Review of the Development and Use of Poverty Maps: 14 Case Study Notes

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2002

World Resources Institute
http://www.population.wri.org/

UNEP/GRID-Arendal
http://www.povertymap.net/pub.htm

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LIST OF ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
CEMMA	Committee for Ethnic Minorities in Mountainous Areas (Vietnam)
CEPAL	Economic Commission for Latin America and the Caribbean (Peru)
CGIAR	Consultative Group on International Agricultural Research
CIDA	Canadian International Development Agency (Canada)
CNS	Ministry of Interior's Risk and Disaster Management Unit (Madagascar)
CONADE	Consejo National de Desarollo (National Council of Development) (Ecuador)
CSES	Cambodia Socio-Economic Survey
CRS	Catholic Relief Services
CSR	Center for Social Research (Malawi)
DANIDA	Danish International Development Assistance
DfID	Department for International Development (United Kingdom)
DOH	Department of Health (South Africa)
DOS	Department of Surveys (Malawi)
DWAF	Department of Water Affairs (South Africa)
EA	Enumeration Area (Malawi)
ECLAC	Economic Commission for Latin America and the Caribbean
EcoCiencia	La Fundación Ecuatoriana de Estudios Ecológicos (Ecuador)
ECV	Encuesta sobre las Condiciones de Vida (Ecuador)
EIS	Environmental Information System
ENV	Encuesta de Niveles de Vida (Panama)
ENIGFAM	Encuesta Nacional de Ingresos y Gastos Familiares (Guatemala)
ENCOVI	Encuesta Nacional sobre Condiciones de Vida (Guatemala)
EPA	Extension Planning Area (Malawi)
FAO	Food and Agricultural Organization of the United Nations
FEWS	Famine Early Warning System
FISE	Fondo de Inversión Social de Emergencia (Emergency Social Investment Fund) (Nicaragua)
FLACSO	Facultad Latinoamericana de Ciencias Sociales (Guatemala)
FONCODES	Fondo Nacional de Compensación y Desarrollo Social (Peruvian Social Fund)
FSS	Supplementary Social Fund (Nicaragua)
GIS	Geographic Information System
GRID	Global Resource Information Database (United Nations Environment Programme)
GSO	General Statistics Office (Vietnam)
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (Germany)
HDI	Human Development Index
HIE	Household Income and Expenditure (Burkina Faso)
HIPC	Highly Indebted Poor Country
IDA	International Development Agency

IDB	Inter-American Development Bank
IES	Income and Expenditure Survey (South Africa)
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IHS	Integrated Household Survey (Malawi)
INE	National Statistical Institute (Guatemala, Mozambique)
INEC	Instituto Nacional de Estadistica y Censos (Ecuador, Nicaragua)
INEI	Instituto Nacional de Estadística e Informática (Peru)
INSTAT	Institut National de la Statistique (Madagascar)
IRD	Integrated Sustainable Rural Development (IRD)
ISR	Index of Social Responsibility (Brazil)
ISRDP	Integrated Sustainable Rural Development Programme (South Africa)
IPEA	Ministry of Planning's Institute of Applied Economic Research (Brazil)
JSIF	Jamaica Social Investment Fund
JICA	Japan International Cooperation Agency
KFW	Kreditanstalt für Wiederaufbau (Germany)
LCI	Life Condition Index
LSMS	Living Standards Measurement Survey
MARD	Ministry of Agriculture and Rural Development (Vietnam)
MECOVI	Program for the Improvement of Living Standards Measurement Survey (Nicaragua)
MEF	Ministry of Economics and Finance (Peru)
MOLISA	Ministry of Labor, Invalids, and Social Assistance (Vietnam)
MPF	Ministry of Planning and Finance (Mozambique)
MPI	Ministry of Planning and Investment (Vietnam)
NIAPP	National Institute for Agricultural Planning and Projection (Vietnam)
NGO	Non-Governmental Organization
NORAD	Norwegian Agency for Development Cooperation
NPIS	National Public Investment System (Guatemala)
NSO	National Statistics Office (Malawi)
ODEPLAN	Oficina de Planificación de la Presidencia de Ecuador (Ecuador's planning agency under the Office of the President)
OHS	October Household Survey (South Africa)
PACE	University of Pennsylvania Pan African Census Explorer
PARPA	National Action Plan for the Reduction of Absolute Poverty (Mozambique)
PCA	Principal Components Analysis
PIOJ	Planning Institute of Jamaica (Jamaica)
PPA	Participatory Poverty Assessment (Cambodia)
PRSP	Poverty Reduction Strategy Program
ROC	Receiver Operator Characteristics (Vietnam)
RPS	Red de Protección Social (Social Safety Net program - Nicaragua)
RTI	Research Triangle Institute (USA)
SADC	South African Development Community
SDC	Swiss Agency for Development and Cooperation
SEGEPLAN	Secretariat of Planning and Programming for the Presidency (Guatemala)

SETEC	Technical Secretariat of the President (Nicaragua)
SGPRS	Strengthened Growth and Poverty Reduction Strategy (Nicaragua)
Sida	Swedish International Development Cooperation Agency (Sweden)
SIF	Social Investment Fund (Panama)
SILAIS	System of Local Health Care Center (Nicaragua)
SNIP	National Investment System (Nicaragua)
Statistics SA	Statistics South Africa
TA	Traditional Authority (Malawi)
UBN	Unsatisfied/Unmet Basic Needs
UEM	Eduardo Mondlane University (Mozambique)
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNPFA	United Nations Population Fund
URL	University of Rafael Landívar (Guatemala)
USAID	United States Agency for International Development
VAM	Vulnerability Assessment and Mapping (Malawi)
VLSS	Vietnam Living Standard Survey
WHO	World Health Organization
WFP	World Food Programme
WRI	World Resources Institute

Experiences with the Development and Use of Poverty Maps

Case Study Note for BRAZIL*

1. Background information on the poverty mapping initiative

Since the late 1990s, Brazil, like many other countries, has been in the process of decentralization. Such decentralization has led to an increased demand for highly disaggregated data, especially at a municipal level.[1] Two highly respected government think tanks—the Ministry of Planning's Institute of Applied Economic Research (IPEA) and Fundação João Pinheiro (a Minas Gerais State Government research center)—along with the United Nations Development Programme (UNDP) recognized this growing demand for high-resolution data. Discussions were held between IPEA, Fundação João Pinheiro, and UNDP on the possibilities of developing high-resolution information that would be easily accessible, reliable, and usable for different audiences. UNDP had recently completed a *Human Development Report* (UNDP et al. 1996) and considered the development of an *Atlas of Human Development* (UNDP et al. 1998) as an effective extension to make data and information more readily available.

2. Process of poverty mapping

IPEA and Fundação João Pinheiro, with UNDP support, initiated the development of the *Atlas of Human Development* for Brazil in 1995 (UNDP et al. 1998). Two versions of the atlas have been developed. The first version of the atlas— *Conditions of Life in Minas Gerais State, 1970, 1980, 1991*—was published in 1997 and consisted of a series of municipal-level human development indicator maps for Minas Gerais, the largest state in Brazil.[2] Subsequently, in 1998, a second version of the atlas was published, containing human development indicators for all 4,491 municipalities, 558 micro regions, 27 states, and five macro regions in Brazil. Two individuals from IPEA, five individuals from Fundação João Pinheiro, one individual from UNDP, and one private consultant were involved in developing the atlas. While UNDP funds covered production costs and the consultant fees, IPEA and Fundação João Pinheiro staff time were covered by their respective institutions.

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[1] Municipalities have been given substantial power under decentralization.

[2] Minas Gerais, at the time, had 721 municipalities and a population of approximately 50 million.

Both versions of the atlas contained and mapped indicators in five sectors: education (literacy and enrollment rates), health (life expectancy), housing (water supply and sewage facilities), income (inequality and population under the poverty line), and infant mortality. In total, 38 simple and transparent indicators, easy to understand and reproduce, were developed. Data from the 1970, 1980, and 1991 censuses were used to create a time series for each of these 38 indicators (e.g., municipal-level maps for school enrollment for 1970, 1980, and 1991). While most of the indicators used disaggregated data (e.g., on education), two of the 38 indicators were composite indices: the Human Development Index (HDI), containing aggregated data on income, education, and longevity, and a Living Conditions Index (LCI), based on education, health, childhood, income, and housing data. The HDI map, in particular, has been widely used (see Section 3). The availability of aggregated and disaggregated data sets (especially the HDI) at different spatial and temporal scales is thought to have helped encourage the widespread use of these data Results of the atlas demonstrate that Brazil's poverty pockets are concentrated in the northeastern part of the country. Furthermore, the atlas results indicate that poverty is found throughout Brazil, even in Brazil's richest state of São Paulo. IPEA, Fundação João Pinheiro, and UNDP are planning to update the atlas using data from the 2000 census.

More recently, Brazil developed even more highly disaggregated atlases (at a neighborhood level) for three large, densely populated cities: Belo Horizonte, Rio de Janeiro, and Recife. The development of these neighborhood-level maps was sparked by the recognition that municipal-level maps inadequately captured the varied levels of poverty *within* urban areas. (Results of this analysis indicated that areas within the city of Recife have lower HDI levels than even the least developed municipality in all of Brazil.) The development of the neighborhood-level city maps relied on both survey[3] and census (1970, 1980, and 1991) data. The Rio de Janeiro neighborhood atlas further relied on comprehensive qualitative surveys (i.e., focus groups) and other data sources, such as police records.

