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ON THE STATISTICAL IMPLEMENTATION

OF A

HEALTH SECTOR RESOURCE ALLOCATION MODEL

IN INDONESIA

PN-AAP-658

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1318

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SUMMARY

The collaboration between the program in Health Planning and Economic Development of The University of Michigan and the Center for Health Services Research and Development in Surabaya, started in December 1977 through a visit by Dr. R. H. Pardoko to Michigan, has been intensified.

The Michigan health sector resource allocation model for comparing effectiveness of levels of medical care and health programs such as nutrition, immunization and vector control has been transferred to the staff of the Center and test computer runs have been run in Surabaya with the staff trained in the use of the model. The cost analysis and equal-cost comparison component of the model can be transferred to Surabaya in early 1979.

A large part of the preparatory work for a survey design has been completed in many days of teamwork by the Director of CHSRD and his staff and the Michigan team. Agreement has been reached on division of functions and responsibilities between The University of Michigan and the CHSRD, while the assignment of responsibilities within the Center has been reviewed.

The project, now proposed jointly by the CHSRD and The University of Michigan, has been discussed with Dr. A. A. Loedin, Chairman of the National Institute of Health Research and Development, Dr. W. Bahrawi, Inspector General of the Ministry of Health, Dr. Hapsara, Director of the Bureau of Planning, Dr. Soebekti, Director-General of Community Health and officials of Kabupaten Tulungagung and the Provincial Health Office of the Province of East Java.

The Michigan team has established that competence to execute the project exists in the CHSRD and in the Health Office of Kabupaten Tulungagung. The critical decision by Dr. Loedin and Dr. Pardoko to undertake the project subject to the availability of outside assistance of about U.S. \$25,000 per year for two years is expected toward the end of September. The team is confident that such

active support can be secured, considering the value of the project.

Apart from close communication between the CHSRD and The University of Michigan it is considered desirable that the transfer of the cost component of the model be arranged through a University staff member in the first half of 1979, that a visit of two University professionals be arranged to participate in the evaluation of the results of the survey pretest (about February-March 1979), and a visit of University staff be arranged during mid-1979 for the mid-year evaluation of the survey.

The ultimate result of the project will provide the Ministry of Health with the capacity to review quickly alternatives for regional policy formulation, for program and project design, and for strategic policy analysis.

Situation and Background

During the past year, the consulting team, in collaboration with Indonesian graduate students in The University of Michigan's Research Seminar in International Health, developed a computer model designed to project in quantitative terms the implications of health sector activities in rural Java. Concerned primarily with assisting resource allocation decisions, the model computes numbers of deaths and days of disability by age group and disease and the investment and operating costs associated with combinations of health programs.* The data used to develop coefficients for applications of the model in Indonesia have been based on scientific literature, reports, and judgements of medical officers and epidemiologists familiar with Indonesia or other third-world rural health problems and behavior. Epidemiological assumptions have been reviewed by the U.S. Center for Disease Control, Atlanta. The concepts of the model were discussed in Ann Arbor with Dr. Julie Sulianti Saroso, then Chairman of the National Institute of Health Research and Development, in August of 1977. This was followed by a visit of three weeks to Ann Arbor by Dr. R. Henry Pardoko, Director of the Center for Health Services Research and Development in Surabaya in December 1977. During Dr. Pardoko's visit we discussed the usefulness and feasi-

*See Appendix C for summary of the health effects estimating equations.

bility of operating and using the model for the Ministry of Health in Indonesia, and noted the critical need for field tests and observations to reduce the significant uncertainties of many of the inputs as determined by sensitivity analyses.

After Dr. Pardoko's return to Indonesia, the Ministry of Health decided to undertake and fund the research on the model at the Center in Surabaya. A request was made through USAID for Michigan staff to visit Surabaya in June of 1978 to review the Center's progress in this endeavor, to participate in designing field surveys for the model, and to transfer the computer technology and programs to the Surabaya staff.

Because of conflicting responsibilities in June and July, the Michigan team could not arrive in Indonesia until mid-August. In the meantime the Center, funded for an initial year at Rs 3,500,000, planned and initiated admirably a household survey in the Tulungagung area of East Java in July and August with a view to securing relevant information for the model and to gain experience with the problem of conducting such a survey and analyzing the results.

Discussion with Ministry of Health Officials (DepKes)

On the 19th of August we met with Dr. Sulianti and Dr. Pardoko to discuss how we might best be of assistance in the research project. It was decided that we first spend a few days in Jakarta to help clarify links between the anticipated research and the articulated needs for such information by decision-makers and planners at Ministry of Health level. We then would proceed to Surabaya to review the progress of work, participate in further research design, identify division of labor in future activities between Surabaya and Michigan, test the feasibility of computing facilities, and transfer computer technology relevant to the operation of the model.

As Dr. Soebekti, Director-General of Community Health, was departing for Ulan Bator and Alma Ata that afternoon, we began by meeting with him, Dr. Louis

Lolong, in charge of planning and programming for the Directorate, and Dr. Soeharto Wirjowidagdo, Director of Community Health Services. We discussed the potential of the model on which Dr. Soeharto had worked with us last year, and in particular its usefulness in quantitative comparisons of the costs and effects of health center program alternatives. The Community Health leaders were very supportive of pressing forward with statistical implementation of the model. On the following day conversations were continued with Dr. Soeharto, with particular concern with identifying items in his own research and administrative work which might benefit from improved data and analysis.

We visited with Dr. Hapsora, chief of the Bureau of Planning of the Ministry, and some of his staff members and WHO consultants. As they were not familiar with the model procedures and design, we began with a description. Dr. Hapsora then outlined his needs for cost and effectiveness analysis for program planning, project planning and implementation, and for development of recommendations for the health items in the Presidential special funds to regions during the next 5-year plan, which last he had discussed with the Minister of Finance that morning.

We conferred with Dr. W. Bahrawi, then Director-General of Communicable Disease Control, and Dr. Kumara Rai, in charge of CDC planning. After general discussion of available disease and program data, and CDC and DepKes needs, it was agreed to meet again on the evening of the 21st, by which time it was anticipated Dr. Bahrawi would have been given additional responsibilities in the Ministry. In fact, Dr. Bahrawi was promoted to the post of Inspector-General.

In our second meeting with Dr. Bahrawi and Dr. Rai (21 August), we went into more specific description of the structure of the model, its data requirements and its possible applications to areas of interest to the Inspector-General. Dr. Bahrawi asked us to arrange another meeting with him after our visit to Surabaya to discuss the progress and future of the research there.

We met again with Dr. Bahrawi on the first of September, and described the projected work in the Surabaya Center. Dr. Bahrawi suggested that its most important use in the near future might be for planning by Kabupaten (regency or district) officials, a level at which local resources and funds from the Ministries of Health and Internal Affairs are available for allocation to Kabupaten and Kecamatan (sub-district) health programs. He also discussed with us next steps in the work, and asked us to send him in the near future possible plans orienting top officials of the Ministry to the applications of the research projects to policy formulation, to program planning and evaluation, and to health services research and development planning.

As the largest part of the disease burden on rural populations in Java is due to communicable diseases, a visit was made on Saturday, September 2, to the newly appointed Director General of Communicable Disease Control, Dr. Adjatma. During this short visit the purpose of the work of the team, its achievements and the proposed survey were summarized. Dr. Adjatma confirmed that while considerable information is available on incidence and prevalence of infection, very little information is available on the disease burden on rural populations. The results of the multi-disease serological survey, conducted with WHO assistance during 1977 and consisting of a sample of 5000 sera, were not yet available and a copy of the results will be forwarded to Michigan when available.

It was understood that Dr. Adjatma supported the concept of the survey and he intended to acquire a more in depth understanding of the potential use of the model during his next visit to Surabaya.

With regard to these and other visits it is opportune to highlight that many decisions in the Ministry of Health are made by the weekly meeting of the Secretary General with the four Directors general and the Inspector General. Of these six most senior officials of the Ministry of Health the team was able to contact four and explained the model, its potential use and the survey objectives most extensively to the Inspector General, the only senior official of the Ministry

of Health who was promoted in the personnel changes at the level during the 2nd half of August, 1978.

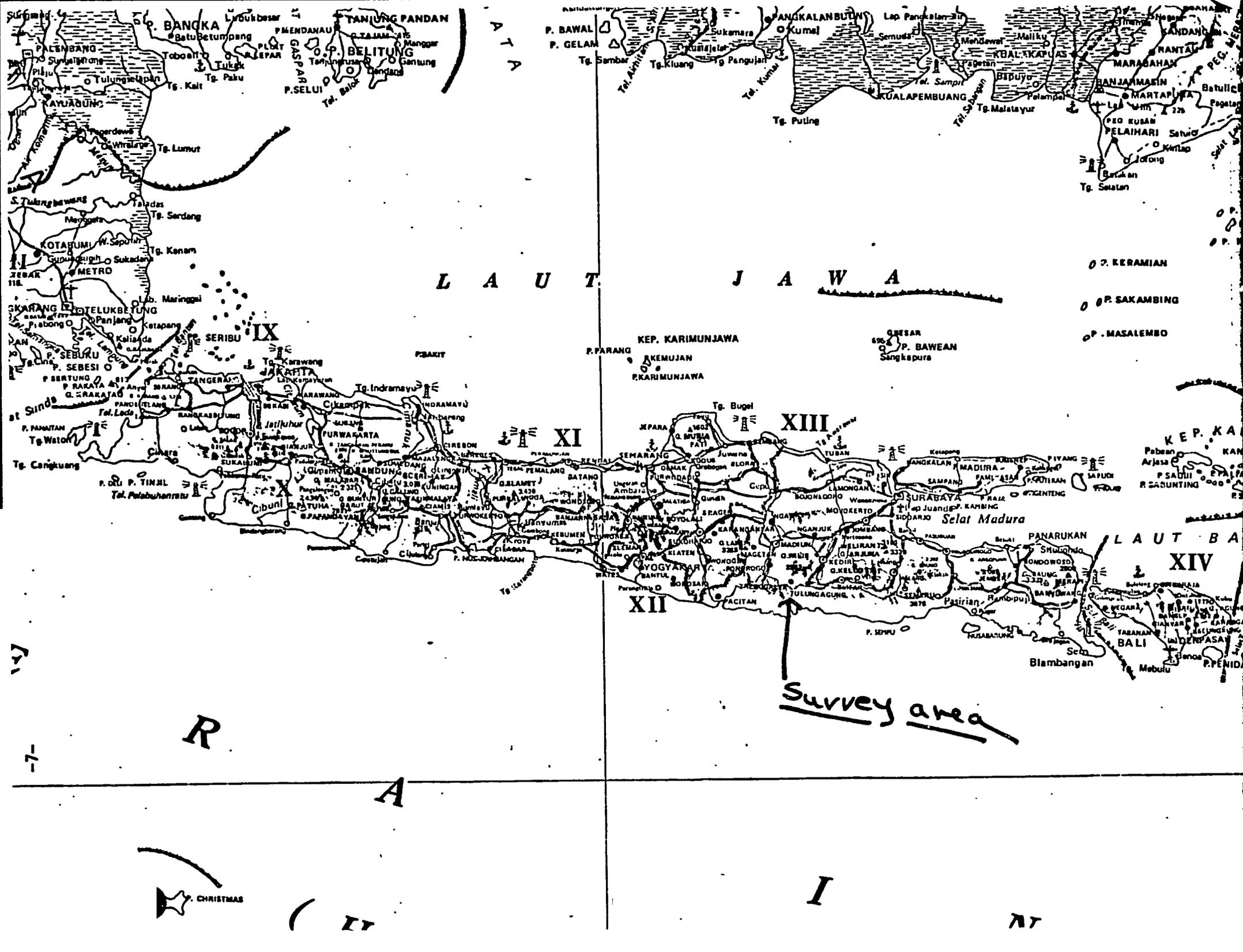
Discussions at Surabaya*

Survey Research:

