

THE POTENTIAL CONTRIBUTION OF SOCIAL RESEARCH TO CONTROL OF MALARIA IN BRAZIL

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This essay focusses on the potential contribution to malaria control of social research, in the broad sense including various social science disciplines. The existing gap in the social science literature and in epidemiological analysis is attributed to the fact that the disease declined and became peripheral and to excessive dependence on purely technical solutions to an eminently social problem. Conventional means of malaria control have not been effective in the Amazon region, where the disease has increased 1500%. The physical and social environment in this region requires diversification of the existing strategy. The potential role of social research is discussed with regard to dynamic micro-stratification, selection and application of new methods, inter-sectoral collaboration, community participation and institutional reorganization. Finally, comments are made on research in progress.

The following notes are based on the experience of a multi-disciplinary research team at the Center for Regional Development and Planning (CEDEPLAR), Federal University of Minas Gerais, which has been studying human factors in malaria transmission and control in the Amazon region of Brazil since 1983. The comments reflect the work carried out by the team, which has maintained close collaboration with the Superintendency of Public Health Campaigns (SUCAM).

Although CEDEPLAR has more than ten years of experience in social research in the Amazon region, its specific interest in malaria is recent. The professional backgrounds of the project's permanent team lie primarily in the social sciences: economics, sociology, demography, public health, political science and architecture. Specialists from the biomedical area participated in the project as mentors, consultants and part-time researchers.

In spite of being non-medical neophytes, CEDEPLAR's team hopes to contribute to discussion of the presently very important problem of malaria in Brazil. It feels this is possible because malaria is not just a health problem, but is also an eminently social problem. Its causes have deep social roots, and social implications must be taken into account in control efforts. In this respect, malaria differs from diseases such as smallpox, poliomyelitis or cholera, which have been eradicated or drastically reduced through health interventions like vaccination and sanitation, more or less independent of changes in the social environment. Because of the far-reaching social dimensions of malaria, biomedical and social scientists must work together in combined efforts that take into account the broader social context in which malaria victims live.

For simplicity, the term "social" as used here includes economic, political and cultural factors, as well as certain environmental and epidemiological aspects, i.e. the dimensions which go beyond the biological and individual levels. The focus is not on the clinic or the laboratory, but on populations in the field. The main concern is with public health.

This essay on the potential contributions of social research to control of malaria in Brazil is divided into sections on: 1) the present status of social research on malaria, 2) the present status of malaria control in Brazil, 3) social research and diversification of the control strategy, and 4) research in progress.

THE PRESENT STATUS OF SOCIAL RESEARCH ON MALARIA

There is very little scientific literature on social aspects of malaria in Brazil. The gap seems to increase over time, with less written in recent decades than previously. Generally, broader studies only touch upon malaria, among many other subjects, or specific studies on malaria only touch upon social aspects.

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Basic epidemiological analyses of malaria are also scarce. With few exceptions (e.g. Marques & Pinheiro, 1982), the enormous volume of data collected by SUCAM goes practically unanalyzed, other than calculating the numbers of houses scheduled and sprayed, slides examined, positive cases, etc., with the respective rates and indices. Except for individual initiatives, routine analysis does not include age and sex distribution, place of probable transmission or the ratio of *P. falciparum* to *P. vivax*. Analyses of this type would provide indications if transmission is autochthonous or not, if it is indoor or outdoor and if drug resistance might be contributing to increases in prevalence.

Such epidemiological analyses would not require collection of new data, but simply better use of the data that SUCAM has collected for decades. There is very little institutionalized epidemiological feedback to control operations in the field. This does not mean that SUCAM shirks its responsibility, since international guidelines for malaria control have not emphasized epidemiological analysis.

The paucity of social research on malaria seems to be world-wide. Although there is much literature with direct or indirect reference to social aspects of malaria (see Sotiroff-Junker, 1978), social research which deals systematically and specifically with malaria, rather than just mentioning it as one problem or variable among others, is rare (e.g. Conly, 1975). Likewise, medical or epidemiological studies of malaria seldom adopt a social science perspective, as opposed to simply including "socio-economic" variables. Few studies, if any, combine social science in the full sense with systematic and profound analysis of the disease. This gap is starting to be filled due to the stimulus provided by the Social and Economic Research component of the UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (Social and Economic Research, 1985).