Brazil has been especially active in disseminating its *Atlas of Human Development*. A digital copy of the atlas on CD was developed and widely distributed. The CD provides the largest database ever assembled at the municipal level for Brazil and includes software that allows individuals to make user-defined maps, indices, and thematic indicators.[4] The software was designed to be user friendly, so that even novice users can easily access, display, and use the CD's geographic and tabular data. The software's open architecture allows users to easily export spreadsheet tables, maps, graphics, and texts to other compatible software. Development of the software emphasized supporting the widest possible access to the atlas information. The software was intentionally created to run on IBM 486-compatible computers (then the most commonly available in Brazil)

[3] Survey data were obtained from yearly surveys resembling the World Bank's Living Standards Measurement Survey (LSMS). Aggregated indicators, based on LSMS data for 1980-85 and 1995-99, were developed.

[4] The software includes tools that allow the user to create 121,220 maps, 6,612 tables, 5,081 profiles, 159,042 charts, and 32 spreadsheets.

and to require little memory. To avoid having to pay costly royalty fees to GIS software companies, the software was developed in country from scratch (in Delphi language).

The atlas' CD has been widely distributed at no charge to all Brazilian libraries and various federal and state government agencies, think tanks, and research institutes. Furthermore, numerous national-, state-, and municipal-level government, donor, and private agencies have purchased the CD (see Section 3). UNDP-Brazil used its existing marketing agreement with IPEA to sell the CD.[5] Demand for the CD has been so strong that the CDs are currently sold out. UNDP is looking for a commercial partner to continue distribution of the CD.

The atlas obtained widespread publicity through newspaper and television coverage. The 1998 CD launch of the *Atlas of Human Development*, for example, received two hours of primetime television as well as front-page newspaper coverage, thought to have reached 16 million viewers. More recently, the Rio de Janeiro neighborhood atlas received 80 pages of coverage in a special supplement of a major newspaper over a 10-week period. Widespread coverage triggered rich debate on the atlas findings; more than 50 newspapers from every region in the country published extensive stories and editorials on the results. Continued annual coverage of the HDI indicates ongoing interest in such data among Brazil's major newspapers and TV stations.

Familiarity with the HDI has become so widespread in Brazil that it is routinely referred to in political speeches and within civil society at large (see Section 3). Fundação João Pinheiro even received an inquiry concerning which areas, based on the HDI, would be most suitable for retirement. Geography curricula in secondary schools now incorporate background on the HDI, the results for Brazil, and use of the digital atlas. Furthermore, university entrance exams currently include questions on the HDI.

3. Use and impact

By providing high-resolution data on key simple indicators and by emphasizing widespread distribution of the atlas, the developers of Brazil's *Atlas of Human Development* have caught the attention of government, NGO, donor, and private users. Foremost, the federal government is currently using the atlas to target its social expenditure under the "Alvorada's Program."[6] This program was developed under the current administration amidst opposition criticism that the government was focusing too intensely on economic conditions and not devoting sufficient attention to social issues. The program supports initiatives to reduce poverty and to improve the quality of life in extremely poor municipalities.

[5] Note that IPEA currently sells UNDP's *Human Development Report* and other publications.
[6] The "Alvorada's Program" is administered by the Secretariat of Social Assistance, which is linked to the Ministry of Welfare. A detailed description can be found at http://www.presidencia.gov.br/projetoalvorada

Over a three-year period (2000-2002), the Alvorada's Program will, through various line ministries, distribute R$11.6 billion (approximately US$4.2 billion)[7] to support poverty reduction initiatives. The program relies fundamentally on the atlas' HDI indicator information to help allocate its funding, based on the HDI's reputation as an "internationally accepted indicator" of social development levels. The targeting procedures used by the program focus on municipalities nationwide with an HDI of less than 0.5.[8] Specifically, the program will provide the following support to Brazil's poorest municipalities:

- provide literacy training for 1,050,000 people aged 15-29;
- provide remedial courses for 525,000 students;
- create facilitating conditions to educate 1,000,000 new students;
- provide scholarships to poor families to keep their children (aged 7 to 14) in school;
- assist 627,000 children and young people in an effort to eradicate child labor;
- improve water and sanitary facilities in approximately 16,000 schools;
- provide 1,350,000 families with water supplies, sewage facilities, and sanitary improvements;
- provide the poorest municipalities with approximately 6,000 new family health care teams (this will serve an estimated 31 million individuals);
- assist approximately 2 million pregnant women and newborns;
- supplement tourism infrastructure;
- fight poverty, especially in northeastern Brazil;
- support family farms in the poorest municipalities;
- install approximately 12,000 solar energy kits at schools and health care posts; and
- transfer R$300 million (approximately US$108 million)[9] to development and infrastructure programs.

In addition to its application in the Alvorada's Program, the federal government used the HDI as one guideline affecting social development expenditure in the 2001 national budget (estimated at R$42.3 billion, or about US$15.2 billion).[10] The Ministry of Communications used the HDI maps to select poor municipalities that will receive

[7] Based on an exchange rate of US$1.00 = R$ 2.788 (September 24, 2001).

[8] Initially, the program selected the 12 poorest states based on HDI rankings (the program was referred to as "HDI 12"). Subsequently, using updated atlas results, the program added another two states ("HDI 14"). Under the "HDI 14" program, all municipalities with an HDI of less than 0.5 in the selected 14 poorest states would be eligible. When more disaggregated HDI results were made available, politicians from the richer states lobbied the central government to extend the program to poor communities within richer states. In response to such pressure, the government refined the targeting strategy to select municipalities *nationwide* with a HDI of less than 0.5.

[9] Based on an exchange rate of US$1 = R$ 2.788 (September 24, 2001).

[10] Based on an exchange rate of US$1 = R$ 2.788 (September 24, 2001). According to the Brazilian government, social development received the majority of funds in 2001, with 54.1% of total expenditures. Source: http://www.planejamento.gov.br/orcamento/conteudo/orcamento_2001/integra_mensagem/politica_desen_social.htm. Other information can be found at http://www.ipeadata.gov.br/.

computers (4,500), free Internet access, and free access to e-government services and online information. The HDI maps have also been used to choose poor municipalities to receive free medicine in an "essential pharmacy" program. In Rio, a community kitchen project (with a budget is approximately US$5.2 million) used HDI maps to identify poor households for distribution of free breakfasts.

At the state level, the atlas has been used to help reshape policies. In Minas Gerais, for example, the government used *Conditions of Life in Minas Gerais State, 1970, 1980, and 1991* to formulate a "Robin Hood law," which changed the criteria for distributing value-added and services tax revenues (ICMS) among the state's municipalities. Under this new law, a comprehensive set of human development indicators is being used to redistribute the total value of tax revenues among Minas Gerais state counties, benefiting poorer municipalities that are making an effort to invest in health, education, sanitation, food security, environmental conservation, and other social issues. Before the Robin Hood law, only two indicators were used to distribute such funds: size of the population (the larger the population, the greater the revenue, providing an incentive for rapid population growth) and fiscal value added locally (providing an incentive for concentration of economic growth). Approximately US$1 billion has been redistributed from the richest to the poorest municipalities using the HDI and the Robin Hood law. Moreover, the states of Minas Gerais and São Paulo recently required, under a Social Responsibility Law, the use of an Index of Social Responsibility (ISR) incorporating the HDI (among other indicators) to help identify state development and investment needs.

Unlike most other countries, Brazil's poverty mapping results have been used by a number of private entities. For example, one of the country's largest insurance agencies, Atlântica Boavista, used the atlas to help calculate life insurance premiums. General Motors used the Brazilian HDI rankings to select a site for a new automobile manufacturing plant. The company chose Rio Grande do Sul, the state with Brazil's highest HDI levels, indicating the availability of a relatively well educated, highly skilled labor force in the state. Similarly, the Federation of Industries and Commerce of Industry in the state of Rio Grande do Sul used its favorable HDI results in efforts to attract investment to the state. Brazil's largest industrial gas firm, White Martins, used HDI data to help administer a social responsibility project in which youngsters (aged 15-17) living in poor areas (i.e., areas of lowest HDI) are given grants to act as community health and human rights agents. This project, undertaken in partnership with the Ministry of Health and Welfare, will invest approximately US$1.17 million.

Neighborhood-level atlases have also been used by the Brazilian private sector. For instance, Telemar Co., one of Brazil's largest telecommunication providers, used Rio de Janeiro's neighborhood atlas to market differentiated telephone services to poor populations within the city. This example illustrates the crucial observation that poverty mapping results can be used for various purposes, not all of them necessarily aligned with improving poor people's living conditions. In Telemar's case, while telephone companies are required by law to provide landlines to all communities, companies would often rather market the use of mobile phones, especially to poor individuals and communities. Not only does such technology obviate the need for costly investments in

landline infrastructure, mobile phones require prepayment, unlike the retroactive charges associated with landline service that poor individuals may have more difficulty in paying.

The *Atlas of Human Development in Brazil* has had widespread impacts in the country. Foremost, it has helped to increase the transparency and accountability of decision-making. Prior to the atlas, it was uncommon for programs to geographically target poverty reduction efforts. The atlas ignited media and local policy debates in which references to HDI ranking (e.g., by politicians in their speeches) are common. Installing the atlas on library computers has generated substantial interest among local communities and civil society at large in community HDI rankings.

While the use of the atlas and its impact have been substantial, the misuse of data in the atlas is a concern. Due to the atlas' popularity, its use has been encouraged in a variety of applications, including some for which it is unsuitable. For example, the government's initial selection of 14 states with the lowest HDI for development initiatives was widely criticized. (This program was ultimately revised as the "Alvorada's Program", as described above). The use of older data—based on 1991, 1980, and 1970 census results—raises concerns, especially the use of atlas results to influence the national budget (see above). Awareness of the limitations of the atlas data is as important as awareness on the existence of the data themselves. Due in part to poor knowledge of the limitations of the atlas, one municipality attempted to sue UNDP over its ranking in the HDI, unaware that the indicator was based on 1991 rather than current data.

