Tracking Malaria Trends in Gusii Using Participatory Rural Appraisal

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Abstract
Participatory Rural Appraisal (PRA) has been used in rural areas as a way of incorporating knowledge and opinions of local people into projects and programs. In this paper, PRA as been used to generate information on malaria trends over a three-decade period covering between 1970 and 2000. The exercise reveals clear trends over this period. The paper concludes that PRA techniques can be employed to guide the research process by yielding information that can then be systematically documented and quantified to generate models with a higher predictive power.

Key words: Participatory Rural Appraisal, Malaria trends, Gusii, Kenya
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Introduction

Malaria is a major risk factor in Gusii, where its incidence has increased over the last two decades. The worst malaria outbreak in the region occurred in 1998 when many people died as a result of malaria infection. This outbreak was linked to the El Niño phenomenon. Gusii is not the only region experiencing an upsurge in malaria. The whole of sub-Sahara Africa has experienced an overall increase in malaria cases (WHO 2003). The increase in malaria has been linked to many factors which include parasite resistance to anti-malarial drugs (Wellems and Plowe 2001, White 2004 and Laufer *et al.* 2007), mosquito resistance to insecticides (Hemingway *et al.* 2002), to changes in the vector ecology caused by global warming (Martens 1995 and Tanser *et al.* 2003) and changes in land use (Lindblade *et al.* 2000).

The cause of malaria increase in the tropics cannot be narrowed down to one factor. In deed there is debate on whether, for example, global warming alone has caused an increase in malaria cases or whether the observed increase is as a result of other related human activities/non-climatic events like emergence of parasites that are resistant to anti-malarial drugs (Hay *et al.* 2002; Patz *et al.* 2002).

In many countries complete systematic data is not available. In countries where it is available data goes back only a few years and is usually incomplete. In the absence of complete data, the construction of trends in the malaria burden becomes problematic. However, all is not lost. This paper draws on local knowledge to construct malaria trends in the Gusii area.

In order to extract local knowledge regarding malaria trends, a Participatory Rural Appraisal (PRA) was conducted in Bogiakumu location, South Kisii district. PRA is a label given to participatory approaches and methods which put greater emphasis on local knowledge. As the name suggests, PRA enables

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people to participate in making their own appraisal, analysis and plans. The key drivers are the local people whose perspective and knowledge of the area's conditions, cultural norms and social structure form the basis of data collected (Chambers 1992). Although originally developed for use in rural areas, PRA has been employed successfully in a variety of settings including the urban areas. Knowledge and information sharing and consensus building are key elements of the PRA process.

The Community Setting

The Bogiakumu community is inhabited by the Bogiakumu clan within Suneka division, South Kisii district. It is situated about 2 km off the Gesonso market on the Kisii – Rongo road and is about 5 km from Kisii town. The PRA was conducted as part of an intervention program aimed at reducing the incidence of malaria in the community. The community is rural with a population of more than 10,000 inhabitants. Agriculture is the mainstay of the people. They grow crops like bananas, avocadoes, tea and coffee which are sold to make an income. The landholdings are small in size making use of machinery expensive and uneconomical. As a result farming is labor-intensive.

As in the larger Gusii region, malaria is the leading cause of ill-health in the area. A majority of the people rely on anti-malarial drugs bought over the counter (Nyamongo 1999, 2002). Use of mosquito nets as a means of protection against mosquito bites is minimal. At the time of this study there were about 60 homesteads with mosquito nets within the community. As farming is the main source of income, when they get sick from malaria and other illnesses their ability to earn an income is curtailed.

Methods

PRA techniques have an inbuilt mechanism that allows for triangulation of the qualitative data collected. In order to validate data and ensure reliability, PRA relies as a rule of thumb on at least three sources of data investigating the same topic. For this paper, data was obtained using: (i) semi-structured interviews; (ii) focus group discussions, (iii) preference ranking, (iv) mapping and modeling and (v) seasonal and historical diagramming.

During the PRA exercise, emphasis was placed on the following areas: (i) developing a community social map, (ii) mapping out a transect of the community (taking special note of areas conducive for mosquitoes to breed), (iii) developing a seasonal calendar for the community, (iv) trends in the community over the last 30 years and (v) malaria symptoms.