The recent shortage of epidemiological and social research on malaria seems to be due to epidemiological and social trends themselves.

As for epidemiological trends, malaria prevalence in Brazil and many other countries fell during the fifties and sixties and retreated from the most developed and populous regions of the country. While about half of the malaria in Brazil in 1965 was in the Center-West and North, virtually all cases in 1985 occurred in or can be traced to the Amazon region. The disease is now a problem only for a region with relatively little population and minimal political influence. Malaria has become peripheral, both geographically and politically. It is now a frontier disease.

Social trends regarding use of technology also seem to be relevant. Starting in the fifties, control programs in Brazil, as in the rest of the world (except Africa), were permeated by optimism that malaria would soon be "eradicated" by massive use of house spraying with DDT and new antimalarial drugs. This was to be a technological "fix", perfectly in line with scientific advances such as nuclear energy, Sputnik and Sabin vaccine. Thirty years later, it is not clear if we have the same faith in technology, having witnessed the explosions of Chernobyl and the Challenger and some new epidemics.

The rise of eradication campaigns and their initial success seem to have marked the demise of epidemiological and social research on malaria. Biomedical research was also affected. Why study a disease that was about to become extinct?

In sum, social research on malaria is in a sorry state. It may or may not be consolation to note that the situation of social research on other endemic diseases is not much better.

CEDEPLAR's team, composed of university-based social scientists, is interested in academic questions such as how to understand social determination and impact of endemic diseases. In fact, some of the most relevant results of the center's research may have to do with the methodology of social research on health or with frontier settlement in the Amazon. Beyond this interest in "basic" research, however, the team also seeks to contribute to the discovery and implementation of practical control solutions, here and now. The two objectives are entirely compatible, perhaps even inseparable.

The question, then, is: How can social research contribute to malaria control? Before answering, a brief diagnosis of malaria control in Brazil is needed.

PRESENT STATUS OF MALARIA CONTROL IN BRAZIL

SUCAM data show that malaria prevalence decreased in Brazil until 1970, when only 52,469 cases were registered. Since then, the number has grown constantly, reaching 399,462 in 1985. 96.3% of the cases were registered in the Amazon region, and most of the rest were contracted there. Thus, malaria has been virtually eradicated in the Center-South and Northeast of

Brazil, while it has grown 1500% in the Amazon. We can conclude that the eradication strategy worked on one side of Brazil, but not on the other.

The reasons for this difference are not clear. In the Center-South and Northeast, we do not know to what extent malaria was eliminated as a result of the control program as such, as opposed to "general development": clearing of forests, greater population density, higher incomes, improvements in sanitation and housing, better education and extension of health services. In the Amazon, we do not know if the program based almost exclusively on DDT and drugs is flawed in its design or its implementation. There may be problems in design, at least for the present situation of vectors and parasites in the Amazon. There are clearly operational problems. Because of insufficient manpower and material, insecticide coverage is incomplete (SUCAM, 1984). Probably, design and operational problems interact, so that the design cannot be implemented "correctly" in the physical and social environment of the Amazon: distance, climate, vegetation, vector density, lack of infrastructure, lack of qualified personnel and so forth.

Doubts regarding the effectiveness or appropriateness of the "chemical" strategy using pesticides and parasiticides do not mean that the conventional arms – DDT and standard anti-malarial drugs – should be abandoned. At least for now, they are what is available and there is much room for improvement in their use. SUCAM is an agency well-suited to apply them if given the means. Its workers make heroic efforts. In remote rubber estates, colonization projects, gold mining camps and poor urban neighborhoods, from east to west and north to south, one rarely finds houses that do not have SUCAM's number. Field work in such areas leaves one convinced that SUCAM is the government agency which is most present and active in the country's vast interior.

This does not mean that it functions well. There are often shortages of DDT, drugs, microscopes, slides, bicycles and fuel for the few vehicles which SUCAM has, if they are running. One sees workers loaded down with packs, supplies, pumps and buckets walking miles on foot in the tropical sun and rain. Slide results sometimes take weeks. Since conventional weapons have not been fully applied, it would be premature to dismiss them simply because they have not produced the desired results.