There is a need to further disaggregate poverty data and especially to update the HDI map. The Federation of Industries of the state of Rio de Janeiro recently decided to launch a $1 million participatory research project to further evaluate, at a fine resolution, poverty in Rio de Janeiro's 166 neighborhoods. This assessment will be used as a foundation for a large collaborative social responsibility project that will include the participation of private companies, NGOs, universities, and other actors. With increased awareness of the appropriate use of the atlas, these data may be used to continue to empower communities, reshape policy, and create accountable and transparent decision-making.

Bibliography

United Nations Development Programme (UNDP), Institute of Applied Economic Research (IPEA), Brazilian Institute of Geography and Statistics (IBGE) & João Pinheiro Foundation (FJP). 1998. *Atlas of Human Development in Brazil*. Brasília, DF: UNDP.

United Nations Development Programme (UNDP) & Institute of Applied Economic Research (IPEA). 1996. *Brazil Human Development Report*. Rio de Janeiro: IPEA; Brasília, DF: UNDP.

Experiences with the Development and Use of Poverty Maps

Case Study Note for ECUADOR*

1. Background information on the poverty mapping initiative

Ecuador's first poverty index and map was developed in 1989 using a methodology originally developed by the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) based on an unsatisfied basic needs indicator. The poverty index relied on 1982 census data and was based on such indicators as access to safe drinking water and electricity. While the ECLAC indicator was initially developed for Chile, it was adjusted for specific circumstances in Ecuador. This indicator nonetheless did not adequately reflect poverty in Ecuador and it was minimally used.

In the early to mid-1990s, various uncoordinated efforts to develop poverty maps—at different institutions using different methodologies—were underway. Among these institutions was the National Statistics Institute of Ecuador (*Instituto Nacional de Estadistica y Censos*, or INEC). The government was considering eliminating a fossil fuel subsidy and needed information on poor households to help target a compensatory transfer. Under tight time constraints, INEC developed a basic needs indicator. Five variables were selected ad hoc to capture, at a household level, access to safe water, sanitation, and waste disposal services as well as education (of the household head) and housing (a crowding index based on the number of people per bedroom). The selection and weighting of the variables was considered by many to be subjective and biased.

While the government eventually decided against removing the subsidy, the development of the INEC basic needs indicator did spark discussion of how best to develop information on the location of poor households. Two World Bank staffers, Jesko Hentschel and Peter Lanjouw reviewed the methodology and suggested to the director of INEC that, rather than weighting variables ad hoc (e.g., assigning access to safe water a possible total of 20 points out of 100), it would be preferable to use an analytically rigorous method (such as regression analysis of survey data) to determine these relative weights. Hentschel and Lanjouw noted that such a methodology should take advantage

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of the wealth of data available in the 1994 Ecuador *Encuesta sobre las Condiciones de Vida* (ECV)—a nationally representative household survey modeled closely on the World Bank's Living Standards Measurement Study (LSMS)—as well as the 1990 census. INEC took on this challenge and provided the World Bank with the required data (i.e., full access to Ecuadorian census data). The World Bank collaborated closely with the National Institute of Labor to develop the methodology.

2. Process of poverty mapping

Soon after the discussions between INEC and the World Bank, Carlos Larrea, a well-respected consultant in Ecuador, and a member of a team in the Technical Secretariat for Social Planning (under the Ministry of Social Welfare), with technical assistance from the Bank, began constructing a poverty map using the proposed methodology. In 1995, a poverty map was developed based on *expenditures*, a refinement of the World Bank methodology. This effort culminated in the publication of the *Geography of Poverty in Ecuador* (Larrea et al. 1996).

At the same time, World Bank staff used Ecuadorian data to develop and refine their methodology, demonstrating how sample survey data can be combined with broader census data to yield predicted poverty rates for the entire population covered by the census. The methodology went through a number of iterations (Hentschel and Lanjouw 1996a); most recently, a refined methodology has been developed combining census and survey data to produce highly disaggregated poverty maps (see Hentschel et al. 2000). In the case of Ecuador, the methodology can be used to estimate poverty rates at a canton or parish level.[11] The Hentschel et al. (2000) methodology is still a work in progress: the World Bank is currently exploring ways to expand the methodology using GIS (geographic information systems) data to further analyze the spatial dimensions of poverty.[12]

In 1998, Ecuador's planning agency (*Oficina de Planificación de la Presidencia de Ecuador*, or ODEPLAN)[13] developed canton- and parish-level poverty maps. These poverty maps were clearly anchored in the World Bank methodology while further exploring the use and integration of GIS. These poverty maps were based on the 1990

[11] Note that, in principle, the methodology can even be used to estimate poverty rates at a household level (although with increased standard error). In the case of Ecuador, the standard errors of poverty rates estimated at a parish level do not compromise analyses unless parish populations fall well below 500 households. Note that in Ecuador there are approximately 400 cantons and 1,000 *parroquias* (parishes).
[12] While Hentschel and Lanjouw were originally involved in developing the poverty mapping methodology (Hentschel and Lanjouw 1996a), the work is currently conducted by a small team of poverty mapping experts at the World Bank.
[13] In an effort to downsize government, ODEPLAN subsumed responsibilities of the previous National Council of Development (*Consejo National de Desarollo*, or CONADE). Note that Carlos Larrea was then working for ODEPLAN.

census and an updated ECV survey for 1995.[14] The poverty maps and data were published in hardcopy and CD versions of the 1998 INFOPLAN (Larrea et al. 1999). The INFOPLAN provides poverty data and disaggregated indicators on health, education, malnutrition, and employment. The INFOPLAN CD includes a simple mapping program that allows for the spatial analysis of poverty and related indicators at various levels of disaggregation (e.g., at the canton and parish levels). Using principal components analysis and comparing different themes, the INFOPLAN describes the social and biophysical conditions conducive to poverty. The INFOPLAN, for example, indicates that poverty in the Ecuadorian highlands is strongly associated with malnutrition, while poverty along the coast is associated with poor infrastructure (e.g., lack of roads and educational facilities). Funding for the development of the INFOPLAN was provided under the World Bank's Modernization and State Technical Assistance Program and the Swiss Agency for Development and Cooperation (SDC).

The INFOPLAN products were disseminated via an extensive outreach program. Indeed, the CD version of the INFOPLAN was intentionally developed to facilitate dissemination of poverty data to a large audience. Various institutions were trained in the use of INFOPLAN data and its mapping software. These trainings emphasized both the value and limitations of the available INFOPLAN data. NGOs (e.g., Ecocienca) and some universities (e.g., the University of Cuenca) conducted INFOPLAN trainings for local-level institutions.

3. Use and impact

Poverty mapping in Ecuador has had two different kinds of impacts: 1) impacts on decision-making in country and 2) facilitating poverty mapping initiatives worldwide.

In particular, the 1998 INFOPLAN poverty maps have had substantial impact on local-level decision-making. The Institute of Ecuadorian Studies used INFOPLAN's data and user-friendly mapping software as a key tool to facilitate the participatory development of 15- to 20-year local plans in the Imbabura province, the Guatamote municipality, and the Saquisilì municipality. Such local plans articulate the need for development and/or strengthening of community facilities and services, ranging from health centers to education. Participatory community discussions were convened, including the participation of mayors, teachers, council members, representatives from indigenous groups, local government, ministries, NGOs, and the tourism, industry, and public transportation sectors. Such discussions were aimed at identifying, verifying, and prioritizing community needs and finding ways to meet these needs.

The INFOPLAN data provided a tool for confirming and further informing community perceptions. For example, if a community identified education as an issue during participatory discussions, INFOPLAN could be used to crosscheck data on education in

[14] In part due to time constraints, the development of the 1998 poverty map did not incorporate extensive statistical error estimations as conducted by Hentschel and Lanjouw (1996b).

the database. Mismatches between expressed community needs and INFOPLAN data prompted further discussions with communities and refinement of local development plans. The use of INFOPLAN data was responsible in part for redirecting Guatamote's budget to direct greater support to rural areas. Rural areas are now receiving 75% of the county's budget, compared to the previously allocated 25%. While the use of the INFOPLAN did facilitate the participatory planning process, users voiced concerns about the need for updated data (the INFOPLAN is based on the 1990 census) and the lack of agricultural data.

Aside from influencing local-level decisions, INFOPLAN maps and data have more recently been used by EcoCiencia (*La Fundación Ecuatoriana de Estudios Ecológicos*) in its Biodiversity Conservation Project, which is developing a biodiversity monitoring system. INFOPLAN socioeconomic data were overlaid with EcoCiencia data on vegetative cover and biodiversity; for example, such overlays have helped highlight the effect of human migration patterns on changes in vegetation cover. Future analysis will include overlaying INFOPLAN data with finer-resolution maps and data (for example, on geomorphology) that will be developed in the second phase of the project .[15] In addition, poverty maps have been used by:

- the Ecuadorian Development Bank, partially supported by the IDB and the World Bank, to determine the distribution of loans to municipalities under a current decentralization program;
- the Fund for Emergency Social Investment, to target and finance small initiatives; and
- the Ministry of Health, to target the poorest 50 parishes in which to develop numerous health initiatives.

The poverty maps were also included in UNDP's Human Development Report.