Our conferences at Surabaya began with a description of the current survey in the Tulungagung Kabupaten. In two of the kecematans of the area (Kauman and Pagerwojo) a survey is being conducted in selected dukuhs of ten desas (villages). We reviewed the questionnaire used in the July survey conducted by health controllers. A second, less complete, survey was conducted using village teachers as interviewers. The population included in the households surveyed is about 8,000. Maps of the survey area are on pages 7 to 11.

Dr. Pardoko is the principal investigator, assisted by Dr. Bambang Winardi, in charge of Communicable Disease Control at the East Java Provincial Health Office. Field operations are supervised by Dr. Karneni, Kabupaten Tulungagung Health Officer (Dokabu).

* Discussions of health research and development project only. Discussions on PKM Management Information Project are included in "Problems and Findings," pp. 17-20



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Survey area

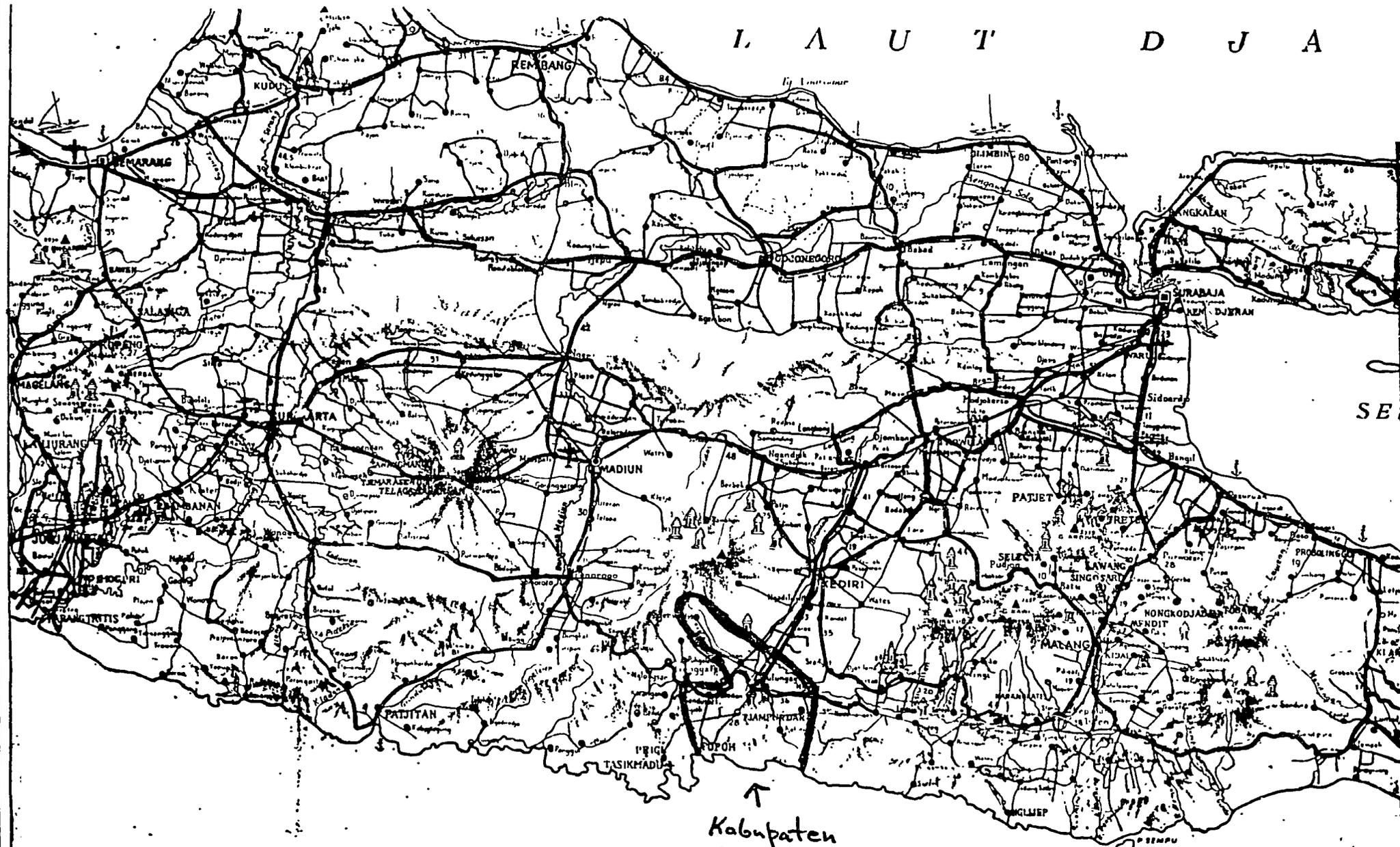
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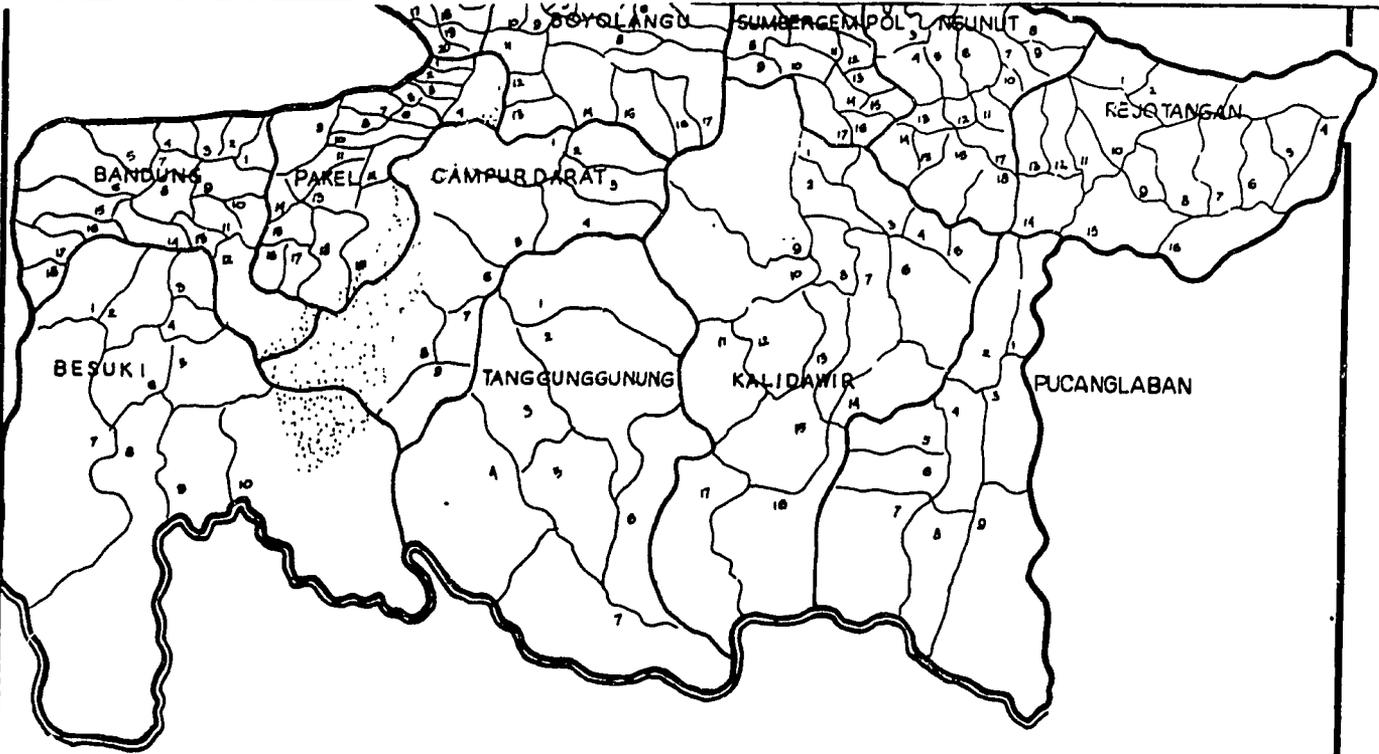
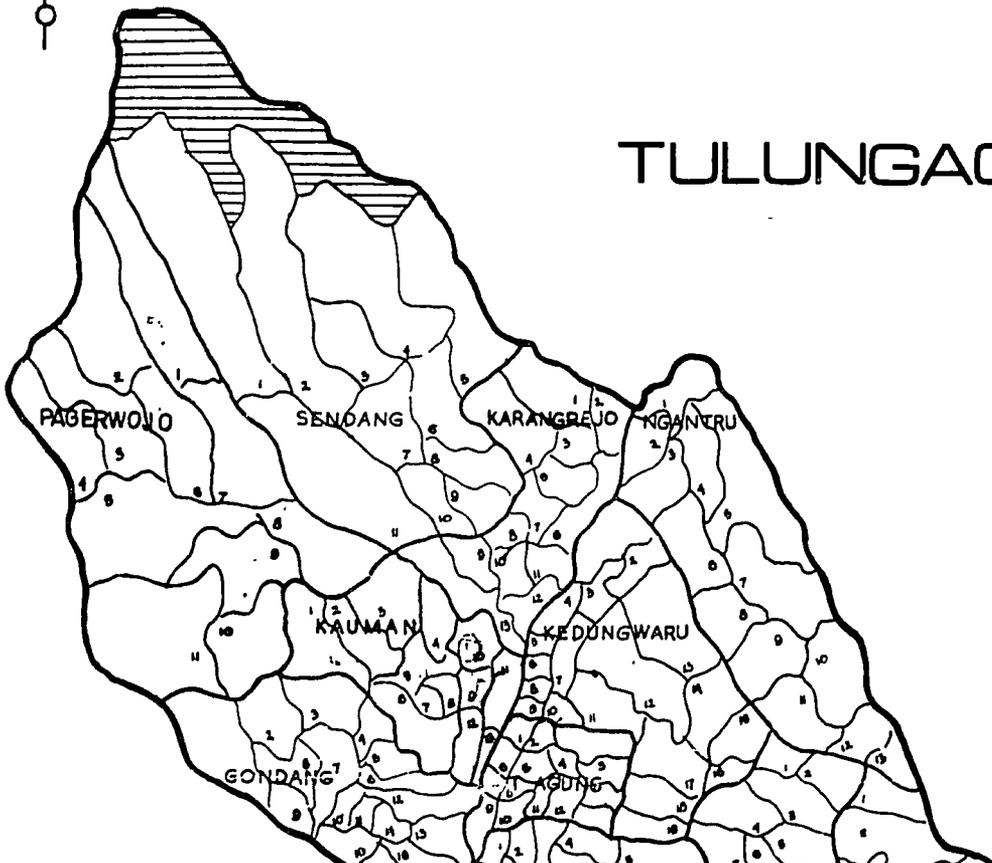