The problem is not just funding. SUCAM is subject to severe spending and hiring controls imposed by the federal government as part of current economic policies. These controls are incompatible with an agile and effective campaign against an enemy which multiplies every year. Because of them, SUCAM does not have the necessary flexibility to use the funds which are available.

Thus, while the first priority is to increase funding for malaria control, providing material conditions for SUCAM to put into practice what it already knows how to do well, this support requires flexibility, so that the funds can be used effectively.

By documenting the effects of the disease and the efforts of those responsible for its control, social research may make a small contribution to this end. Paradoxically, the greatest contribution is being made by the *Plasmodium* itself. The 14 cases of vivax malaria which recently appeared in a beach resort in São Paulo may have more impact on public opinion and on public policy than 400,000 cases in the Amazon. More so if there is a simultaneous attack of *Aedes aegypti* spreading dengue and yellow fever, with daily newspaper coverage. In 1986, endemic diseases previously isolated and forgotten may receive more attention and more action.

There is a number of ways in which social research might contribute to specific improvements in malaria control.

SOCIAL RESEARCH AND DIVERSIFICATION OF THE CONTROL STRATEGY

Although improved coverage with existing control methods, which requires additional resources, is a priority, the availability of sufficient resources should not be a pre-requisite for modifications in the antimalaria strategy. Ironically, the nearly impossible goal of spreading chemicals over the entire Amazon may constitute the greatest obstacle to change. Until full coverage is achieved, alternative measures tend to be considered luxuries, detours or waste of time and resources.

Even if full coverage is feasible in the Amazon, which is questionable, it may not be sufficient, given the region's particular physical and social environment, which has undergone significant change in recent decades. So far, the goal has been changed from "eradication" to "control", without significant modification in the content of the program. Reformulating the strategy itself may be the best justification for additional resources.

In addition to lack of funds, those responsible for controlling malaria place much of the blame for its persistence and resurgence in the Amazon on characteristics and behavior of the region's population: intense migration and mobility, primitive housing, little clothing, close contact with forest and water, etc. (Lima, 1982; Taul, 1984). Of course, this does not imply that migration must be stemmed or controlled, better houses be built and behavior changed before malaria can be controlled. Without accepting or defending these conditions, social scientists may show that the population's behavior is to a large extent structurally determined and cannot be changed easily. Unfortunately, malaria is not restricted to stable and "well-behaved" populations. Much to the contrary. The control strategy must be adapted to regional reality, and not vice-versa.

Whether or not there is sufficient funding to apply conventional control methods fully, there are several areas in which social research may contribute to diversification of the strategy: 1) dynamic micro-stratification, 2) selection and application of new methods, 3) intersectoral collaboration, 4) community participation, and 5) institutional reorganization.

1. Dynamic micro-stratification — Within the existing methodology, WHO recommends and SUCAM adopts a stratification approach for establishing priorities. In 1970, the malarious area of Brazil was divided into areas of short-term and long-term eradication, long-term eradication being in the Legal Amazon. Attack areas are defined for house spraying with DDT. Within these, specific areas are given priority I or II (Marques, 1986). Under existing procedures, all houses within these areas should be sprayed twice a year, regardless of prevalence in each locality.

It should be noted that all of the Amazon — 5.1 million square kilometers, more than half of Brazil — is in the attack area subject to DDT spraying. Areas with priority I are the size of Latin American or European countries, with enormous distances and poor accessibility during much of the year.

Since malaria is not evenly spread, but highly focal, available resources are literally dispersed over millions of square kilometers. To make matters worse, malaria outbreaks are most severe in areas where settlement is recent, which is where SUCAM is least prepared. Consequently, there is much spraying where there is little malaria and little spraying where there is much malaria.

It is not only a question of where spraying is done, but also when. Schedules are normally established without regard to trends in malaria. While teams are spraying in localities with little or no malaria, outbreaks may be under way in others, which will only be visited months later. SUCAM has a quasi-military structure, but it takes little account of the enemy's movements and reacts very slowly.