While poverty maps have been used to influence many decisions, there has been some reluctance to use these data. For example, the Ministry of Social Development has not used poverty maps and data in its malnutrition programs. While the INFOPLAN poverty maps revealed that malnutrition is concentrated in the Ecuadorian highlands, the Ministry has continued to distribute food aid to cities along the coast (where more electoral gains are likely to be made). Further efforts are needed to: 1) encourage and provide incentives for the use of poverty data; 2) strengthen coordination with local-level institutions and NGOs to ensure that programs target the poorest communities; and 3) increase national and local capacity to sustain the production, dissemination, and use of poverty maps, including the use of new methodologies as explored by Hentschel et al. (2000).

Aside from in-country use of the poverty map, the World Bank methodology whose development was based on Ecuadorian data has had tremendous impact on the poverty mapping community worldwide. To date, this methodology has been used in several countries, including Guatemala, Nicaragua, Panama, and South Africa. Moreover, China, Indonesia, Malawi, Mexico, Mozambique, Pakistan, Thailand, and Vietnam are in the

[15] The future development of finer-resolution, updated INFOPLAN data (i.e., at a census "block" level rather than the parish level, and based on 2000 census data) would help facilitate such data comparisons.

process of developing poverty maps based on the Hentschel et al. (2000) methodology. The World Bank has presented its methodology on many occasions, including to Bank task managers as well as academic institutions. It has conducted poverty assessment training and specific training on poverty mapping, and has been invited to give a course in poverty mapping at the African Economic Research Consortium. The Bank is also developing software to facilitate the application of econometric modeling to poverty mapping.

Bibliography

Hentschel, J., J. Lanjouw, P. Lanjouw, and J. Poggi. 2000. "Combining Census and Survey Data to Trace the Spatial Dimensions of Poverty: A Case Study of Ecuador." *The World Bank Economic Review* 14(1):147-65.

Hentschel, J. and P. Lanjouw. 1996a. "Poverty Profile." In *Ecuador Poverty Report*, The World Bank, Washington D.C., pp. 53-91.

Hentschel, J. and P. Lanjouw. 1996b. *Constructing an Indicator of Consumption for the Analysis of Poverty: Principles and Illustrations with Reference to Ecuador*. LSMS Working Paper No. 124, Policy Research Department, The World Bank, Washington D.C.

Larrea C. et al. 1996. *La Geografia de la Pobreza en el Ecuador*. Quito: PNED – Secretaria Tecnica del Frente Social.

Larrea C. et al. 1999. *INFOPLAN: Atlas para el Desarrollo Local.* CD-Rom, Quito. ODEPLAN – Proyecto Mosta – COSUDE.

Experiences with the Development and Use of Poverty Maps

Case Study Note for GUATEMALA*

1. Background information on the poverty mapping initiative

In 2000, the president of Guatemala commissioned the development of a Poverty Reduction Strategy Program (PRSP) (Government of Guatemala 2000).[16] SEGEPLAN, the Secretariat of Planning and Programming for the Presidency, was selected to lead PRSP development. The agency was particularly interested in helping to facilitate better targeting of public expenditure to reach Guatemala's poor communities. Following an October 2000 presentation by the World Bank on the development of highly disaggregated poverty maps combining census and survey data, SEGEPLAN was convinced that the development of such a poverty map for Guatemala could be instrumental in achieving better targeting national public expenditure.[17]

The Guatemala PRSP was developed under a tight time frame: SEGEPLAN was commissioned to produce the PRSP in about six months. SEGEPLAN and the World Bank decided to develop an initial poverty map for inclusion in the PRSP based on the 1998-99 ENIGFAM household expenditure survey (*Encuesta Nacional de Ingresos y Gastos Familiares*). Although not designed for poverty assessment, ENIGFAM does capture a number of critical poverty-related variables that correspond well to the 1994 census.[18] A specially designed poverty-assessment survey—*Encuesta Nacional sobre Condiciones de Vida*, or ENCOVI—is currently in development. Following its completion, anticipated in October 2001, the poverty map will be updated.

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[16] Guatemala is not classified by the World Bank and International Monetary Fund as a Highly Indebted Poor Country (HIPC) and thus is not required by these institutions to conduct a PRSP.

[17] Note that a map of unsatisfied basic needs had been previously developed by Guatemala's FIS (Social Investment Fund). While this map was used by the FIS to target social investment, it was not used by other institutions. SEGEPLAN, with the assistance from the World Bank, recognized that a poverty map based on Hentschel et al. (2000), would more adequately capture poverty than the previously developed unsatisfied basic needs indicator.

[18] Compared to Living Standards Measurement Surveys (LSMS), the ENIGFAM has a greater focus on urban areas. Approximately 70% of households surveyed were from urban areas.

2. Process of poverty mapping

Guatemala's poverty map, based on the ENIGFAM and 1994 census, was developed using the Hentschel et al. (2000) methodology. A prediction model of consumption was estimated and the predicted parameters applied to the census data to derive household-level poverty statistics. The poverty map was disaggregated to the municipal level.[19]

The map development process featured an approach designed to build long-term in-country analytical capability and to create national ownership of the poverty map results. A team of nine individuals from three institutions—SEGEPLAN, INE (the National Statistical Institute), and University of Rafael Landívar (URL)—were involved in producing the map.[20] This group represented a mix of information producers (INE, which was already involved in developing the ENCOVI), information users (SEGEPLAN, with its mandate to coordinate national planning), and information analysts (URL). The World Bank and an external consultant provided technical assistance.[21] While staff time was covered by the institutions involved, the World Bank provided the funding for technical assistance.

Under tight time constraints, the poverty map team conducted the statistical estimates and developed the poverty map within three months, between November 2000 and February 2001. Although the current poverty map needs to be updated with higher quality data (i.e., 2001 ENCOVI data), it provides information on the proportion of the population in poverty, the proportion in extreme poverty, the poverty gap, the extreme poverty gap, and the severity of poverty at a municipal level. The complex econometric modeling involved in map production was at times challenging, as several of the team members were trained primarily as statisticians rather than economic modelers.

Upon completion of the poverty map, a technical report and draft guidelines were developed. The map was integrated into the PRSP and various presentations were given on the PRSP and poverty map results. In particular, a presentation on the poverty mapping results was given in February 2001 to the Cabinet, including the vice president and senior-level official from numerous ministries. The Cabinet was very responsive: the Minister of Finance even suggested that the poverty map be used as a critical instrument for national budgeting. Such senior-level support has facilitated the use of the poverty map in Guatemala to help restructure public expenditure procedures (see Section 3).

To further disseminate poverty mapping results, SEGEPLAN hired the Latin American think tank *Facultad Latinoamericana de Ciencias Sociales* (FLACSO) to develop a non-technical report that could reach a larger audience. SEGEPLAN has also developed a number of informational posters and booklets.

[19] Note there are eight regions, 22 departments, and approximately 330 municipalities in Guatemala.
[20] Specifically, the team included four researchers from SEGEPLAN, two from INE, and three from URL.
[21] Carlos Sobrado provided technical assistance from the World Bank, while Werner Hernany was employed as an external consultant.

3. Use and impact

The poverty map has had a tremendous impact in Guatemala, especially on the restructuring of the National Public Investment System (NPIS). With senior-level support, particularly from the Ministry of Finance, SEGEPLAN is currently revising procedures for allocation of public investment funds. The new procedures are intended to affect national public-investment budgeting every year. In the past, the Ministry of Finance used no standard criteria to select projects for investment. These new NPIS procedures are intended to make national budgeting more responsive, especially to the needs of poor communities.

SEGEPLAN has been developing technical criteria and indicators to restructure the NPIS. These indicators fall under three main categories: geographic, political, and sustainability criteria. The geographic criteria—including indicators on poverty level, coverage of basic services, and distance from basic services—will rely heavily on information provided by the poverty map. Such geographic criteria are expected to constitute approximately 50% of the total points used to prioritize projects. SEGEPLAN will apply these indicators for the first time to prioritize projects requesting NPIS funding (estimated at $576.5 million) in the 2002 fiscal year.

Besides SEGEPLAN, line ministries will be asked to use the prioritization guidelines, including geographic targeting, to select projects for funding. SEGEPLAN plans to develop sector-specific prioritization guidelines (such as health and education) to facilitate their use within the line ministries. Government offices at the department level will also be asked to use targeting guidelines if national public-investment funds are requested.[22] SEGEPLAN has conducted a small training on the current NPIS guidelines for 22 departmental delegates.

While the revision of the national budgeting procedures is by far the most notable application of the poverty map in Guatemala, there have been other uses. For example, the World Bank is currently using the poverty map in conjunction with other data (e.g., on transportation networks, health centers, schools, earthquakes, floods, landslides, river, elevation, and conflict) to help develop a road strategy for Guatemala. GIS (geographic information systems) data for this exercise was compiled primarily by various agencies in Guatemala, several of which have extensive GIS capacity. Overlaying the poverty map with roads data, preliminary analysis conducted at the World Bank indicates that poverty is strongly correlated with a lack of roads and that travel times are significantly higher in poor areas. This analysis highlighted three poor departments (Huehuetenango, Quiche, and San Marcos) in which accessibility to basic services is particularly low. An estimated US$100 million will be allocated towards improving roads in six departments,

[22] Departments are administrative units in Guatemala. These 22 departments have their own budgeting system and will not be required to follow national guidelines unless national public-investment funds are requested. However, SEGEPLAN does intend to provide information to the departments to show how poverty mapping results can be used in department-level decision-making.

the three mentioned above, plus another three that are expected to be selected based on poverty, economic potential, and accessibility criteria. To date, this GIS analysis has been conducted by the World Bank and Louis Berger, a consulting agency located in Washington DC. However, once the methodology is refined, project partners intend to build this type of analytical capacity in Guatemala.