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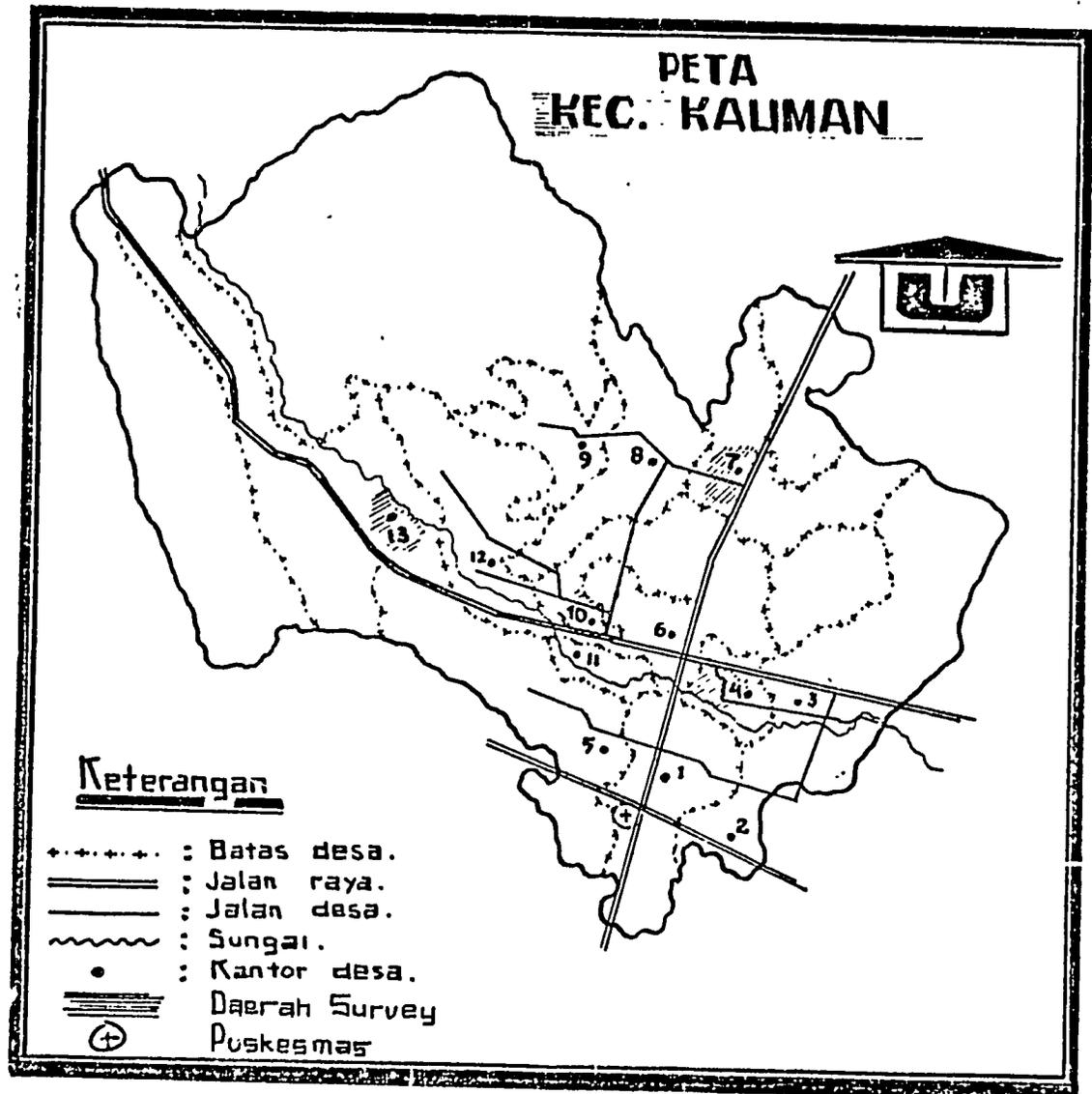
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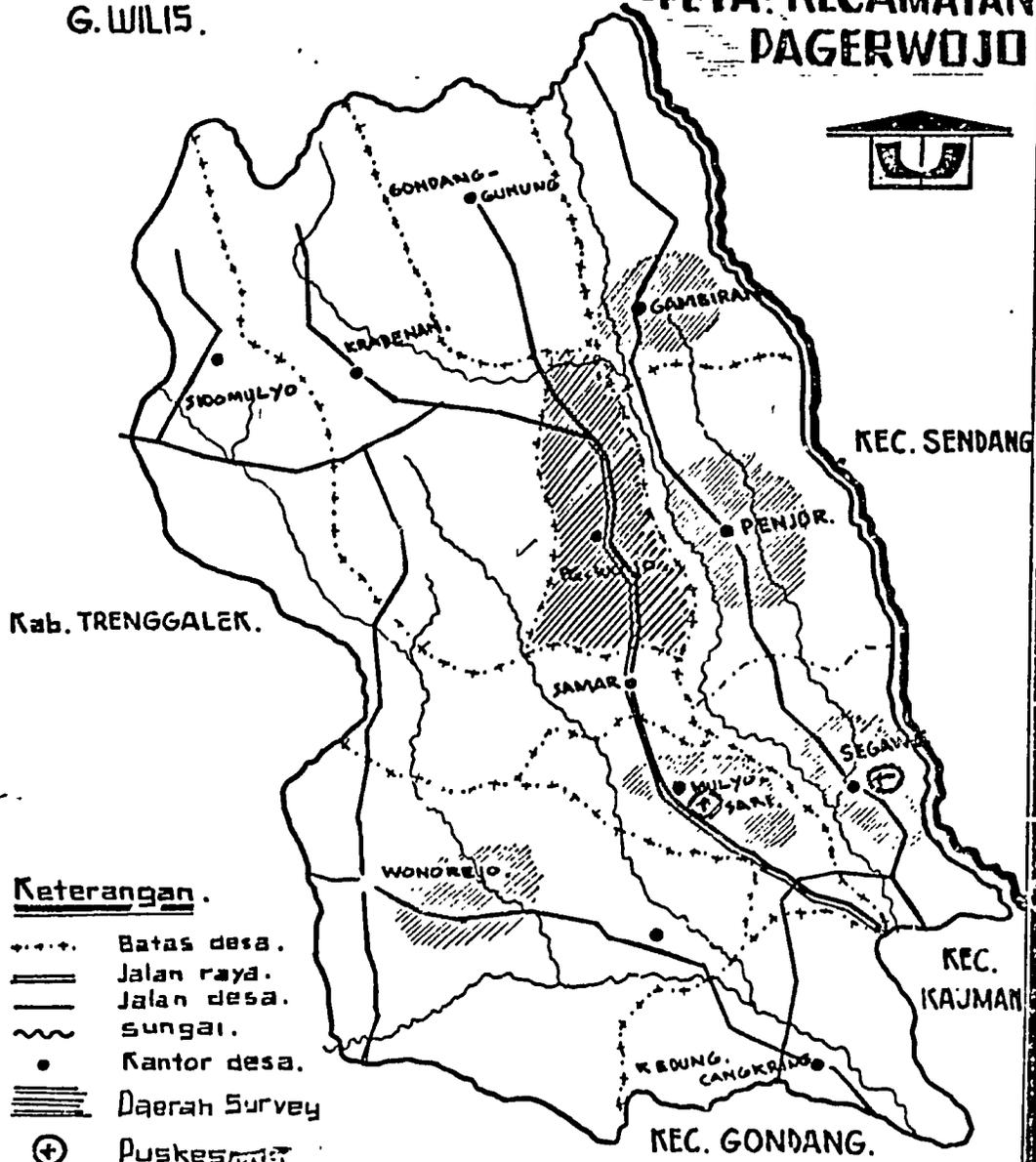


KEC. KAUMAN.

1. Kauman .
2. Balorejo.
3. Batangsaren.
4. Panggunorejo. ✓
5. Balorejo .
6. Sidorejo.
7. Jatimulya.
8. Banaran .
9. Kates .
10. Mojosari
11. Kalangbret.
12. Karanganom.
13. Pucangan. ✓

G. WILIS.

PETA KECAMATAN DAGERWOJO



Initial discussions were concerned with developing a list of tasks necessary for the research to be well conducted and with identifying when these could be done and by whom. A tentative list of data items was developed, compared with the current survey's items, and decisions arrived at as to desired data which might be obtained either by a household survey or by other tests or observations.