Four meetings were held within the study site. Participants were asked to generate a social map of their community and to identify the various ecological factors associated with malaria risk (Figure 1). They were also involved in a community transect walk which resulted in the development of the transect map shown in Figure 2.

In addition to producing the social and transect maps, they were asked to provide a list of diseases common in the area and then, since the focus was on malaria, to name malaria signs/symptoms which they were asked to rank using a pair-wise ranking method. In order to obtain the required information, informants were presented with a pair of signs/symptoms and then asked to vote on a predetermined criterion i.e. what they considered to be the more important indicator or sign that one had malaria.

A total of 35 community members were involved in the PRA exercise. The community identified a team leader and an assistant from amongst the members present. In liaison with this person, the research team collected data to answer the research question, "how has the

malaria burden changed over the past 30 years?" The leader and the assistant were responsible for documenting all the information.

Findings

Community social map

Figure 1 is the community's representation of their social map. The social map contains a number of features which the community considers as important. These are described below. Some of the features such as swampy areas, ponds and areas with rivers have a direct link to the observed burden of malaria. Information on how the community recognizes and manages malaria infection was also collected.

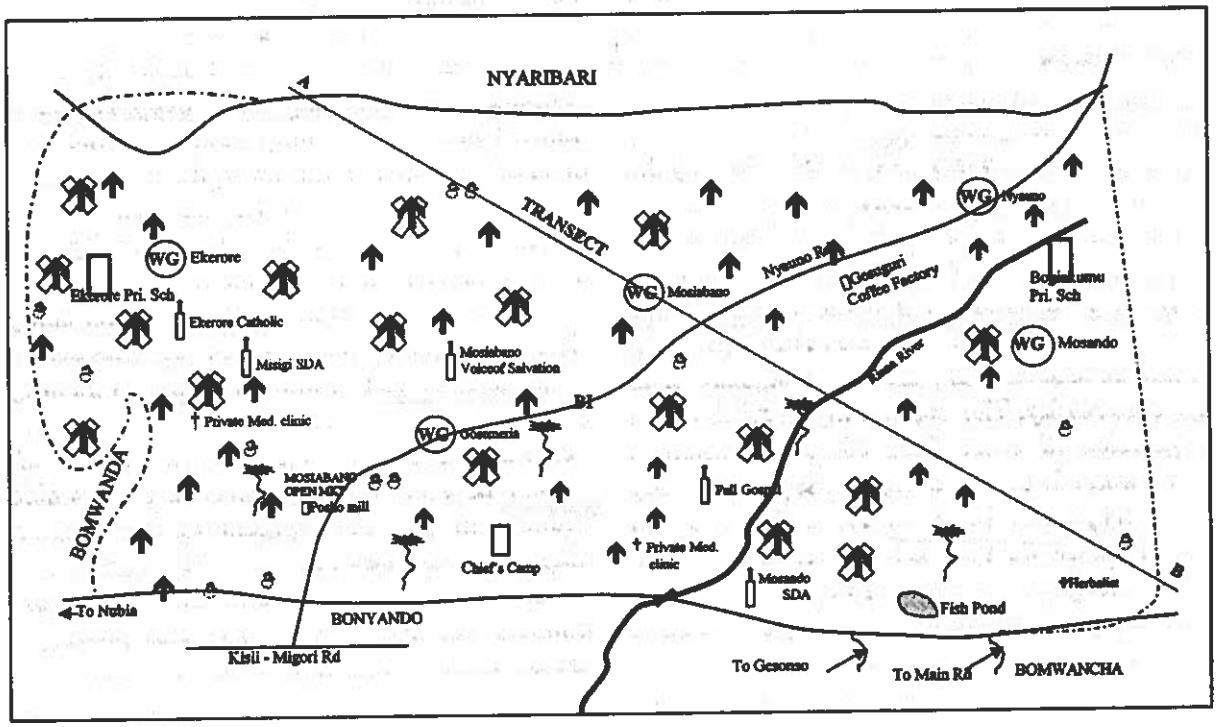

Figure 1: Community map of Bogiakumu, Kisii

The community is traversed by two roads and served by one open air market which operates throughout the week. Shops (kiosks) are scattered throughout the community. Community members expressed a concern that accessing health services, particularly during malaria outbreaks is problematic, a function of poor access roads. Due to poorly maintained roads, the cost of accessing care is high, which puts an additional burden on already low-resource households. The shops (kiosks) stock first-line anti-malarial drugs and antipyretics. Sulfadoxine-Pyrimethamine (SP) drugs were the first-line anti-malarials at the time of data

collection.