The Ministry of Education has also referred to the Guatemala poverty map to help validate its selection of municipalities for a poverty-focused scholarship program for elementary schools. Prior to the availability of the poverty map, the program used data on illiteracy and unsatisfied basic needs (housing, water, and electricity) to select the poorest municipalities within the poorest of Guatemala's 22 departments. Following the release of mapping results, the selected municipalities were crosschecked against the poorest municipalities on the poverty map. This comparison indicated a good fit and helped demonstrate that the scholarship program was well targeted. Students aged 7 to 12 from poor families are candidates for scholarships of about US$40 per year. School boards within the selected municipalities are asked to identify candidate students. The program initially planned to distribute 145,000 scholarship nationwide; however, due to national budget constraints, 30,000 scholarships have been allocated. Staff from the Ministry of Education obtained access to the poverty map through an informal personal contact at SEGEPLAN, perhaps indicating that formal efforts to disseminate poverty mapping results should be strengthened.

More recently, poverty mapping results have been used in conjunction with vulnerability, nutrition, and other socioeconomic data to identify municipalities in need of anti-hunger initiatives. An action plan has been developed, under the lead of the Social Cabinet, to help combat hunger in 102 municipalities. This initiative is ongoing.

The development of the PRSP and poverty map is having tremendous impact in Guatemala. The 22 department delegates involved in the brief SEGEPLAN training have responded very favorably to the use of the poverty map and prioritization guidelines. They indicated that such procedures will help make the project selection process in Guatemala more objective and accountable. In addition, the World Bank and Ministry of Education have stated that the use of the poverty maps, with their distinctive visual impacts, has helped substantiate, validate, and make more transparent governmental involvement and actions in various sectors. The development of the PRSP and poverty maps has also affected SEGEPLAN as an institution, producing increased credibility and leading to more active involvement in the development of national budgeting guidelines. The development of the poverty map entailed assembling a multi-institution team and has encouraged collaboration between institutions that in the past had often worked in isolation.

Bibliography

Government of Guatemala. 2000. Poverty Reduction Strategy Program (PRSP).

Experiences with the Development and Use of Poverty Maps

Case Study Note for JAMAICA*

1. Background information on the poverty mapping initiative

In the early to mid-1990s, Jamaica developed a national poverty-eradication policy, which created increased demand for poverty data. To meet this demand, in 1995 the World Bank-funded Jamaica Social Investment Fund (JSIF) project identified the need to develop a poverty map. The Planning Institute of Jamaica (PIOJ), already involved in the development of the Jamaica Living Standards Measurement Survey (LSMS), was commissioned to develop the poverty map. The PIOJ worked jointly with the JSIF to select various indicators upon which the poverty map was based (see Section 2).

2. Process of poverty mapping

A technical committee made up of several staff from the JSIF and the PIOJ was established to 1) select various indicators to be incorporated in a composite poverty indicator and 2) assign relative weights to these individual indicators. Using 1991 census data, the committee selected four indicators: unemployment among those aged 15-29; primary school education; exclusive use of toilets; and the homes with drinking water supplied by modern plumbing. In 1995-96, the PIOJ developed a community-level poverty indicator and map based on these indicators and their respective weights.[23] The PIOJ poverty indicator and map results were published (Planning Institute of Jamaica 1996) and copies of the poverty map have been freely available upon request from the PIOJ. To further encourage broad dissemination, the PIOJ gave presentations on the indicator and map results and various newspapers circulated copies of the poverty map.

Poverty mapping results indicated that poverty was widespread throughout Jamaica. This finding was a source of embarrassment to the government, as well as a source of potential political advantage for the opposition. A cartoon in a Jamaican newspaper highlighted the poverty indicator results by depicting the poverty map with poor communities shown in black and other communities in white; in the cartoon, the Prime Minister is portrayed pointing to the few non-poor areas.

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A summary of all case studies can be found at: http://population.wri.org/ or http://www.povertymap.net/pub.htm

[23] Note that the map represented 500 communities of varying sizes. For example, the number of households surveyed per community ranged from 130 to 13,000.

While the poverty indicator has generally been used by the JSIF to help allocate its social funds (see Section 3), selecting the indicators and weights proved to be challenging and time consuming. After lengthy debate, the committee selected the four primary indicators upon which the poverty map was based. Various analysts and scholars noted that some of these primary indicators may inadequately capture poverty. For example, while census data indicates that communities have exclusive use of toilets, these facilities may not be functional.

Concerns have also been raised regarding the scale of the poverty map and the varied number of households evaluated in each community. The number of households surveyed per community ranged from 130 to 13,000. Evaluating poverty at a community (rather than household) level precludes the possibility of identifying pockets of poverty within larger, communities. To capture variation within communities, the JSIF used the poverty indicator and map in conjunction with qualitative community-based poverty assessments (see Section 3).

Over the past several years, a major drawback has been the use of outdated 1991 census data to develop the poverty indicator. The distribution of poverty in Jamaica has changed substantially since 1991. While the JSIF has been able to provide some updated data on poverty through its community-based poverty assessments (see Section 3), various other agencies (such as the PIOJ) believe that the poverty indicator inadequately reflects the current reality of poverty in Jamaica. The PIOJ and other agencies have emphasized the need for a new and more reliable poverty map. Jamaica plans to develop an updated poverty map using the Hentschel et al. (2000) methodology. The use of a statistically rigorous methodology such as that of Hentschel et al. is being looked upon very favorably, especially considering the difficulties in selecting indicators for Jamaica's first poverty map.

Jamaica's current poverty map has seldom been linked to other data. The PIOJ did, however, recently receive a request from a Latin American NGO to use the poverty map to evaluate El Nino's impact on poor communities. In addition, PIOJ compared the poverty map with data on crime and violence to gain a better understanding of the relationship between the distribution of crime and poverty in Jamaica.[24]

3. Use and impact

The use of the PIOJ poverty indicator and map has been limited mainly to the JSIF. Among other things, JSIF has applied the poverty map in targeting projects for social expenditures. Due to concerns that the poverty indicator may be outdated (see Section 2), the maps have been used in conjunction with community-based poverty assessments. Typically, the JSIF uses the indicator to establish initial eligibility of a funding request. Thereafter, qualitative community-based assessments are conducted to further assess the extent of poverty.

[24] This work was primarily conducted for research and its results have not yet been used.

Aside from the JSIF, use of the poverty indicator and map in other agencies has been minimal. In the first several years following publication of the poverty map, the PIOJ did refer to the map to help generally describe poverty in Jamaica but did not use it for prescriptive purposes (such as targeting of expenditures). Soon after the development of the poverty map in 1996, the PIOJ received various requests from donors for copies of the poverty indicator and map. Although donors expressed concerns regarding the map's reliability, it is thought that some donor-funded projects did make use of the poverty map for purposes of targeting. Use of the poverty map has progressively tapered as the data upon which it is based have grown increasingly outdated (see Section 2).

Various additional uses of Jamaica's poverty map are envisioned once an updated map is developed. A new poverty reduction initiative—funded by the Inter-American Development Bank and focusing on reform of the social safety net—is expected to use the updated poverty map to target funding. In addition, the PIOJ plans to use the updated poverty map to better target its projects. The electric and water sector also are expected to use the poverty maps to expand their services, especially to poorer communities.

While the PIOJ poverty indicator and map have not been extensively used in Jamaica (aside from at the JSIF), their development has produced several impacts. Foremost, the poverty map raised awareness of the use of such maps as a tool to improve program targeting. This awareness has helped generate the current demand for an updated and more reliable poverty map. Despite the indicator's weaknesses, the PIOJ poverty map, in conjunction with community-based poverty assessments, provided the JSIF with greater confidence that investments were being made in poor communities. Widely circulated in Jamaica, the poverty indicator and map results are thought to have helped highlight poverty itself as an issue and to have focused government interest on poverty reduction.

Bibliography

Planning Institute of Jamaica. 1996. *Poverty Mapping: A Report on the Spatial Representation of Deprivation in Jamaica*. Policy Development Unit, Planning Institute of Jamaica. March 1996.

Experiences with the Development and Use of Poverty Maps

Case Study Note for NICARAGUA*

1. Background information on the poverty mapping initiative

Nicaragua's first poverty map was developed in 1992 by the Emergency Social Investment Fund (*Fondo de Inversión Social de Emergencia*, or FISE). The FISE was established as a social fund to construct infrastructure (such as schools and health centers) nationwide.[25] When the FISE was created in 1991, the Nicaraguan civil war had recently ended and the country was highly polarized politically. Various groups, particularly the Sandinistas, increasingly criticized the government for bias towards developing projects in non-Sandinista municipalities. Consequently, the FISE recognized the need for more transparent allocation of its funds. FISE staff were aware of the development of poverty maps elsewhere (in Bolivia and Honduras) and proposed the development of a similar map to help allocate FISE funds.

FISE's first poverty map was based on indicators of Unsatisfied Basic Needs (UBN), such as access to water and sanitation, nutrition, and displaced people. This UBN map, initially used in 1993 to allocate FISE funds, was looked upon very favorably (see Section 3). Through a national association of mayors (AMUNIC), most of the country's mayors publicly stated that the FISE was, at the time, the only Nicaraguan organization using a transparent mechanism to distribute its funds. Such statements put substantial pressure on other institutions to increase the transparency of their decision-making and allocation of funds (see Section 3).