In 1984, SUCAM concluded that better vector control would require micro-stratification at the level of localities, the smallest unit used in control planning. The approach is now being implemented. It would be desirable for critical localities to be identified in advance and for priorities to be redefined as conditions change. Micro-stratification should be dynamic. Agility would be improved by use of epidemiological and social criteria for planning as well as mobile spraying units not tied into a pre-established schedule. Following the military analogy, SUCAM needs to be prepared for a "guerrilla" war.

What does social research have to do with dynamic micro-stratification? To a large extent, micro-stratification could be done with standard epidemiological data. Indeed, SUCAM could make better use of slide results, at the local level, for this purpose. Entomological studies would also be very important. On the other hand, better understanding of the social environment — settlement patterns, work environment, housing, spatial mobility, income, personal protection, treatment seeking, etc. — might permit foresight, so that critical points could be identified in a more timely way. With knowledge of social determination of disease, gained from studies at carefully chosen sites, it would not be necessary to do social research at each site.

Of course, it would be ideal if priority localities received a greater share of additional resources, without taking resources away from other areas. If, however, there are not sufficient additional resources and reduction of coverage in less critical areas is necessary, criteria must also be established for selection of these areas, and alternative methods must be found for dealing with them. Social criteria may also be useful for these purposes.

2. Selection and application of new methods — SUCAM recognizes that the present control strategy based on application of DDT to houses and certain antimalarials to patients should be diversified. New drugs are becoming available, biological control is being investigated and there are great expectations regarding malaria vaccine. Still, possible limitations in the Amazon setting, as well as past experience with "magical" solutions, recommend against excessive dependence on these new technologies.

Diversification could start by reviving some older weapons which were practically abandoned in the last few decades. In addition to combatting anopheline larvae with sanitation, there could be individual or community control of breeding places, including chemical or biological control, clearing vegetation in and around the water and small drainage or fill projects. Within economic limits, better personal protection against the vector could include improved house construction, avoiding sites or times of day in which biting is most intense, use of bed nets, coils, repellents and protective clothing and numerous other small measures that people could take once they are conscious and convinced of the transmission mechanism.

The choice of "new" methods depends basically on two things: 1) What are the specific factors that affect transmission and treatment of malaria among different social groups? 2) What is the economic, social and cultural feasibility of introducing new methods? Social and economic acceptability as well as technical effectiveness must be taken into account, particularly for the second question.

SUCAM insists that changes in policy should not be based on suppositions. Old practices should not be abandoned or new ones adopted on the basis of doubts, hunches or interesting ideas. There must be scientific data, with appropriate analysis. Social science data and analysis relevant for policy orientation are practically non-existent.

3. Intersectoral collaboration – The classic strategy is the exclusive responsibility of one federal agency, which has a "monopoly" of malarial control. With rare exceptions, the program does not receive collaboration or support from other sectors: agencies, firms or other organizations, public or private, connected to health or not. For supposedly "technical" reasons, SUCAM has sole responsibility for house spraying and administration of some antimalarials.

It is important to recognize that this vertical organization was an essential ingredient in the success of extending the malaria control program all over the Amazon, even in areas where other government agencies were absent or ineffective. Now, however, given the failure of eradication in the Amazon and the growing presence of the government and private enterprise, SUCAM's monopoly should be reassessed. At present, other sectors – the National Institute of Colonization and Agrarian Reform, Eletronorte, large ranches, construction companies, mining companies, etc. – are responsible for a large part of settlement in areas where malaria is critical. They have financial, material and human resources, as well as exercising great power over their employees and clients. They can and should be included in the struggle against malaria (SUCAM, 1981).

How can this be done? Integration depends on motivation and techniques. Social research can contribute to both. It can contribute to motivation primarily by demonstrating and documenting the costs of malaria. This is not just a matter of multiplying days of work lost by an average wage, even though this cost is considerable. There may be other direct and indirect costs, depending on the context. For example, there are negative effects on selectivity and retention of migrants with different socio-economic levels: avoidance, abandonment and turnover in settlement projects, reinforcing land speculation, and difficulties in recruiting and retaining qualified labor. The impact on small farmers can be devastating, with loss of an entire crop, if malaria strikes during critical moments such as clearing or the harvest. In many ways, malaria weakens those who are weak while strengthening those who are already strong.