There are three primary schools and one secondary school serving the area. The pupils in the primary schools are involved in malaria control activities as a result of Merlin (a non-governmental organization working in the health sector) setting-up health clubs in the schools. They use these clubs to provide health education materials. The central focus is on mosquito control, recognition of malaria (including the recognition of danger signs) and the benefits of appropriate and prompt action in the treatment of malaria infection.

Three water springs in the community are protected by the Rural Domestic Water Supply and Sanitation Program. There is also a shallow unprotected well and two protected ones. There is one old fish pond, which did not have any fish. Mosquito larvae were observed in this disused pond. On a section of Riana river is a marshy area where mosquito larvae were similarly observed. However, no entomological data was collected to determine the species responsible for the larvae.

No government health care facility is located within the community. However, there is a mobile clinic ran by Nyabururu Catholic Mission which operates from the Chief's camp. Other medical facilities that serve the community include Iterio Mission Health Center which is located about 2 km away and the Kisii District Hospital about 5 km away. There are also 2 private clinics within the community. The Bamako Initiative (BI) center located in the community sells mosquito nets at a cost of about US$6.00 per net. The nets are sold untreated implying that those who buy the nets have to incur additional expenses to purchase chemicals to treat the nets. The community members reported that not all people are able to afford the nets and net retreatment chemicals. Consequently as shown in Figure 1 a number of homes lacked treated mosquito nets. There are four traditional healers who treat childhood illnesses such as sore throat, mouth sores, stomachache and body rashes among other ailments. They rely on locally available herbs for their work.

A transect of the sub-location reveals important features which might influence mosquito distribution and density. The transect and the summary of these features is presented in Figure 2. The community identified two areas with a relatively higher risk of malaria (shown as Zone A and Zone C in Figure 2). They identified these as areas with the potential for trapping water during the rainy season thus providing a favorable place for mosquito breeding to occur. Along the transect route banana plants were observed in every home. Banana is a popular food crop (but is also increasingly becoming a cash crop) grown in Gusii as is the maize crop. During the transect walk the maize crop had just been harvested.

Seasonal calendar

Seasonal changes identified by community members are summarized in Figure 3. These include changes in the rainfall patterns, cropping patterns, labor demand, temperature and availability of food and disease patterns. Heavy rains start around late February slowly rising to a peak in April. From then on the rains decline until June. As the rains decline, the mosquito population was reported to increase hence an increase in malaria cases in the community immediately following the rains. A second but shorter rainy season is also experienced in September/ October. However, the community observed that due to weather changes the rainfall pattern in the area is also changing.

Diarrheal diseases and typhoid also follow a similar pattern as malaria as captured in Figure 3. As shown in the seasonal calendar, diseases appear to coincide with the time when the food is in short supply. Participants linked

	ZONE A	ZONE B	ZONE C	ZONE D
Settlements	Densely populated	Densely populated	Densely populated	Densely populated
Vegetation	Blue gum trees, bananas, other trees and bushes	Cypress trees, bananas, bushes, other trees	Reeds	Blue gums, other vegetation
Malaria risk	Water likely to collect in the valley providing breeding places for mosquitoes		Water likely to collect in the valley providing breeding places for mosquitoes	
Problems	Erosion, many rocks, stagnant water (rainy season)	Lots of stones, very windy, shallow pit latrines	Marshy areas, fish ponds, high water table, open wells	Lots of stones, erosion, shallow pit latrines, open wells
Opportunities	Terracing, breaking big rocks to make ballast for sale, plant trees	Break rocks to make ballast for sale, plant trees, improve pit latrines	Plant trees, provide terraces, cover wells	Break stones to make ballast for sale, provide terraces, improve pit latrines
Constraints	Ignorance, ballast not in demand	Improved pit latrines expensive	Need mosquito larvae eating fish in ponds	Ballast not in demand

Figure 2: Transect map of the study community

a higher incidence of disease during the low food supply period to "reduce body immunity." They argued that when the food is plenty, "the body's immunity is also strong and can withstand infections leading to fewer diseases during that time."