In 1996, the FISE updated its poverty map with data available from the 1995 census and 1993 Living Standards Measurement Survey (LSMS). Nicaragua's poverty map was again updated in 2000 using 1998 LSMS data and the Hentschel et al. (2000) methodology (see Section 2).

FISE's successful use of the poverty map is thought to have encouraged heavy reliance on the map in Nicaragua's recent Strengthened Growth and Poverty Reduction Strategy (SGPRS). The text of the SGPRS notes: "A major component of the SGPRS is its

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[25] The FISE has been supported primarily by donor funding, including from the World Bank, the Inter-American Development Bank, the United Nations Development Programme, the European Community, the Organization of Petroleum Exporting Countries, and the governments of Germany (KFW), the United States (USAID), Sweden (SIDA), Canada (CIDA), Switzerland (COSUDE), and Japan (GRANTS).

concentration of actions and assistance upon the poor and extreme poor…The [poverty] map has proved to be an excellent tool for designing policies and programs aimed at poverty groups, and for making the most efficient assignment of poverty reduction resources among competing targets. It will be equally useful in guiding and monitoring the SGPRS" (Government of Nicaragua 2001a, 59).

The SGPRS was developed as a condition of World Bank and International Monetary Fund (IMF) debt relief under the Highly Indebted Poor Countries (HIPC) initiative.[26] The SGPRS strategy is focused on developing an in-country participatory program on poverty reduction. Use of the map of extreme poverty, together with participatory consultations, is expected to affect the allocation of approximately US$1.1 billion in SGPRS funding over a five-year period (2001-05) (see Section 3).

2. Process of poverty mapping

FISE's 1992 poverty map was based on data collected from various agencies. Few data were available at the time: the last Nicaraguan census had been conducted in 1974. Data on access to water and sanitation were obtained from the water authority; data on nutrition were collected from UNICEF and on displaced persons from the UN peace mission. The poverty map was developed at a municipal level[27] using internal FISE funds.[28] Though initially useful, the UBN indicator forming the basis of the 1992 poverty map tended to overstate poverty; i.e., it included some non-poor households. Results of the UBN poverty map were presented to various government agencies.

In 1996, a second FISE poverty map was developed using data from the 1995 census and 1993 LSMS.[29] The new map relied on a different, more accurate method—small area estimation—to calculate the poverty gap at a municipal-level. The development of this second poverty map was contracted out to a U.S.-based consulting agency, the Research Triangle Institute (RTI). Based on the most recent data, the 1996 map provided the best analysis then available of the distribution of poverty. However, there were some problems; in particular, the sampling framework used in the 1993 LSMS did not match the 1995 census. FISE gave several presentations on and distributed several copies of the 1996 map. The map was used primarily by the FISE itself and by various donor and government institutions (see Section 3).

The Nicaraguan poverty map was most recently updated in 2000 using the 1998 LSMS and 1995 census. This latest map used the Hentschel et al. methodology (2000) to predict consumption. Variables in the 1998 LSMS that corresponded with 1995 census data

[26] Created in response to concern that there was a stalemate in the fight against poverty, the HIPC initiative prompted an intense reexamination of development and debt strategies. The World Bank, International Monetary Fund (IMF), United Nations agencies, regional development banks, NGOs, and church groups have been actively involved in developing the HIPC initiative. In 1999, the World Bank and IMF agreed to link debt relief with the establishment of poverty reduction strategies.
[27] Note that Nicaragua contains seven regions, 17 departments, and 151 municipalities.
[28] At the time, FISE was supported by the Inter-American Development Bank and the governments of Germany (KFW) and the United States (USAID).
[29] Funding for the development of Nicaragua's second poverty map was provided by the IDB.

were selected to develop a prediction model of consumption. The predicted parameter estimates were then applied to census data to derive nationwide statistics on household-level consumption and poverty. Poverty maps showing the percentage poverty, percentage extreme poverty, severity of poverty, severity of extreme poverty, poverty gap, and extreme poverty gap were constructed. These maps were disaggregated to the regional, departmental, and municipal levels. Data were tested for normality, heteroscedasticity, and fixed effects. Current use of the maps, especially the map of extreme poverty, is widespread (see Section 3). Funding for this poverty mapping effort was provided by the Government of Nicaragua through support from FISE, IDB, the Program for the Improvement of Living Standards Measurement Surveys (MECOVI-Nicaragua), the United Nations Development Programme, the United Nations Population Fund, the World Bank and the governments of Denmark (DANIDA), Norway (NORAD), and Sweden (Sida).

The 2000 imputed poverty maps were developed using a collaborative approach involving staff from the National Statistics and Census Institute (INEC), MECOVI, the Technical Secretariat of the President (SETEC), and FISE.[30] Technical assistance was provided by the World Bank.[31] The effort took approximately 10 months to complete (1999-2000).

The use of a collaborative, multi-institution approach is thought to have substantially encouraged the use of the poverty maps (see Section 3). However, the process of collaboration proved difficult at times. A lack of staff resources necessitated the hiring of two full-time consultants to complete the maps. Hence, mechanisms for encouraging future institutional collaboration should emphasize the need for experienced full-time staff at key local institutions.

In addition, the 2000 poverty mapping effort faced some data constraints. In general, the use of 1995 census and 1998 LSMS data was considered sufficient, especially in a context in which few data have historically been collected.[32] However, there have been some concerns. For example, Hurricane Mitch (1999)—which caused the deaths of approximately 3,000 persons and the displacement of 870,000—did change the profile of poverty in Nicaragua, albeit not significantly, according to a study conducted by the INEC.[33]

Publications incorporating the 2000 Nicaragua poverty map results include the SGPRS (Government of Nicaragua 2001a), a technical report on the poverty mapping effort (Government of Nicaragua 2001b), and a guideline publication describing steps for using

[30] Individuals involved in conducting the statistical estimations and developing the poverty mapping initiative were Juan Rocha Nuñez, Dulce María Mayorga, Marta Vargas, Tránsito Gomez, Maria Fernanda Muñiz, Joaquin Murillo, Luis Alaniz, Florencia T. Castro-Leal, Gabriel Demombynes, Carlos Lacayo, Carlos Sobrado, Peter Lanjouw, and Berk Özler.
[31] In-country technical assistance was provided primarily by Carlos Sobrado.
[32] Note that a census had not been conducted for more than 20 years prior to 1995.
[33] This assessment indicated that there have been some changes since Hurricane Mitch. For example, extreme poverty increased by approximately 2.9% in the Central Rural region and declined by 3.6% in the Pacific Rural region. However, the poverty rates observed in 1998 were not significantly affected.

the most recent poverty maps to help allocate public expenditures (Government of Nicaragua 2001c). The last publication, *Nicaragua Poverty Map to Target the Extreme Poor*, contains: a copy of the map of extreme poverty map; statistics on the extent of extreme poverty by region, department, and municipality; estimated numbers of the extremely poor; proportion of the extremely poor in rural areas; the extreme poverty gap; and proportion of the national extreme-poverty gap. The report recommends that the national extreme poverty gap map, which defines the proportion of resources necessary to close the extreme poverty gap, be used to help allocate public expenditure.

Awareness has also been built through a series of SGPRS presentations and trainings conducted by the SETEC since mid-2000. Presentations and trainings on the poverty map results (especially the map of extreme poverty), combined with other social indicators, have been given to staff at planning divisions in various ministries (e.g., the Ministry of Health, Ministry of Education, and Ministry of Transport) and international and national NGOs. These trainings are raising decision-makers' awareness of the availability of information tools such as poverty maps to improve decisions[34] as well as educating them on the use and weighting of poverty mapping data and sector-specific indicators.[35]

The Government of Nicaragua plans to update the poverty map based on 2001 LSMS data in the near future. To ensure future availability of data, the Government has committed itself to conducting a census every 10 years and a LSMS every four years.

3. Use and impact

Nicaragua's poverty reduction strategy, the SGPRS, relies heavily on the LSMS and poverty map results. The SGPRS commits Nicaragua to the use of the extreme poverty map to better target the allocation of government resources: "[I]t is vital to focus more resources on programs related to poverty reduction and the improved efficiency of public expenditures. This process will be facilitated by the application of the law of Public Contracts, the assimilation of the Integrated System of Financial Management and Audits (SIGFA) by all government institutions, the establishment of priorities from the Poverty Map, and the inputs from the international community and civil society" (Government of Nicaragua 2001a, 41).

[34] Specifically, training in the health sector has included presentations at the Ministry of Health to all senior staff at the national level (November 2000) and the departmental level (December 2000 and October 2001). Four training sessions for technical-level staff (both national and departmental) have also been held.

[35] Social indicators included in the SGPRS are being combined with the poverty map. For example, education indicators (such as enrollment and drop-out rates) or health indicators (such as access to prenatal care, institutional births, and access to reproductive services) can be overlaid with the poverty map to affect allocation of the education or health budget. Furthermore, data on natural threats and on critical environmental areas—developed by the Territorial Studies Institute and the Ministry of the Environment and Natural Resources, respectively—could be overlaid with the poverty maps to improve natural disaster preparedness and environmental management.

Ample reference is made throughout the SGPRS to the 2000 extreme-poverty map and the need to improve targeting of programs. The use of the poverty map is expected to help affect the allocation of US$1.1 billion in capital spending under the SGPRS during a five-year period (2001-05). The Strategy notes: "The SGPRS is not only a series of government actions and reforms, it includes a major improvement in the targeting and expansion of fiscal resources directed towards the poor" (Government of Nicaragua 2001a, xiv).

