you know that the existing city water system in Surakarta is being expanded? (417) Yes No

IF NO, GO TO QUESTION 61

60. From whom did you first learn this? (418) Friend Relative Chief of RT Polyclinic/Puskesmas SWE Other (specify)_____

61. Would you like to have access to piped city water from SWE? (419) Yes No Not sure Not applicable

62. If yes, would you prefer:

Private tap inside (420)	Yes	No	Not sure
Private yard tap (421)	Yes	No	Not sure
Public tap nearby (422)	Yes	No	Not sure

63. If you had easier access to water, would you use more for:

Drinking (423)	Yes	No	Don't know
Cooking (424)	Yes	No	Don't know
Bathing (425)	Yes	No	Don't know
Washing clothes (426)	Yes	No	Don't know
Washing dishes (427)	Yes	No	Don't know

64. Do you feel you need cleaner water? (428) Yes No Not sure

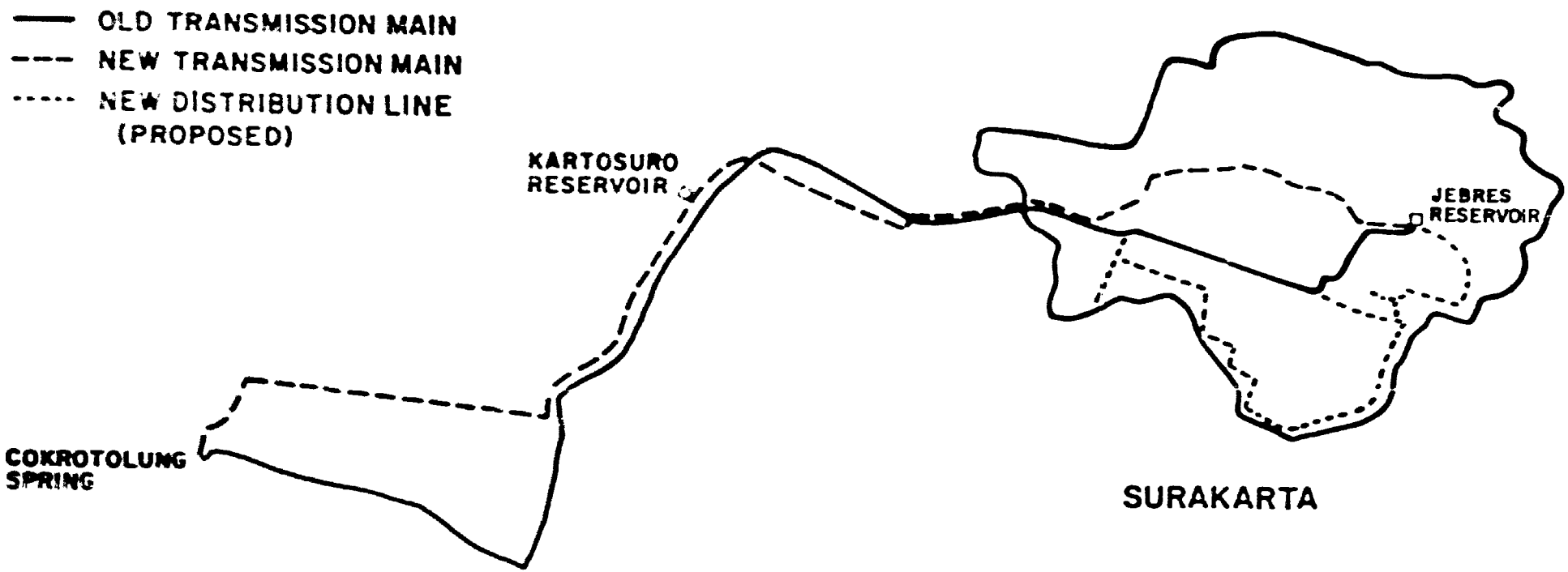
65. If you receive piped city water for which you have to pay, would you continue to use the currently available sources for:

Drinking (429)	Yes	No	Don't know
Cooking (430)	Yes	No	Don't know
Bathing (431)	Yes	No	Don't know
Washing clothes (432)	Yes	No	Don't know
Washing dishes (433)	Yes	No	Don't know

Signature: _____ (434-435)

Date: _____

SURAKARTA WATER SYSTEM



ATTACHMENT R