The different crop cycles have implications on the labor demand in the community. In general, apart from the domestic chores, women are involved in weeding and harvesting during the months of February to March and August respectively. The highest demand

for male labor is mainly during the ploughing period in January and February and in July and August. The community noted that unlike the women who work throughout the year, men have time to rest during most of the year. December, a month generally accompanied by ceremonies such as circumcision and Christmas celebrations, is usually a resting period.

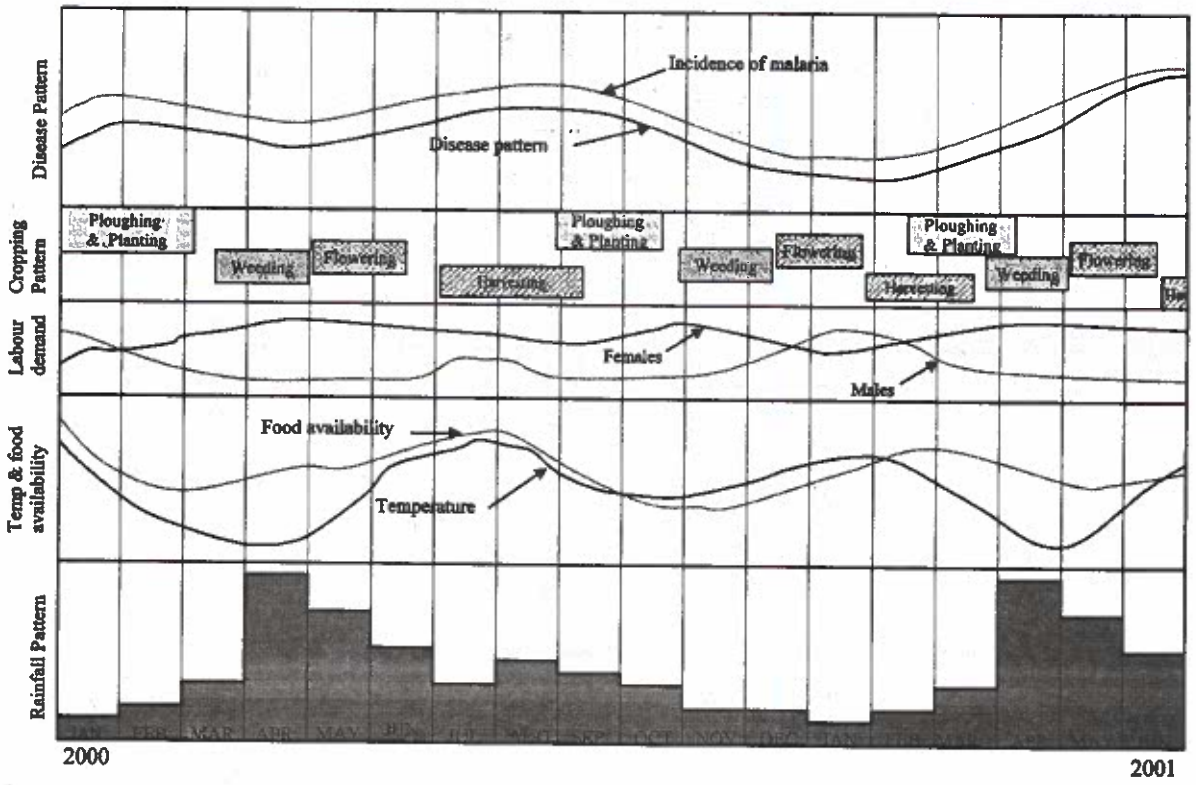

Figure 3: Seasonal calendar for Bogiakumu, Kisii

Trends

Figure 4 shows changes perceived to have occurred over a thirty-year period between the year 1970 and 2000. These include changes in land size, rainfall patterns, number of dams and fish ponds and perceived malaria trends. Generally the size of landholdings has reduced in the last 30 years due to subdivision arising from increased population. This has resulted in small uneconomical plots leading to reduced food production.

Similarly, members reported that rainfall has reduced over this same period. From oral narratives, rains used to start in April, but there have been recent changes in this pattern with the starting period becoming irregular. As farming is rain-fed, this means people are less accurate in predicting the start of the planting season. The changes have also resulted in the area receiving less rainfall over time. The community attributes this to "deforestation and as a result of industrial development." They argued that these factories, which are not necessarily in the area, interfere with rain formation.