The SGPRS has drastically changed how resources are allocated in Nicaragua and is expected to improve targeting of the vast majority of government-funded programs. Improved targeting has and/or will affect the following programs, to name but two:

* *Development of a health strategy*. The Government of Nicaragua is developing a strategy to provide expanded health care coverage to very poor areas. The map of extreme poverty map has already been used to: develop nine new health posts; better equip two hospitals on the Atlantic coast; and rehabilitate a hospital in Rio San Juan.[36] Basic health services—such as improved nutritional services and prenatal care, family planning methods, basic and emergency obstetric care, and access to safe water and basic sanitation—will be provided in selected poor areas, based on the poverty map and key health indicators. The poverty map has also recently been used to help target departments for a reproductive health services initiative focused on providing community-based training for midwives and family planning.

**Development of an education strategy*. SETEC is working with the Ministry of Education to use the poverty map and data to expand coverage of basic education, modernize and decentralize schools, and improve education in poor areas. The poverty map and data are being used to target direct support to rural poor areas. Under this strategy, 300,000 rural students, particularly in poor areas, will receive a free package of supplementary material.

Aside from the SGPRS, the FISE has also relied heavily on the 2000 poverty map, in conjunction with community and neighborhood consultations, to help target its expenditures. The FISE has invested in the development of various social infrastructure, including school and health center construction, in extremely poor areas. The 2000 poverty map is expected to influence the distribution of approximately $140 million in FISE funds during the 2002-04 period.[37] In particular, the FISE plans to use the map to

[36] Based on data from the extreme poverty map, the Atlantic and Rio San Juan areas were found to be the poorest in the country.

[37] The FISE currently solicits and finances projects proposed by communities. In accordance with a decentralization scheme begun in 1999, future FISE funding will be transferred directly to municipalities. However, poverty maps and data will still be used to determine the amount of money that will be allocated to each municipality.

help select poor municipalities for cash transfers under the IDB-funded Social Safety Net program (*Red de Protección Social*, or RPS).

In addition to the SGPRS and FISE, the 2000 poverty map and data have been used by various ministries to prepare Nicaragua's 2001 national budget. Within committees at the Ministry of Finance, the maps have been used to approve various line ministry projects. Nicaragua's National Investment System (SNIP) database now includes data on poverty; it automatically classifies each municipality and provides decision-makers with data on poverty reduction initiatives.

Besides the 2000 poverty map, the earlier 1992 and 1996 UBN maps (see Section 2) have also been extensively used in Nicaragua. FISE used these maps to target poor areas in its initiatives: it used the 1992 map to help allocate approximately US$200 million in funds (1992-97) and the 1996 map to influence the allocation of approximately $160 million (1998–2001).

Numerous NGOs have also relied on Nicaragua's early poverty maps. Save the Children used the 1996 poverty map to target several of its food security, disaster relief, infant survival, rural roads, and basic sanitation projects—influencing the allocation of approximately US$8 million of organizational funds during 2000. Similarly, Catholic Relief Services (CRS) used the 1996 map to target its projects in agriculture, health, microfinancing, and civil society development, affecting the allocation of approximately US$7.5 million of its funds since 1999. One specific CRS use of the FISE poverty map is in a microfinance project that has provided community banking to over 14,000 clients, most of whom are located in extremely poor areas. The World Food Program (WFP), International Fund for Agricultural Development (IFAD), and several donors have also used the 1996 FISE poverty maps to help identify poor municipalities for their program activities. Government institutions have used the FISE maps to help endorse several government social-policy documents prepared between 1994 and 1999.

The use of poverty map and data has had tremendous impact on Nicaragua's growing commitment to good governance, accountability, and transparency. First, the use of poverty maps has encouraged broader participation among and within government and civil society in Nicaragua. The poverty maps helped identify regions and communities previously neglected by the government. For example, poverty maps identified the Atlantic Coast department, inhabited by Nicaragua's ethnic and indigenous groups (including *miskitos*, *mayagnas*, *ramas*, and Creoles), as amongst the poorest in Nicaragua. Allocating increased public expenditure to the poorest areas is expected to promote increased participation in civil society by these communities.

Second, better targeting is helping ensure synergy between programs. A major challenge for the FISE has been the discontinuity between its mandate to provide infrastructure support (e.g., school building and health center development) and the responsibility of

other government agencies to provide operational services (e.g., teachers and hospital personnel). Using the same poverty map to target both FISE and SGPRS initiatives should help direct support to the same poor communities, helping to ensure that the government will provide operational services (e.g., teachers and school supplies) for new infrastructure developed by FISE.[38]

Third, the use of the poverty map and data has increased FISE's institutional credibility. The FISE has been cited as one of the best-run, most efficient, and most accountable programs, not only in Nicaragua, but in all of Central America.[39]

While the use of poverty maps has been favorably received in Nicaragua, there have been some concerns—namely, that the poverty map should not be used as the *only* tool to allocate funds and target projects (e.g., in the SGPRS). For this reason, the SETEC has emphasized (including during its training sessions, as described in Section 2) that decision-makers should rely on sector-specific indicators and community consultations as well as poverty map results.

Bibliography

Hentschel, J., J. Lanjouw, P. Lanjouw, and J. Poggi. 2000. "Combining Census and Survey Data to Trace the Spatial Dimensions of Poverty: A Case Study of Ecuador." *The World Bank Economic Review* 14(1):147-65.

Government of Nicaragua. 2001a. *A Strengthened Growth and Poverty Reduction Strategy.*

Government of Nicaragua. 2001b. *Mapa de Pobreza Extrema De Nicaragua: Censo 1995 – EMNV 1998.*

Government of Nicaragua. 2001c. *Nicaragua Poverty Map to Target the Extreme Poor*.

[38] In the interim, a Supplementary Social Fund (FSS) program was established by the government to provide temporary support for key social sector programs including those of line ministries. The FSS is providing administrative and logistical support for the expansion of education and health programs in areas of extreme poverty, including by supporting the salaries of teachers, nurses, and doctors, and by providing school and hospital equipment.

[39] See, for example, Government of Nicaragua (2001a), pp. 44 and 51.

Experiences with the Development and Use of Poverty Maps

Case Study Note for PANAMA*

1. Background information on the poverty mapping initiative

The World Bank provided technical assistance to the Panamanian Ministry of Economy and Finance to develop the *Encuesta de Niveles de Vida* (ENV), a survey resembling the a Living Standard Measurement Survey (LSMS). This process raised awareness of the possibility of developing a poverty map in Panama based on consumption indicators. While the Panamanian government had since 1970 developed basic needs indicators to estimate poverty (especially for its Social Investment Fund, or SIF), there was increasing recognition that these indicators were crude and required updating. The availability of a high-resolution map was envisioned to help improve targeting of poor areas in Panama's SIF (see Section 3).

There was substantial interest—particularly on the part of the Ministry of Economy and Finance's Social Policy Department, which was already involved in developing poverty data (see below)—in creating a high-resolution poverty map for Panama. A poverty map based on census and survey data was developed in 1998-99 using the Hentschel and Lanjouw (1996) methodology (see Section 2). The World Bank agreed to provide technical assistance for developing a high-resolution map, while the Government of Panama covered staff time involved in the poverty mapping initiative. The Ministry of Economy and Finance, involved in developing the ENV survey, became the key collaborating agency (see Section 2).

2. Process of poverty mapping

A high-resolution poverty map was developed in 1998-99 using data from the 1997 LSMS-like ENV survey—and the 1990 census. The Hentschel and Lanjouw (1996) methodology was used to develop a prediction model of consumption. The model's predicted parameters were in turn applied to the census data to derive household-level poverty statistics for Panama. The poverty map estimated the number of people in poverty at a district level and for some districts at a *corregimiento* (county) level.[40]

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[40] Note that Panama contains 75 districts and 510 *corregimientos* (counties).

The poverty mapping initiative in Panama heavily emphasized capacity development. This approach was intentionally used to strengthen country capacity, while critically building ownership of poverty map results. With technical assistance from the World Bank, approximately six individuals at the Ministry of Economy and Finance's Social Policy Department were trained to develop a high-resolution poverty map for Panama. The group consisted of individuals with primarily statistical and computer backgrounds.

The development of the statistical estimations and poverty map took approximately six months (April to September 1998) and resulted in the creation of two poverty indicators: percentage poor and percentage extreme poor. The group involved in the poverty mapping effort gained substantial confidence in their capacity to construct, with some technical assistance, future poverty maps.

With technical assistance from the World Bank, the group developed a technical report describing poverty map results and the steps used to develop the map. In addition, various presentations were given on the poverty map and assessment results to numerous agencies, including line ministries and universities. There are plans to create an updated poverty map based on the 2000 census and 1997 ENV survey using the Hentschel et al. (2000) methodology.

3. Use and impact

The most notable use of the poverty maps in Panama has been by the Social Investment Fund (SIF). An agency created by the Panamanian presidency in 1990, the SIF has used the poverty maps to help allocate its funds, especially to those districts with the greatest number of people under the national poverty level. The SIF provides funds for the development of, for example, roads, health centers, and schools. The agency has emphasized community participation in further allocating funds by organizing meetings to define project priorities within each *corregimiento*. The SIF is currently distributing approximately US$150 million over a four-year period (1997-2001).

Under the SIF, one specific use of the poverty map has been to help target areas for a school lunch program. Results show that this program is one of the most effectively targeted programs in Panama, reaching the extreme poor at impressive rates and by a disproportionate percentage. An estimated 120,000 students in 1,500 schools have been beneficiaries of this program, with a budget of approximately US$2 million.