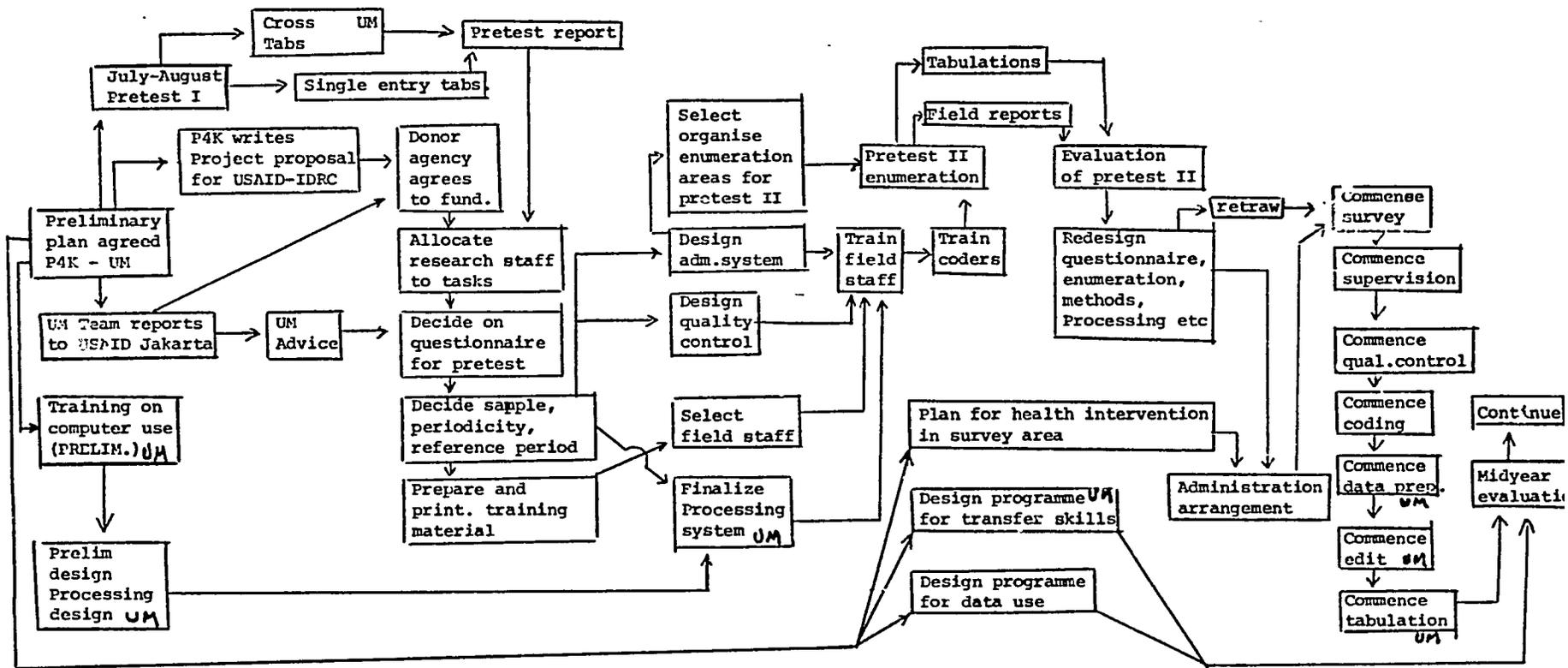
On the 24th, together with Dr. Bambang and Mr. Cholis of the Surabaya Center, we visited Kabupaten Tulangagung. We began with a productive discussion with Dr. Karneni and his staff about the survey and reviewed tabulations for three of the desa (villages). After a quick look at the kabupaten hospital and a call on the Secretary of the Bupati, we visited the health center at Kauman, directed by a physician who is also the visiting doctor for a number of health centers, one of which, located in Kecamatan Pagerwojo, is directed by a nurse. Kecamatan Kauman is on relatively level ground, but Pagerwojo is on the slopes of a mountain. Accompanied by the health center doctor and Dr. Karneni, we visited the Pagerwojo center, talked with its staff, walked about the dukuh (hamlet) in Mulyosari desa, and visited with the lurah of the desa and other village leaders. We discussed their ideas about their village's problems and then specifically health problems. Later with Dr. Karneni we identified some immediate data needs for research planning. He organized the information and brought it with him to our Surabaya conference on sample design on the 30th of August.

Back in Surabaya the Michigan and Center staffs continued to develop a detailed research design. A flow chart of the work plan is shown on the following page. The following items relevant to the survey research for model inputs were completed jointly at the Surabaya Center.

Outline Plan: network logic, financial resources, staffing, and milestone setting

Decisions on data items

Questions and classification of response design



Tentative decisions on periodicity, duration, location, and sample design.

It was decided that a review of the sampling procedures would be undertaken at The University of Michigan after our return there. With respect to where the surveys would take place, there were several alternatives, the selection from which would largely be determined by the relative importance of using the survey results in developing kecamatan level planning, kabupaten level planning, or general insights into the correlates of morbidity and mortality variations. It was agreed that Ministry of Health level interests should play a major role in this choice, and, until that is done, we will review sampling problems related to each application.

The University of Michigan agreed to undertake at Ann Arbor, in addition to sample design:

- cross tabulations of July-August pretest after local coding
- preparation of table formats for new survey
- design of coding rules
- development of data processing principles with respect to error edits and non-response edits
- data processing and analysis for evaluation

The Michigan work will be out of University funds, some of which derive from AID/PPC and DSB in Washington. No current funding supports computer activities for the Surabaya Center's research program, nor is the current project funding sufficient for the implementation of the revised survey design. AID's recent 5-year grant of \$2.2 million to the National Institute of Health Research and Development, of which the Surabaya Center is a component, is a potential source for the needed funds.

It is tentatively projected that reliable information will require that about 8,000 households be visited every twelve months to collect environmental and behavioral data, that each house be visited twice every twelve months for morbidity information, and that each village or dukuh in the survey will have someone trained and responsible for complete collection of birth and death statistics.

Computer Technology Transfer:

Together with the Center staff, Mr. Tilden examined the computer capability in Surabaya, adjusted our program for the FORTRAN compiler in place, substituted Tulungagung disease lists in Bahasa Indonesia, and ran tests which demonstrated the capacity of the local commercial computer facility to accept the model program and specified coefficients and health programs and produce consistent morbidity and mortality estimates. Three Surabaya staff members participated in a seminar to assure their familiarity with the procedures and applications of the model computations.

It was agreed that at this time the effectiveness model would be the only computer program transferred. The Center is not yet ready to undertake cost analysis and the associated more complex programs for computing comparisons of numerous program alternatives with specified cost constraints. Michigan will develop training materials to assist in transferring these methodologies.

Field observations reinforce earlier conclusions on the overriding importance of inter-personal and other information diffusion, supported by wide but non-governmental drug distribution, in affecting ill-health in developing countries, and more particularly on the postulation that women provide the greatest contribution to reduction of infant - and child - mortality, in themselves more expressions of socio-cultural change than socio-economic change. To explore these aspects for East-Java, a visit was made to Dr. R. Wasito, until recently in charge of family planning in East Java, and easily the senior public health official most sensitive to socio-cultural patterns in Java in general and East Java in particular. The success of family planning in East Java was explained as due to three components:

- (i) The development of an extensive network of MCH sub-centers in the province during the 1950's and nearly 1960's.
- (ii) The authorization of trained midwives to install IUD's in the early 1970's.
- (iii) The use of a "women-organization", originally instituted by the

Department of Village Development in 1972 and revived by the Family Planning Organization and now also used for the Extended Programme of Immunization, in which East Java had the best results of all Indonesia.

While Dr. Wasito confirmed the dominant role of women in child health, he stressed that in the socio-cultural setting in East Java husbands played a smaller, but essential role of informants and authorizers for behavioral change. However, no measurements for diffusion of information had been established nor was any work going on towards establishing such measurements. It was decided by the team to explore the state of the art of measuring diffusion of information so as to review measurements for possible adaptation to developing countries.

Problems and Findings

Survey Design:

The feasibility of pre-test surveys conducted in Tulungagung during July and August have yielded useful information and insights. The supervisory personnel in the field are excellent, and the ability to secure cooperation from village leaders and responses from the households on the subjects of concern has been demonstrated.

Three broad problems remained: the pre-test sample is not representative of the hamlets, villages, kecamatan or kabupaten; the questionnaire needed changes to give greater assurance of answers that could form the basis of data inputs into the resource allocation model; and data processing plans needed to be redesigned.

While improvements undoubtedly will be made in the course of the project, we believe that the revised questions (See Appendices A and B), combined with good sample design and proper administrative and logistic support, give promise of developing significant information useful to health sector resource allocation analysis. Specific sample design, as noted earlier, will depend on priorities with respect to application of the model (e.g., correlates of dependent variables such as deaths, kecamatan planning, kabupaten planning, strategic planning for the nation).

Because of differences in the expected occurrence of certain events (e.g., more people have illness periods than die during a year), and the desired cross tabulations (the more variables needing to be matched from a given sample, the smaller the numbers of events are likely to occur), we do not expect equal reliability for all items of interest.

Environmental and behavioral conditions which change slowly over time could be of high reliability. Some other single variables, such as frequency of illness, frequency of lengths of disabling conditions, and frequency of utilization by source of medical care should be reasonably represented by

the frequency of events in the sample selected. It should be noted that sampling refers not only to households in space, but also in time.

Almost as reliable might be the frequencies of disease by type, and total mortality (without ascription of cause). Multivariate relationships are expected to be less reliable, but possibly acceptable, for example the combination of the frequency of a specific disease, the utilization by source of care of those so afflicted, and the length of disability associated both with the disease and the source of care for the same set of events. Because of differences in disease frequencies, we can expect that data for more common (and perhaps more important) diseases will be relatively more reliable than the data for rarer (and perhaps of less concern for resource allocation decisions) disease.

Mortality, which it is hoped and expected will have a low relative frequency of occurrence, would be less reliable than morbidity data. As mortality information is a critical set of data, it has been decided to train and deploy trained village workers who will record every death by cause in each of the surveyed dukuhs or villages. Morbidity data would be collected for only a two-week recall period in each household no more than twice a year.

The correlation of illness and death with economic, social, and environmental conditions will depend both on the number of events of death and illness observed and the amount of variations in the observed social and other conditions associated with health effects.

It is because of the need to increase the reliability of the survey results for even rough planning purposes that the number of households has been set at approximately 8,000, with a population of around 40,000. For such a sample, we expect about 1,600 births, 800 deaths, and slightly over 10,000 morbid events to be reported every year.

Thus, one single problem is to assure that sufficient additional resources are available to support the increased number of interviews in the revised plan

of action. Using rough unit cost estimates, the specifications of the survey over a two year period would require an additional \$50,000 over the current level of funding.

Field supervision of such a survey is a substantial challenge, and will be particularly difficult in mountainous areas during the rainy season. " Our findings in Tulungagung confirm that a very dedicated and conscientious group of senior health officials in the kabupaten guarantees the required supervision.

The pattern of part-time assignments to projects in the Center at Surabaya would, if not changed, endanger the success of the project. After considerable discussion of staffing needs and timing requirements, the Center director did allocate sufficient full-time personnel to the project.

As yet, the Surabaya Center has not been requested to make a serious commitment to research on policy analysis. It is not likely that information decisions can be satisfactorily made in the absence of interaction with analysts who might use the information being developed. Further, and perhaps obviously, if policy and program analysis is not done, and it is questionable if it could be done elsewhere, the data collected and processed will be of little use, regardless of its' "quality." On the other hand, the Center is moving in the direction of such analysis and over the last years has developed a considerable capacity to provide support in data collection for such analysis.