As for techniques, proposed measures must be appropriate to the technical and financial capacity of the other sectors and to the type of "cliente" to be reached. Social research can certainly provide contributions on costs of malaria and appropriateness of measures for other sectors.

4. Community participation – House spraying does not depend on acceptance or participation, but is an authoritarian measure imposed from above. Indeed, in order for it to work, it must be obligatory. Other measures such as local control of breeding places and personal protection, on the other hand, depend almost entirely on people's participation.

WHO has given considerable attention in recent years to "community participation" (WHO, 1983). In endemic areas of the Amazon, one must ask: what community? Prevalence is greatest exactly where the population is most transitory and least organized: gold mines, road and dam construction sites, logging camps, new settlement projects. The question of community participation in such circumstances presents a great challenge for social research.

5. Institutional reorganization – The basic contradiction in SUCAM's structure is that its hierarchical organization, responsible for its brilliant success in deploying men and material in the vast interior, is now an obstacle to innovation and agility required by changing circumstances. There is a strong tension between needs for centralization and decentralization. Horizontal integration, involving other sectors, general health services and the population itself in the struggle

against malaria, as recommended by WHO, requires new procedures, new mentalities and new alliances. SUCAM's role is no longer purely technical, but must include a political dimension.

Social scientists specialized in analysis of organizations, cost-effectiveness, public policy and public administration, among other fields, could contribute in various ways to institutional reorganization, provided that they understand SUCAM's singular history and strengths and its institutional culture as well as the regional context in which it operates.

RESEARCH IN PROGRESS

CEDEPLAR's research on malaria began during field work on frontier expansion in São Félix do Xingu in Southern Pará. The gravity of the disease and its implications for frontier settlement suggested that it should be studied from the social angle. The Collective Health Program of FINEP and CNPq as well as IDRC of Canada provided financial support. In July of 1984, a household survey covering 887 families was conducted in Tucumã and Ourilândia. Data were also collected on agriculture, gold mining, urbanization, health care and other facets of life in the region. The data from different sources are being analyzed in an integrated way, so that individual attributes can be understood in their economic, social and political context.

Also in 1984, at SUCAM's request, the research was extended to Rondônia. The first step was a malaria perception survey among families selected for the Machadinho Settlement Project. A proposal submitted to the Social and Economic Research component of TDR led to financial support for a pilot phase of a longitudinal study. CNPq and SUCAM itself also provided support.

The longitudinal study involves follow-up of hundreds of settler families during at least three years and seeks to relate malaria prevalence at the individual and family level with the settlement process, social and economic differentiation and environmental changes. While the cross-sectional study in southern Pará provided considerable diversity, the Machadinho study will permit analysis in greater depth as well as observation of changes over time.

Results of multivariate analysis conducted so far show very marked socio-economic and environmental differentials in malaria prevalence (Sawyer & Fernández, 1986). In southern Pará, gold miners and rural workers have non-adjusted prevalence rates more than twice as high as urban workers and employers, which in turn have rates double those of children and the inactive. Differentials are attenuated but remain strong after adjustment for factors and covariates. Similar patterns are observed for work environment. These observations suggest that outdoor transmission may be much more important than was thought when the house spraying strategy was designed.

Prevalence rates used in the study are the number of cases of reported malaria per year, adjusted for time of exposure. Self-reported malaria histories are used because of biases inherent in hemoscopic or serological examinations and the relatively low number of present cases (see Sawyer, Fernández & Sawyer, 1986).

In addition to these analyses of the household surveys and complementary data, the political scientist in CEDEPLAR's team is carrying out an institutional analysis of malaria control in Brazil, based on historical research and interviews in SUCAM offices around the Amazon.

Multidisciplinary field work with large samples is very demanding in terms of staff and funding, but may generate, for the first time in Brazil, reliable and representative quantitative data on social and economic aspects of malaria transmission and control, in addition to qualitative data based on systematic observation rather than speculation.

FINAL CONSIDERATIONS

The problems and the research mentioned above illustrate potential contributions of social research to more effective control of malaria and the challenges it faces. For the goal to be reached, social scientists must work together with control personnel and with researchers in the fields of malariology, epidemiology, immunology, entomology, etc. Joint efforts are required if malaria control is to become more effective in the conditions prevailing in the Amazon today.

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