Fish ponds were introduced in the 1970s. The fish was meant to provide a protein supplement to the community. However, the

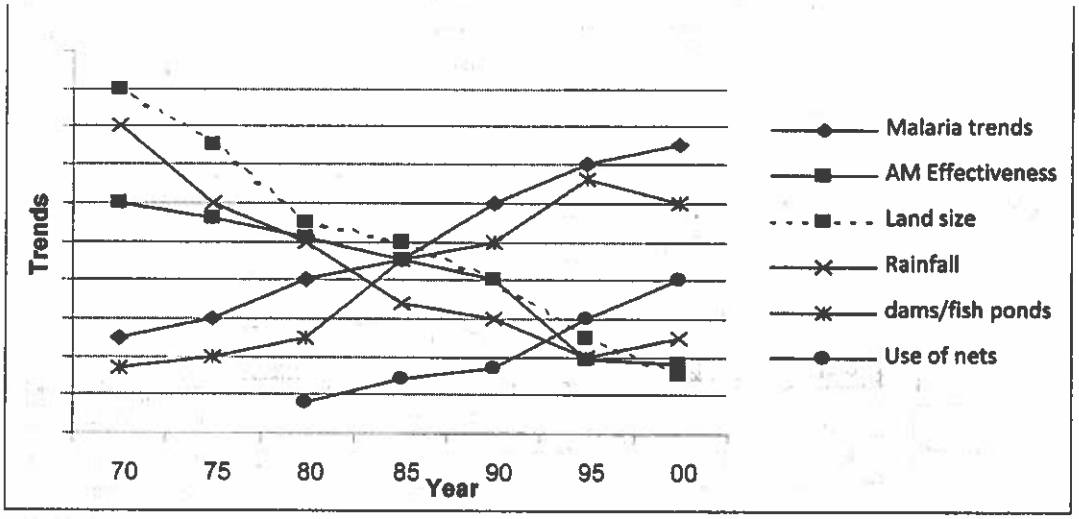

Figure 4: Perceived trends of various indicators in the study area

ponds were later abandoned as fish farming became unviable due to indiscriminate harvesting and as a result of being eaten by wild animals. These ponds now act as a breeding ground for mosquitoes. There are efforts by organizations working in the area to encourage the community to re-introduce fish farming.

Community members noted that during the last three decades malaria cases have tripled. Regardless of the improved living conditions and better drugs, the disease continues to claim more lives. Community members argued that the increase in malaria cases is the result of the introduction of fish ponds, and cattle dips which have now been left unused for several years. They also argued that use of plastic containers trap water for mosquitoes to breed in. According to participants, all these "have contributed to an increase in the number of mosquito breeding sites."

The community also links the rise in malaria cases to resistance against—anti-malaria (AM)—drugs, notably Chloroquine, which is no longer a first-line drug. Members observed that they are forced to take several doses (which may imply an overdose) before observing any change. Some end up visiting traditional healers when the drugs seem to fail. Despite its documented ineffectiveness some people reported that they still preferred Chloroquine in the treatment of malaria.

Change from Chloroquine as a first-line drug to SP was reported to have reduced the burden of malaria. Perceived mortality due to malaria was reported to have dropped. People preferred SP because it is a single-dose therapy against malaria. However, others argued that there is potential to overdose because SP does not have antipyretic properties of Chloroquine. They reported that a patient who takes SP is likely to take another dose thinking that the presence of fever is an indication that the earlier dose failed to work. Anti-malaria drugs were available at no extra cost at government facilities.

In order to deal with the increase in malaria problem, they reported that they now

use treated nets. The use of nets was reported to have gone up during the last 10 years but as noted earlier, there are problems of coverage. Members said that those who have nets do not get sick regularly. The nets were obtained from a BI center that has been in the community for more than six years. The majority of the community members felt that the nets are, however, expensive.

The close link between the increase in the incidence of malaria, effectiveness of anti-malarial drugs and net use is demonstrated in the reports of perceived trends (Figure 4). The trends were collected over the span of the four meetings and members were not shown the previous representation of the trends they had identified. What is interesting to note is that the time when they reported an upsurge in malaria (the period after 1985) is also the time the effectiveness of anti-malarial drugs seem to nose-dive while the use of mosquito nets and construction f fish ponds increased.