There is a lack of knowledge of Indonesian disease patterns and a lack of laboratory capacity to establish them in order to serve as guidance in research design and to check the reasonableness of some of the results.

On Friday, September 1, a visit was paid by two team members to the Jakarta Detachment of United States Naval Medical Research Unit No. 2 (NAMRU-2) to explore the availability of population based studies of incidence of specific diseases and/or infections. While a few whole village studies were available, it transpired that such population-based work had started to expand during the last year or so, and no results, let alone reports, were available yet. On the

other hand, the increased interest of the Jakarta Detachment to relate its studies to information useful for health planning in Indonesia was explored with regard to possible support by laboratory based information on the survey population in case that the interview survey would not succeed in adequately reducing uncertainty of those disease profiles found to be of importance after sensitivity analysis.

Dr. David T. Dennis, Officer in Charge of the Jakarta Detachment confirmed that the NAMRU-2 team would be very willing to provide such support if required. It was explained that the need for this support could be established by the mid-year evaluation in mid-1979 of the planned survey.

Development of Management Information System for Health Centers

While at Surabaya we reviewed the research project on PUSKEMAS (Kecamatan Health Center) information systems which is under the direction of Dr. M. H. Widodo Soetopo with Dr. Widodo. We reviewed the current flow of information recorded at PUSKESMAS level, what is sent to higher-level units of the government, and the information flow from kabupaten level. We reviewed the surveys and analyses made by the project, including the following:

- Survey of three PUSKESMAS in Central Java (outside the current study area). This collected data from each staff member with respect to what each does with the items recorded, and what each needs for his or her activity. The study also observed and noted the activities of each during a week. A finding of interest was the comparison for each type of worker of the number of hours of actual work with hours available for work during the week. This indicated that on the average only 40 to 50 percent of available hours were actually worked (1).
- In Kabupaten Brebes, all seventeen PUSKESMAS are included in the study, as are private clinics. An early study analyzed recording steps by activity class to determine who uses what material at the PUSKESMAS. It was noted that lack of funding from the Bupati of printing costs is a common reason given for not generating reports at Kabupaten level (1).
- Each health worker in the study area is now required to carry one or more of five register books into which records of activities are entered for each patient by name and address. Appendix D contains copies of a page from each register book and charts showing the flow of information within the D.K.K., and a summary. Weekly summaries of register book records are kept at the PKM; monthly reports got to the D.K.K.
- Having developed via the register system what was believed by the research team to be a simpler, completer, and more useful information recording and reporting system at the PKM level, they turned their attention to the use of such information for planning. It was ascertained that PKM managers, trained as clinical physicians, lacked the tools and perspectives of systematic management, and were not able to make such use of the reports generated. To fill this perceived gap, Dr. Soetopo undertook a series of presentations entitled: Management of Village Community Health Development: A System Approach. Research concern with the purposes of information recording and reporting has only recently emerged, after the design and testing of a new information recording reporting system.
- Having developed a PKM information system, and training the PKM directors to consider planning as a major function, the next step was the design of a "Health problem sheet" (Masalah Kesehatan) for each health problem. The problems were assumed to be appropriately categorized by a disease name. The sheets noted the numbers of cases, the ages principally affected, and identified

interventions for each desa (village) into seven personal medical care activities, health behavior actions, and environmental targets. Each activity also identified the category of worker to be involved. A copy of the problem sheet is on the following page.

- In order to develop information for the health problem sheets, questionnaire forms were designed. These were to help identify needed activities. A principal innovation was a questionnaire which cross tabulated activities against possible workers. Its question is: "who can carry out the activity?" Worker types listed ranged from mothers and teachers to dentists and physicians. These manning (or womanning) forms are summarized for all problems and activities to attempt a horizontal cut at needs, in addition to the vertical one by disease type (2).
- Other activities of the project include suggestions for program implementation (3) and PKM monitoring and evaluation guidelines (4).

References

- (1) dr. M. H. W. Soetopo dan dr. S. Goenawan, Pelaksanaan Program Pelayanan Kesehatan Kepada Masyarakat (Kaporan Suatu Survey Dalam Rangka Sistem Informasi untuk Manajemen Puskesmas), Pusat Penelitian dan Pengembangan Kesehatan Surabaya, 1978.
- (2) dr. M. H. W. Soetopo, Mentapkah Sasarah Program (Target Setting), P4K, Surabaya, 1977.
- (3) dr. M. H. W. Soetopo, Improving Program Implementation through Human Relations Approaches and Effective Control, P4K, Surabaya, 1977.
- (4) dr. M. H. W. S etopo, Sistem Informasi untuk Monitoring dan Evaluation Pembangunan Kesehatan Masyarakat Desa, P4K, Surabaya, 1978

The new ideas for the recording and reporting of PKM events appears to be concerned almost totally with activities of a PKM. It does not attempt to go beyond governmental health services delivery and the manpower resources used or required for an estimated workload. Information about morbidity and mortality patterns in the population for which the PKM is responsible or data on the effects of health service interventions and other variables on the population's health status are not part of the information system.

In our judgement, then, the PKM-Kabupaten information system, either the existing one in Indonesia or the experimental system in Central Java, is inadequate as a complete basis for planning at kecamatan level. Other information which is critical for planning include the health status, environmental and behavioral conditions which are sought in the survey research project using Tulungagung as its field experimentation site.

Best Available Document

M/105/78

EPID/MIS/78

MASALAH KESEHATAN (PENYAKIT) :

(Tindakan yang direncanakan/Tindakan yang telah dilaksanakan) *

Minggu	Bulan	Tahun
Kecamatan		

Lokasi masalah	Luas masalah (jumlah kasus)	D e s a																	Dari luar Kecamatan	Keterang- an **)	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17			
		Golongan umur ter- kena ***)																			
I. Dituju- kan ke- pada per- orangan dan ma- syarakat	1. Pemeriksaan penderita 2. Pemeriksaan Laboratorium 3. Pengobatan penderita 4. Follow-up penderita 5. Surveillance 6. Immunisasi 7. Rujukan																				
II. Dituju- kan ke- pada pe- rubahan tingkah laku (be- havior)	A. Perorangan Target/pop: Topic: B. Kelompok Target/group: Topic:																				
III. Dituju- kan ke- pada per- baikan lingkung- an.	A. Fisik Target: B. Biologis Target:																				

*) Coret yang tidak perlu.

**) Jenis dan jumlah tenaga pelaksana.

***) Hanya diisi golongan umur (bukan jumlah)

But we have noted that the research on securing data for model variables does not yet deal with resource and costs questions with respect to interventions on the part of governmental health services. It would seem that here a useful role might be played by a revised PKM information system, although it may not be necessary to make it a routine activity in all PKM's. That is, with some additional thought, effort, and experimentation and testing, the PKM health service information research could be used to develop the physical quantities of manpower by type, equipment, drugs, etc., and the cost estimating relationships between these quantities and funding needs. For these purposes, the limitation of the PKM data to governmental services in a kecamatan would be appropriate and useful for the development of the cost analysis capability needed first at the research level in Surabaya, and then as a tool of managerial planning at the PKM and Kabupaten and higher levels.

Capacity for Computation

Training workshops and staff working directly with the effectiveness programs of the model have given good assurance that these are qualified staff capable and interested in handling and applying these programs.

The computer facilities possibly available to the Surabaya Center are:

1. Pan Esge Data Processing Corp., Surabaya
2. Gadjah Mada University, Yogyakarta
3. PUTL (Perkerjaan Umum & Tenaga Listrik)
4. DKI (Daerah Khusus Ibukota Jakarta)
5. Mini-computer at Badan Litbang
6. Terminal linkage to MTS, Ann Arbor, Michigan, USA

There is no question of the need of computational facilities by the Center. The problem is to secure these capabilities to the Center in a way that will meet present needs and allow the development of more capabilities within the Center.

Installing a mini-computer would be convenient and useful, but its limits in future development of software and maintenance might be a problem.

The use of Pan Esge is convenient but costly and no terminal facilities currently exist for on-line editing of programs and data bases. The computer is an IBM-360 with limited storage. Pricing procedures are unsatisfactory and expensive. For example, operations costing \$5 at the University of Ann Arbor cost about \$200 with the Pan Esge system.

Gadjah Mada University, while possessing terminal capabilities, is distant from Surabaya and its use would involve travel expenses that might be too costly over a span of time. The computer is a UNIVAC and the costing (based on CPU time) is less than the equivalent for Pan Esge. Travel costs, however, might negate this saving in total.

The same problems also are associated with the use of either of the IBM-360 systems operated by PUTL and DKI in Jakarta.

Terminal linkage to MTS in Ann Arbor would provide access to one of the best computer systems in the world. However, the cost of phone-linkage hook-up, which would be needed, probably would make this too high a cost approach.

Perhaps the preferred option would be the purchase (or securing) of a mini-computer to be placed in the Center itself.

All of the above notes are based on opinions and reports of others, except at Pan Esge, where we have been able to demonstrate that the system will handle the model's needs, with Center staff operating the system.

Because of the importance of the computer decision (although it can be reversed), both to assure capability and to minimize cost, and because of a wider interest in the same choice among facilities for other applications than those discussed in this report, it was agreed with the Health Division of AID/Indonesia that a special study for this purpose would be undertaken as a supplementary activity. A report on this study will be submitted to AID prior to 11 September.

Recommendations

1. The Health Services Research and Development Center be encouraged to assign a full-time leadership to the research project.
2. Funding for computer work, not in the current budget, should be added.
3. Study of the preferred computer facility and equipment be done.
4. Survey schedule should provide for one or two surveys on which quality checks can be made by field supervisors before weather makes travel too difficult.
5. We urge support to the development of policy and program analysis capability at the Surabaya Center. Present needs of the Ministry of Health are in selecting programs for implementation and in identifying projects to improve the efficiency of health services. The model under study, with statistical implementation, can provide an instrument to compare alternatives other than through trial and error.
6. If policy and program analysis are to be major future activities of the Surabaya Center, its present and planned research program might be reviewed regarding its potential relevancy to produce information for such analysis (through application of the model for quantitative estimates). Adaptation of present research projects and development of new research projects supplementing the present survey might also be considered in close cooperation amongst the Center, the Bureau of Planning, and the University of Michigan.
7. Study should be undertaken of how to approach an all-Java or all-Indonesia mortality and morbidity survey, based partly on evaluation of the results of the survey research currently under design.
8. Although a national serological survey has been conducted in collaboration with WHO (with laboratory examination in Tokyo, Moscow and Prague.), it appears necessary to establish an adequate laboratory capacity at central and peripheral level in the health care system to provide identification of incidence and prevalence of infection for surveillance of communicable diseases and regular follow-up of the survey completed in 1975.
9. Implementation of the research design will need substantial additional funding. We recommend that steps to assure such be taken rapidly. Budget estimates for the revised survey plans approximate an additional RP 10,000,000 (\$25,000) per year, based on the following items (beyond researchers already budgeted in Surabaya):

13 Interviewers	Rp 3,000,000
3 Field Supervisors	1,500,000
Research staff incentives additional 2.5	1,000,000
Data processing (coding) ^a	300,000
Additional transport	1,000,000
Printing forms & manuals	2,000,000
Training	800,000
Other	<u>400,000</u>
TOTAL	Rp 10,000,000

a) other data processing and computing will be done by The University of Michigan.

10. A cost analysis capability should be developed in the Surabaya Center. We suggest that this might be accelerated if the current PKM health information system research could be purposively guided by this objective. In addition, there exists literature on cost analysis methods in the library of the Center, and The University of Michigan is prepared to develop training manuals in public health system cost analysis for the Center's use. It would be useful for the Center to identify a research staff member with responsibility for cost analysis research. Computer programs developed at Michigan for rapidly comparing the health effects at various stipulated cost levels could be made available to the computer people at the Center sometime in the future, when usable cost information has been developed from Indonesian sources.

ACKNOWLEDGEMENTS

We would like to note our thanks to those officers of the Government of the Republic of Indonesia and to those WHO consultants to the Republic of Indonesia who by their suggestions, comments and reference materials made it both possible and pleasant for us to complete our tasks. These include:

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Dr. W. Bahrawi, Inspector General
Dr. Adjatma, Director-General, Communicable Disease Control
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Health Services Research and Development Center, Surabaya

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Other

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APPENDIXES

APPENDIX A

I.

ITEM	CLASSIFICATION	QUESTIONS	NOTES
Illness type	31. diseases (see-list) Appendix B.	- Has person been ill during the last weeks. - What illness. a). Q. to be prepared and discussed on Wednesday	9. Requires identification through symptoms list. 3. To be asked specifically. (leading questions)
Disability Level	Unit Says: a). Death b). Bed c). Away from work d). At work with difficulty (loss time, less effective e). Unable to do house work f). Out of School 1. Highest disability 2. Days of highest disability 3. Other stages 4. Days of time	- Do you feel healthy? If no What is the problem	reg. of questions record 14 days & include earlier days disability
Disease Care	1. Source: 1. Lab. Hospital 2. Health Center 3. Health Sub Center 4. Outside of Lab 5. Other hospital - name 6. Other clinic - name 7. Private source: a. Dr. (M.D.) b. Nurse c. Midwife d. Dunkun: - drug - message - spirit (white magic) - bone setter e. Needle men f. Chinese traditional - drug - needle g. Pharmacist h. Self Care i. Family care II. Cost: Rp..... - Transport - Kind payment - Time loss of care - Employment loss - Drugs III. No. of visit..... Location of clinic.		Date: Cover the illness between 14 days and earlier

ITEM	CLASSIFICATION	QUESTIONS	NOTES																													
Nutrition status	1. Weight + Height for ages 5 years. 2. Weight + Height for ages under 15 years. 3. Arm circum. under 15 years. 4. Skinfold for all ages. 5. Anemia -- special separate study.																															
Environmental sanitation	I. SOURCE OF WATER 1. Well: a. protected b. not protected c. private d. communal -- No of houses use 2. Bucket or pump 3. At springs 4. Ponds 5. river 6. Pipe - house connection: - metal + plastics - bamboo a. general b. household 7. Rain catchment II. SOAP CONSUMP: - for washing - yes/no - for bathing - yes/no III. WATER QUALITY:	Where do they get? <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Source</th> <th colspan="3">drinking</th> <th colspan="3">bathing</th> <th colspan="3">washing</th> </tr> <tr> <th>D1</th> <th>W</th> <th>D2</th> <th>D1</th> <th>W</th> <th>D2</th> <th>D1</th> <th>W</th> <th>D2</th> </tr> </thead> <tbody> <tr> <td style="height: 100px;"></td> <td style="border: 1px solid black;"></td> </tr> </tbody> </table> <p>D1 : dray D2 : distance W : wet</p> <p>freq./person/week #bars/week Rps spent on soap</p>	Source	drinking			bathing			washing			D1	W	D2	D1	W	D2	D1	W	D2											
Source	drinking			bathing			washing																									
	D1	W	D2	D1	W	D2	D1	W	D2																							
Kitchen	FOOD Use some knife for meat + vegetables without washing FOOD STORAGE: UTENSILS: running water or one bucket HAND WASHING: Wash hands before eating - household members.	How do you store prepared food? - screen food safe - exposed to flies.																														
Fecal Disposal	Type: Swan latrine Communal latrine Shared with neighbour River Bush Compound UTILIZATION	If you have latrine, do all members use all the latrine time if yes - go to next question if no - when on farm do you defecate there? Children: in ten times how many times do they use latrine?																														
Drinage		Is there standing water in household compound? Yes/No.																														

G. GARBAGE (solid waste) out

H. ANIMAL REARING

- species and #
- night-time - penned in separate

I. ECONOMIC FACTORS

Possessions:

Land owned - hectares, food product., other agriculture purp.
other (leased)

Land rented - value per hectare

Land rented - amount (of land)
rental payment/time period.

Money in Bank -- gold

Motor vehicles	Radio
auto	T.V.
truck	Tape player
tractor	Jewelry
cycles	Large animals
Other vehicles	Small animals
bicycle	House (value)
dokar	Shop/Toko
becak	Warung
other	
Agriculture vehicles	Other industrial building
motorized	
tools	
Food Production:	Pilgrimage
rice	
maize	
fruits	
vegetables	
cassava	

J. EDUCATION

current school grade	Enrollment in school
	Highest grade completed
Literacy (reading)	Literacy (reading):
	- Bahasa Indonesia
	- Local language

K. OCCUPATION

1. At all occupation: # of hours worked last week
for money, to produce goods.

APPENDIX B

Disease List

1. LOWER RESPIRATORY INFECTION*	
2. UPPER RESPIRATORY INFECTION	INFLUENZA, WATUK-PILEK
3. OTITIS MEDIA	KOPOKEN
4. SKIN DISEASES	GUDIG, BOROK, EKSIM
5. MILD DIARRHOEA	NGEBREK, MENCRET, MURUS
6. SEVERE DIARRHOEA	MENCRET-MENCRET, MURUS-MURUS
7. TUBERCULOSIS	KEMATUS
8. MALARIA	PANAS TIS, MALARIA
9. DIPHTHERIA*	(No local word found)
10. TETANUS	SAWAN KAYU
11. PERTUSIS*	(No local word found)
12. MEASLES	GABAG, CAMPAK
13. BURNS	KOBONG, MESIRAM BANYU PANAS
14. FRACTURE	BALUNG TUGEL
15. CUTS	KEBACOK
16. ANAEMIA	PUCET
17. MALNUTRITION*	(No local word) BERI-BERI
18. INTESTINAL PARASITES	CACINGAN
19. CHRONIC HEART DISEASE*	Symptom: MENGGEH-MENGGEH
20. CEREBRO VASCULAR DISEASE	MATI SEPARO, LUMPUR SEPARO
21. COMPLICATION OF PREGNANCY* CHILD BIRTH	KLURON, means abortion
22. TYPHOID FEVER*	TIPES
23. HEPATITIS	KUNING
24. CONJUNCTIVITIS	BELEKEN
25. RHEUMATIC FEVER	ENCOK
26. VARICELLA	CANGKRANGEM (Virus)
27. MUMPS	GONDONG
28. GONORRHOEA	KENCING NANAH
29. GOITRE	GONDOK (endemic)
30. VIT. A DEFICIENCY*symptoms
31. DENTAL HEALTH*	PENYAKIT GIGI DAN MULUT.

* Specific symptomatology

Appendix C - Model Algorithm

Let:

R_{ij} = attack rate per person in age class j of disease i

P_j = number of population in age cohort j

N_{ijk} = proportion of people in age cohort j with disease i who seek and receive care from source k

F_{ijk} = Case fatality rate of disease i in age cohort j when utilizing medical care from source k

\bar{F}_{ij} = Case fatality rate of disease i in age cohort j for those who do not use medical care

D_{ijks} = Days of disability of level s associated with disease i in age cohort j of those who seek care from delivery source k

\bar{D}_{ijs} = Days of disability at disability level s associated with disease i in age cohort j who do not use medical care

Then:

$$\text{Number of deaths} = \sum_{i=1}^n \sum_{j=1}^m \sum_{k=1}^p R_{ij} P_j \left[(N_{ijk} F_{ijk}) + (1-N_{ij}) (\bar{F}_{ij}) \right]$$

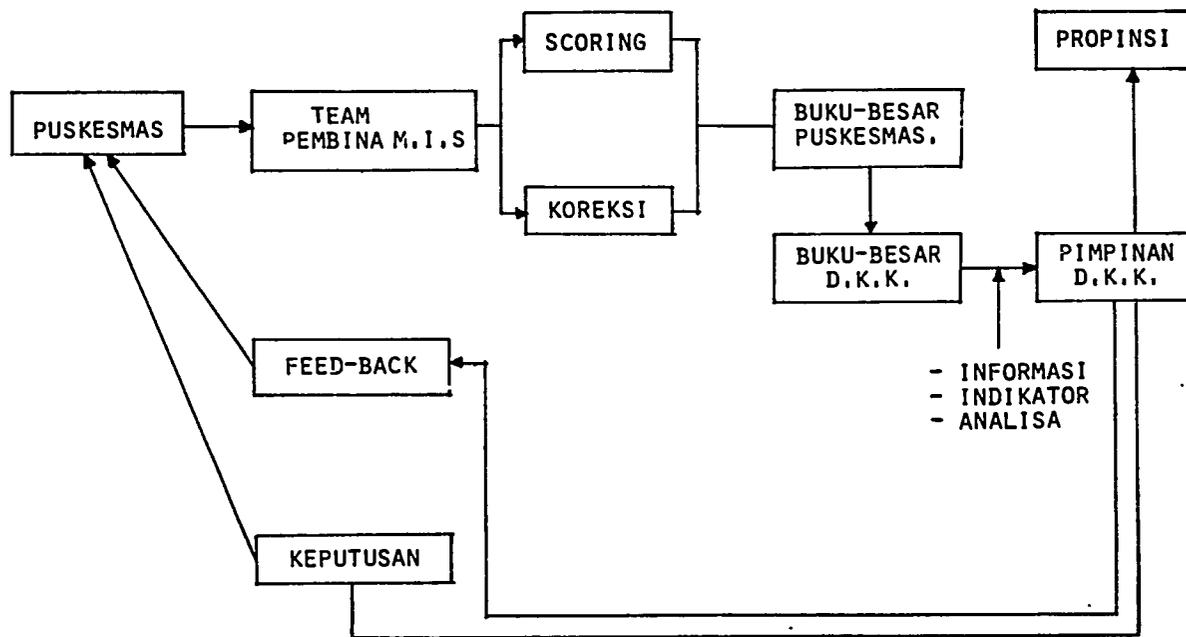
$$\begin{array}{l} \text{Number of days of} \\ \text{incapacitation at} \\ \text{each level of} \\ \text{disability} \end{array} = \sum_{i=1}^n \sum_{j=1}^m \sum_{k=1}^p \sum_{s=1}^{\bar{p}} R_{ij} P_j \left[(N_{ijk} D_{ijks}) + (1-N_{ij}) (\bar{D}_{ijs}) \right]$$