Malaria signs/Symptoms

The pair-wise ranking of seven important malaria signs/symptoms are presented in Table 1. These signs/symptoms were selected by members as the most important. On the basis of the community's ranking, the most important indicator for malaria in their view is feeling cold followed by headache. The other indicators in the order they were ranked are fever, joint pains, general malaise, vomiting and diarrhea.

Table 1: Pair-wise ranking of malaria symptoms by the Bogiakumu community

	Cold	H/ache	Vomit	Joint pains	Fever	General malaise	Diarrhea	Votes (rank)
Coldness		C=29 H = 6	C = 35 V = 0	C = 30 J = 5	C = 27 F = 8	C = 35 G = 0	C = 35 D = 0	191 (1)
Headache			H = 35 V = 0	H = 26 J = 9	H = 25 F = 10	H = 35 G = 0	H = 35 D = 0	162 (2)
Vomiting				V = 0 J = 35	V = 0 F = 35	V = 15 G = 20	V = 31 D = 4	46 (6)
Joint Pains					J = 10 F = 25	J = 28 G = 7	J = 33 D = 2	120 (4)
Fever						F = 32 G = 3	F = 35 D = 0	145 (3)
General malaise							G = 18 D = 17	48 (5)
Diarrhea								23 (7)

Discussion

Indigenous knowledge (IK) is an important element in community ecological information systems. Often because the community is composed of members who have resided in a place over a long period, there is rich repository of knowledge. This knowledge is a reservoir of qualitative data which, not the least, is important as it provides entry points in intervention programs. IK also drives what the community does as a group – individual members always tend to conform to the general norm. Unfortunately often program implementers overlook IK as a resource.

From the qualitative data presented here, it is clear that the community is aware of the

trends occurring in their area. For example, they reported an increase in malaria risk due to what they consider to be gradual changes over time and changes in environmental conditions and land use patterns. The increased risk of malaria during certain months of the year also affects labor supply. From Figure 3, demand for agricultural labor is greatest during the time when the community perceive malaria to be at its highest intensity. In terms of seasonal changes, the community reported that the risk to malaria is highest during the period of heavy rains, which is also the time they need more labor as farmers prepare their land for food production.

The link between malaria and lost agricultural labor as been reported from other regions; it is not unique to Bogiakumu. For example, in Mali it is estimated that a sick child alone would reduce family labor supply by 893 hours per cropping season as caretakers shift their time to caring for the child as opposed to working on the rice field (Larochelle and Dalton 2006). On the other hand, for non-rice producing households the reduction in agricultural family labor was an average of about 455 hours per agricultural season which worked out to about 109 hours per hectare. Assuming an eight-hour working day, clearly farmers lose anywhere between 57 – 112 days per cropping season.

Quarry sites and abandoned fish ponds, the water collecting sites, and cattle sheds expose the community to the risk of malaria. In the Bogiakumu area water is likely to collect in the low-lying areas thereby creating breeding sites for mosquitoes. In Nigeria one study has documented a relationship between malaria infection and abandoned quarry sites (Emeka *et al.* 2007). In this study infection was highest among those who were closest to quarry sites while the presence of malaria parasites reduced the farther away the people were from the quarry sites. This and similar other studies reveal an increased malaria risk near quarry and brick making sites.

The tradition of having cattle sheds within the homestead may also be contributing to the incidence of malaria. As study in western Kenya (Mikanawa *et al.* 2002) has documented a link between livestock and human host availability and the relative abundance of mosquito larvae. Thus the perception b the people that these cattle shed may be contributing to the level of malaria may not be farfetched.

The proportion of people using nets as a means of protection against mosquito bites is low. This is clearly shown in the community social map. Overall, the proportion of people with nets is in the range of 20% to 35%. Lack of means for self-protection against mosquito bites elevates the relative risk of malaria infection. As a result of this increased risk people suffer from malaria and incur economic loses due to treatment seeking and as a result of lost agricultural labor.

Conclusion

The PRA exercise reveals that in the absence of documented data communities have a unique contribution that they can make to program development. Local knowledge is context-specific and it can contribute to the success of programs if carefully harnessed and used to plan implementation. The use of the PRA techniques provides a fast and cost-effective way of achieving this. PRA can also be employed to guide the research process by yielding information that can then be systematically documented and quantified to generate models with a higher predictive power.

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