APPENDIX D
Puskesmas Register Book Forms and
Utilization Schema

TANGGAL	TEMPAT KEGIATAN DILAKSANAKAN	IMMUNISASI						JUMLAH MURID DIPERIKSA	PEMERIKSAAN DALAM RANGKA SURVEILLANCE PENYAKIT											TINDAKAN LANJUT TERHADAP									
		Cacar		B. G. G.		D. P. T.			MANUSIA (KONTAK)						VECTOR	SUMBER	ORANG	VECTOR	ENVIR.	Lein?									
		P	R	P	R	1	2		Malaria	Filarisis	Cholera	Cacar (sir)	Framboesia	V. D.	T. B. C.	Kusta	Kejadian luar biasa	Zoonosis	Malaria		D. H. F.	Filarisis	Zoonosis	Ring - vaccin	Pengobatan profilaxis	Penyemprotan	Fogging	Desinfekt sumur	Desinfekt rumah
SUB - TOTAL																													
TOTAL																													

Best Available Document

BAGAN ARUS PELAPORAN DAN PENGELOLAAN
RISALAH KEGIATAN BULANAN PUSKESMAS
DITINGKAT KABUPATEN.



BAGAN ARUS PELAPORAN DAN PENGELOLAAN RISALAH
KEGIATAN BULANAN TINGKAT PUSKESMAS.

PETUGAS :

DOKTER
PERAWAT
BIDAN
P.K.C.
P.K.E.
J.M.D.
PETUGAS KHUSUS

REG. I

DOKTER
BIDAN
PK/E

REG. II

DOKTER
PERAWAT
PK/C
PK/E
JMD/KJMD
JURU IMMUNISASI
JURU SURVEILLANCE
JURU H.S.
PETUGAS KHUSUS YANG
DITUNJUK

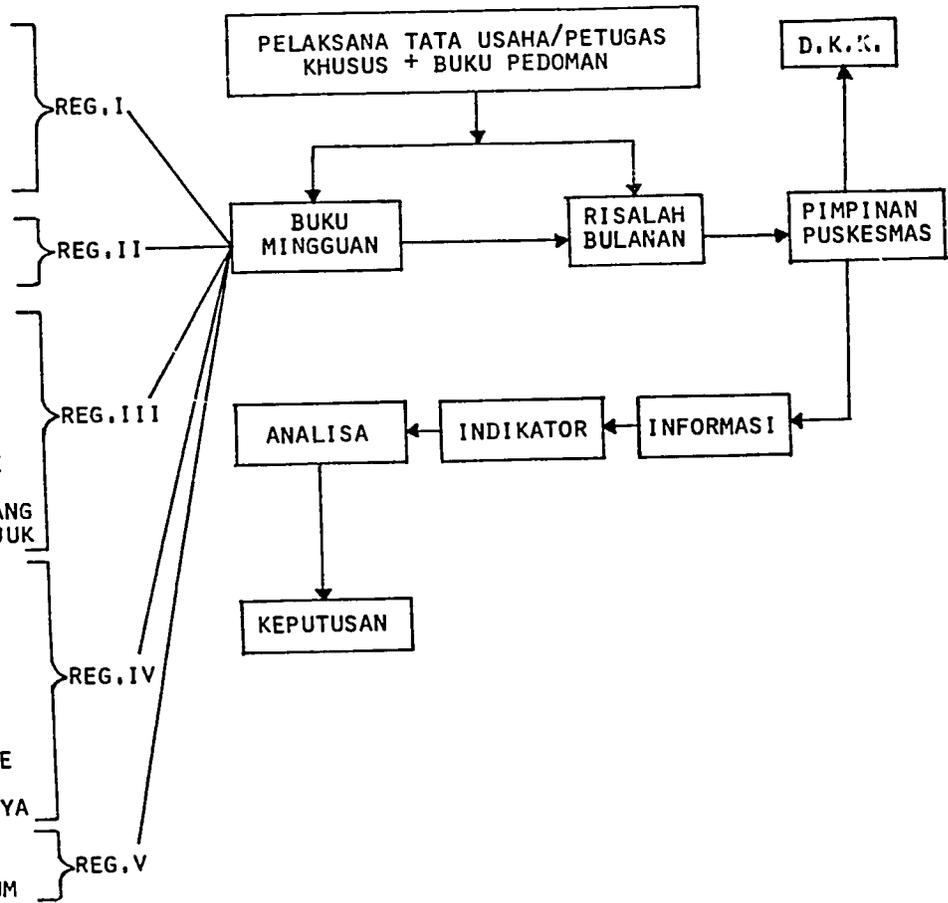
REG. III

DOKTER
PERAWAT
BIDAN
PK/C
PK/E
JMD
KJMD
JURU IMMUNISASI
JURU SURVEILLANCE
JURU H.S.
TENAGA P.M. LAINNYA

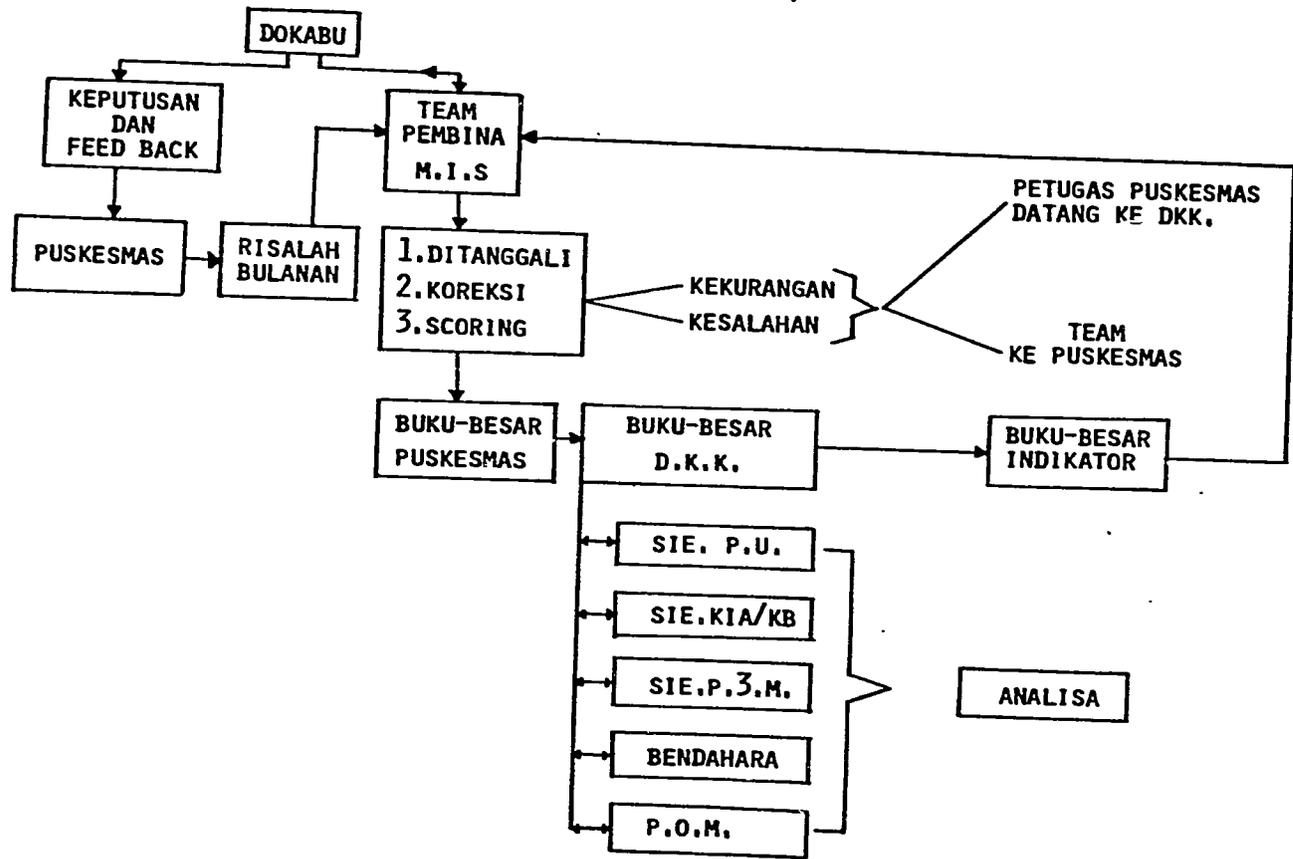
REG. IV

PERAWAT
PK/C
JURU LABORATORIUM

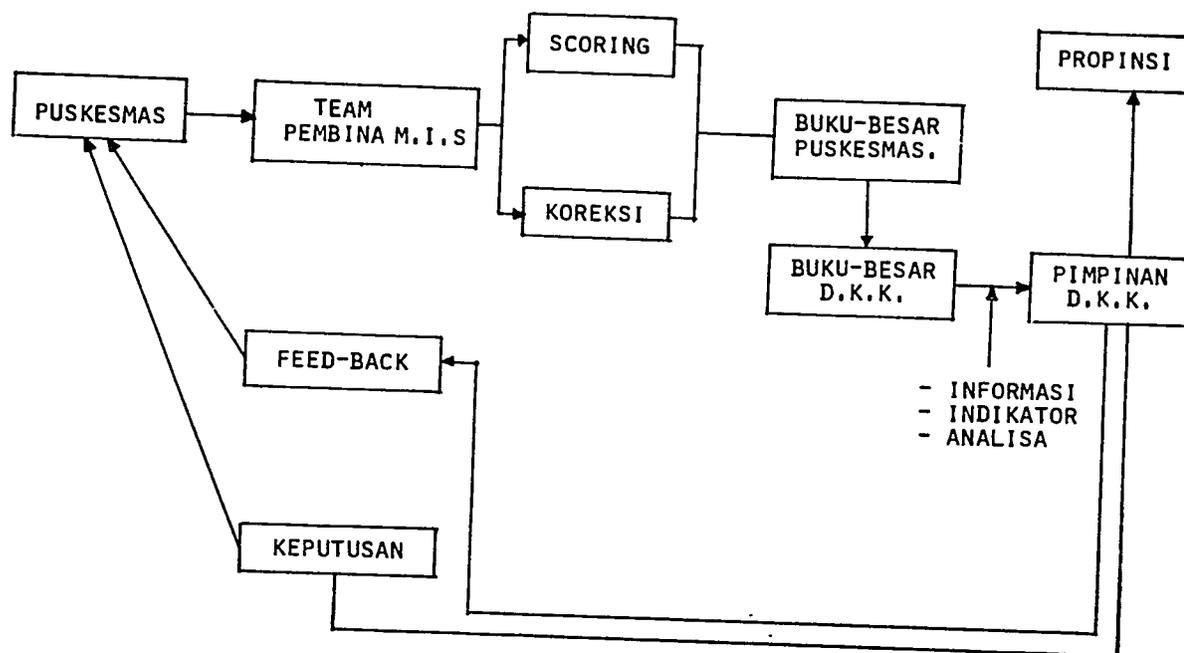
REG. V



BAGAN PERINCIAN TUGAS TEAM M.I.S.
 DINAS KESEHATAN KABUPATEN DATI II
 BREBES .



BAGAN ARUS PELAPORAN DAN PENGELOLAAN
RISALAH KEGIATAN BULANAN PUSKESMAS
DITINGKAT KABUPATEN.



September 19, 1978

APPENDIX E

Technical Transfer of Michigan Cost Effectiveness Model
and Association Options for Computerized Operation

On the Statistical Implementation of a
Health Sector Resource Allocation Model in Indonesia

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Prepared for the American Public Health Association

September 7, 1978

Appendix E

Technical transfer of Michigan Cost Effectiveness Model and associated options for computerized operation.

The technical transfer of the computer software and the instruction of staff as to its use as a management and planning tool is at best a rigorous academic exercise without the computational backup for use of the model as a planning tool. This section of the report will deal with the options of P4K Surabaya for the continued use of this model using mechanized computation.

The need for mechanized computation arises for 1) The editing and processing of the various disease profile information used as input data, and 2) The running of the University of Michigan model to generate the effectiveness reports. Two alternatives for this are possible: 1) use of facilities in Surabaya, 2) use of other facilities in Jakarta, Semarang or Yogyakarta. The cost, limitations, line editing, system subroutines, and spillover benefits of alternative systems' usage will be considered as criteria for deciding which approach is most appropriate for P4K Surabaya, for those systems available in Surabaya.

The Health Research and Development Center (P4K) in Surabaya has a trained staff in statistical analysis and computer programming. They have a constant temperature-controlled humidity room within the complex where their key punch and IBM sorter is located. They are constantly engaged in demographic and health surveys. Because of the limited facilities they can only do cross tabulations on the surveys. Such activities as regressions, multiple stepwise regressions, and analysis done by stratifying the sample can only reasonably be done by mechanized computation. The lack of this ability is a serious problem in the development of expertise in statistical and computational activities.

Within Surabaya there are three basic options to computational services.

The first is via a private corporation called Pan Esge Data Management. The second is with the Surabaya Electric Company. The third option is the purchasing of a mini computer for the center in Surabaya.

1A. Pan Esge Data Management

This independent company operates an IBM 360 system. The main purpose of the company is to meet data needs in Surabaya region.

a) cost: The cost of this system is Rp 70,000/hour within the facilities. This method of costing does not reflect actual use of the machine but all the time involved in reading in the program and data as well as time involved for the generation output. When the program is finished running and the output received, the user is logged off. The real cost of the use of this machine is very expensive. Program alteration and the running of three programs at Pan Esge cost approximately US\$180.00 for what could be done on the Michigan Terminal System for US\$5,00 or less.

b) limitations: The system can only be used by tapes or cards (batch); there is no terminal facility. Because the model is still in the development stage all changes must be made on the computer cards. Although expensive, this system is relatively under-utilized so that turn-around time is relatively quick.

c) on line editing: Because there are no terminal components to this system, on line editing is not feasible.

d) system subroutines: This system has a statistical package subroutine which is useful in health surveys and demographic data processing.

e) spillover benefits: The use of any Surabaya-based option will increase the amount of expertise gained because of close proximity of the system. It will also increase the demand on the computational services available, thereby hopefully providing more incentives for the upgrading of local computational facilities.

2A. Surabaya Electric Company

This local electric company is in possession of an IBM 370. This machine is presently over-utilized. Indeed there is some question as to availability of time for other government agencies.

a) cost: Rp150,000 for CPU (machine time) hour plus Rp20 per page of output. Costing by CPU time is a better way of costing as it charges only for the amount of machine time used.

b) limitations: The machine is already over-utilized so that a week might pass before a job might be done.

c) on line editing: There is none.

d) system subroutines Non statistical package.

e) spillover benefits: If turnover time is kept at a minimum then there will be the immediate feedback necessary for the evaluation of various alternatives in planning.

3A. Mini Computer

After a lengthy discussion with the IBM representative in Jakarta several models of mini computers were discussed. The best option considered was the smallest mini available for handling Fortran IV programming language; the IBM 32 system.

a) cost: The investment cost is US\$50,000 plus 50% surcharge for government tax, insurance, flight and handling. The monthly maintenance charge is US\$299.00. The round trip airfare for the repariman between Jakarta and Surabaya must also be included, so that yearly operation costs would be around US\$5,000.00.

There is also a lease option which would be approximately US\$1,000.00/month plus the 50% surcharge. The lease would be with the national corporation, USI, which has recently superceded IBM in Indonesia.

b) limitations: The major limitation with this system is disk storage 3.2 million bytes and with processing unit 16K bytes. But given the needs of P4K Surabaya the machine should be adequate to handle the needs of model and survey work of that center.

c) on line editing: This system has a file conversion utility for accessing files that could be used for editing.

d) system subroutines: Data file utility for editing, sort utility for sequencing record, source entry utility for simplification and creation of different language program source statements, text editing subroutines, statistical analysis subroutines, project management subroutines and several other accounting functions that might be useful to P4K Surabaya.

e) spillover benefits: This machine would be very useful to the research center in Surabaya. Not only would it allow immediate feedback on planning problems but would allow the development of expertise in planning statistically valid survey research and data processing that is very sorely needed in the planning sector of the Ministry of Health.

B. The other set of broad alternatives is that set of options that involve use of a computer facility outside of Surabaya. The major options for linkage with installations in Indonesia outside of Surabaya are:

1. Gajah Mada University in Yogyakarta
2. U.I. Medical School - Jakarta
3. Public Works Department - Jakarta
4. DKI (local Jakarta government)
 - a) Central Bureau of Statistics - Jakarta
 - b) Ministry of Health available, 1979, April
 - c) Police Department - Jakarta
5. Semarang Electric Company
6. Garuda Airlines - Jakarta
7. IBM (USI) - Jakarta

8. Seodarpo Service Bureau - Jakarta
9. Asian Computer Services PTE LTD - Jakarta
10. Data Search Indonesia - Jakarta
11. Pan Systems PTE - Jakarta
12. Terminal linkage with UI or Gajah Mada
13. Terminal linkage with MTS - Michigan

One major drawback with use of computer facilities outside of Surabaya is the travel involved between Surabaya and that point. This also means there will be a substantial time lag between initiation of program variables, changes and receipt of output. Even more than real dollar cost, this criteria is an important consideration in the long range development of survey expertise in Surabaya.

The terminal linkage with the Michigan Terminal System should not be considered because it is against the law to transmit data to computers outside of the country.

Terminal linkage with either Gajah Mada or UI is also very expensive as the initial line cost may run Rp 5-10 million. The annual operating cost is also very expensive.

The cost of computer time varies in the systems outside Surabaya from a low of Rp 75,000 to a high of Rp 150,000 per CPU hour. The smaller private corporations charge from Rp 20,000 to Rp 80,000 per hour in computer facilities. This method of pricing time is misleading, as an hour in the computing center might utilize only 15-20 CPU minutes, thus equalling Rp 80,000 - 320,000 for CPU hour. Another factor making comparison of cost very difficult is the fact that some computers take 10 CPU minutes for jobs that other computers take 2-3 CPU minutes to finish. Thus for unit prices to be compared the same program must be run in different systems with different methods of pricing. The question becomes: does one hour of running time on an IBM 360 equal 5 minutes of CPU time on an IBM 370.138? Until questions such as this are answered by running the same program on different systems, little more than educated guesses can be made as to

the relative cost associated with utilization of different systems. To go into the detailed cost estimates at this time has little meaning. A proper analysis requires a minimum of forty man days to exhaustively enumerate and price the alternative systems of computing available to P4K in Surabaya.

Another question that is important to any analysis to alternative options available to P4K is the number of CPU hours needed within the next five years to perform the primary mission of health planning, research and development. Obviously, the convenience of a system and the unit cost will determine the level of utilization of that system, but some information is needed as to the projected number of hours needed at different levels of cost.

Another question that is important is the question of who is to pay? The model computer work done thus far was paid for by the University of Michigan research group. If the research center of P4K is to pay, then the criteria of least cost must obviously override other criteria. The University of Michigan research group, if asked to pay, must defer the work to Ann Arbor where unit costs are 25-100 fold less than in Indonesia. If however, USAID considers development of local expertise in analytical methods and data processing to be important then that body must undertake some subsidy of the computational process until indigenous demand has lowered the unit price of mechanized computation to a level comparable to cost in countries where this activity is more common place.

Using the criteria of least cost at project level of model utilization (maximum 90 hours in the next year) then all of the non-Surabaya options must be eliminated. If all the data processing needs of P4K are considered then there is need for a more extensive analysis to include unit cost of all the systems mentioned in Surabaya, Yogyakarta and Semarang.

RECOMMENDATIONS:

1) That a unit cost analysis be done on the different options considered in this report.

2) That an IBM 32 mini computer be rented for a period of 1 year by USAID for use by the Health Research and Development Center, Surabaya and an analysis be done at the end of this time as to the utilization and problems associated with that system in Surabaya.

3) That the Health Research and Development Center P4K Surabaya do an analysis as to the different levels of computer utilization at different unit costs.

4) That until such time as above questions and analysis be done, P4K continues to use the computational facilities available in Surabaya.