In addition to the SIF, the poverty map has guided the work of the Nutrition Department (within the Ministry of Health). Programs concerning micronutrient supplements and nutritional strengthening used the poverty map as an initial means of identifying the poorest districts. Thereafter, the Nutrition Department conducted specific community-

based nutrition surveys to get more detailed information at the *corregimientos* level. In conjunction with community-based survey data, this use of the poverty map has helped the Nutrition Department to assess and monitor nutrition programs in Panama.

Aside from in-country users, donors have also used the poverty map. The Inter-America Development Bank (IDB) has recently required the use of the poverty map as a condition of *all* loan requests in Panama. IDB loans currently in negotiation (e.g., to complement the four-year SIF and for a new health and nutrition program) will be required to use the poverty map to help target activities.

The overall sentiment of poverty map users is that the map has helped guide and improve project development and planning. Specifically, the use of the poverty maps has made funding decisions in various programs and projects more equitable, effective, and transparent. In particular, SIF officials have stated that the use of the poverty map allowed them to resist political pressure to alter funding decisions once these were made. The use of the poverty maps resulted in improved targeting of poor areas (e.g., SIF's use of the poverty maps resulted in the allocation of funds to those districts with the highest poverty levels) and helped provide additional and often complementary information for research and monitoring (e.g., by the Nutrition Department).

A notable impact of the production and use poverty maps has been its institutional effects. The Ministry of Economy and Finance has, for example, been regarded as having increased credibility since developing the poverty map (e.g., an increasing number of international institutions have collaborated with this institution since their development of the poverty map). Furthermore, SIF's use of the poverty map has strengthened its institutional image. The agency is currently viewed with credibility and trust not only by Panamanians but also by the donor community. Such increased credibility is facilitating negotiation of future loans, including a loan to complement the development of the four-year SIF plan.

While the poverty map has been favorably looked upon, the scale of the district-level poverty map has in some instances been a concern. For example, the Nutrition Department indicated that a higher-resolution poverty map at a *corregimiento* level would be more useful. There have been discussions concerning development of an updated, higher-resolution poverty map for Panama. The government has stated its intention to finance (or find funding for) a majority of this work, suggesting that the level of interest in such a project is quite high.

Bibliography

Hentschel, J., J. Lanjouw, P. Lanjouw, and J. Poggi. 2000. "Combining Census and Survey Data to Trace the Spatial Dimensions of Poverty: A Case Study of Ecuador." *The World Bank Economic Review* 14(1): 147-65.

Hentschel, J. and P. Lanjouw. 1996. "Poverty Profile." In *Ecuador Poverty Report*, The World Bank, Washington D.C., pp. 53-91.

Experiences with the Development and Use of Poverty Maps

Case Study Note for PERU*

1. Background information on the poverty mapping initiative

Peru has a long history of developing poverty maps, particularly based on Unmet Basic Needs (UBN) indices. Webb (1977) developed the first UBN poverty map in Peru using data from the 1961 census (Schady 2000). This poverty map was subsequently updated in 1972, 1981, and 1993 (Amat y León n.d., Banco Central de Reserva 1981, INEI 1994, Schady 2000). These initial poverty maps were developed primarily to help stimulate investment, although their ultimate use was restricted to academic circles.

With the creation of the Peruvian Social Fund (*Fondo Nacional de Compensación y Desarrollo Social*, or FONCODES) in 1991, there was increased demand for information on the distribution of poverty. The main objectives of FONCODES are to alleviate poverty, generate employment, and improve access to social services (Schady 2000a).[41] Specifically, FONCODES was established to ensure that social expenditure in Peru, which traditionally had favored the urban middle class, was redirected to poor areas and households (Paxson and Schady 1999). Since 1991, FONCODES has developed several district-level UBN poverty maps (see Section 2).[42] The use of the UBN poverty maps at FONCODES helped allocate approximately US$564 million between 1992 and 1998 (Schady 2000b) (see Section 3).

More recently, Peru has relied on imputed poverty maps based on census and survey data. An imputed district-level poverty map was developed in 1996 by INEI (*Instituto Nacional de Estadística e Informática*) using the 1993 census and 1995 INEI household survey. The Ministry of Economy and Finance (MEF) updated this map in 1999 using 1993 census and 1997 INEI household survey data (see Section 2). The MEF is putting substantial pressure on various agencies, including FONCODES, to use the updated map (see Section 3). The INEI is currently coordinating the development of a new poverty map that will be based on 1993 census and 2001 INEI household survey data.

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A summary of all case studies can be found at: http://population.wri.org/ or http://www.povertymap.net/pub.htm

[41] FONCODES was created during a severe recession that followed the adoption of stringent stabilization and structural adjustments by the Fujimori government.

[42] There are 1,812 districts in Peru.

2. Process of poverty mapping

The majority of poverty maps in Peru have been developed by FONCODES and have relied primarily on census data. FONCODES has produced district-level estimates of poverty for 1994 and 2000.[43] The most recent FONCODES poverty map used eight indicators: the rate of chronic malnutrition, illiteracy, school-aged children not in school, overcrowded housing, inadequate roofing, and the proportion of the population without access to water, sewerage, and electricity. Technical assistance for developing the FONCODES maps was provided by the Inter-American Development Bank, the German government (GTZ), and the World Bank.

Peru's first imputed poverty map was developed in 1996 by INEI with technical assistance from CEPAR, the population agency of CEPAL (Economic Commission for Latin America and the Caribbean). First, income in each of Peru's 24 departments (rather than for each individual household) was estimated. Income was imputed based on numerous variables in the 1995 INEI household survey, including household composition, education levels, access to basic services such as water sewerage and electricity, and ownership of durable goods such as televisions, radios, and refrigerators. The regression coefficients from each of the 24 departments were subsequently applied to the 1993 census to impute district-level income and poverty measures for the country's 1,812 districts. Using department-level data to estimate district-level poverty raises concerns, as the distribution of variables may not be identical across all districts in a given department.

In 1999, a new district-level imputed poverty map was developed by *Direccion de Asuntos Economicos y Sociales*, a division of the MEF, based on the Hentschel et al. (2000) methodology.[44] The map combined 1993 census and 1997 INEI household survey data to impute consumption at a district level. As in the case of the 1996 map, the use of coarse, regional- and department-level survey data to estimate district-level poverty raises concerns. Other concerns about the 1999 map included the:

- lack of standard-error estimation to verify the robustness of imputed consumption;
- use of two different, non-comparable household surveys to derive estimates of income and consumption measures;
- use of a national model only, rather than subnational models with greater predictive power; and
- composite nature of the final poverty indicator.

The MEF presented the poverty map results to various government agencies and civil society in December 2000. It also published a report (*Un Nuevo Instrumento de Focalización para la Asignación de Recursos Destinados a la Inversión Social en el*

[43] In 1997, Peru was divided into 13 administrative regions, 24 departments, 194 provinces, and 1,812 districts.

[44] Individuals involved in developing the first edition of the 1999 MEF poverty map were Juvenal Díaz Alvarez and Nelson Shack Yalta. Patricia Vásques Sotero was involved in developing the updated MEF document.

Marco de la Lucha Contra la Pobraza) on these results. Funding for the development of the 1999 map was provided internally by the MEF.

While there have not been any major efforts to link the poverty maps with other Peruvian data, Escobal and Torero (1999) compared the FONCODES poverty map with various geographic variables (e.g., altitude, rainfall, and temperature). The study assessed whether geographic variables help explain per capita expenditure. Results indicate that there is no clear evidence that expenditure is highly correlated with geographic variables. Rather, non-geographic characteristics—namely, public and private assets—were shown to almost fully explain differences in expenditure. In Peru, as in many other countries, the full potential of linking poverty map results with other data has yet to be explored.

3. Use and impact

The use of poverty maps in Peru has been limited mostly to FONCODES. The FONCODES poverty maps helped to allocate approximately US$564 million in FONCODES funds between 1992 and 1998.[45] Specifically, the maps, in conjunction with community poverty assessments,[46] were used to help target 32,000 community-based projects totaling approximately US$285 million. Such projects included: the construction and renovation of classrooms; the distribution of educational material to students; the development of nutrition and family planning projects; micro-financing; and the construction or rehabilitation of sports facilities, health posts, water and sanitation systems, rural roads, electrification, and small-scale irrigation. In addition to community-based projects, poverty maps have been used to help allocate US$98 million in funds for FONCODES "special projects," including the development of school breakfast programs and the distribution of uniforms to school children, shovels to farmers, and motorized canoes for isolated jungle communities.

The use of poverty maps has resulted in better targeting of FONCODES initiatives. Schady (2000b) provides evidence that FONCODES funds have flowed to poor provinces and that infrastructure constructed by the FONCODES has benefited poor households. Specifically, the use of poverty maps is thought to have helped ensure that FONCODES educational funding, accounting for one-quarter of total FONCODES

[45] This is based on the December 1992 exchange rate of 1.63 soles to the U.S. dollar. While government revenue initially financed FONCODES projects, since 1994 loans of US$100 million and US$94 million have been obtained from the World Bank and Inter-American Development Bank, respectively.

[46] Qualitative community poverty assessments were also used to help verify poverty levels in identified communities. These communities were asked to select projects from a menu and prepare proposals for funding. FONCODES regional offices subsequently reviewed the community-based proposals and, upon approval, released funds to designated *núcleo ejectuors*, i.e., community members responsible for allocating funds within the specified communities. While this approach is targeted and "demand driven," it should be noted that, given the learning curve for communities to develop a good proposal, this system may be biased toward those communities that have already prepared a successful proposal; i.e., communities that have been turned down might decide that developing a new proposal is not worth their effort.

expenditure between 1992 and 1998, has reached poor districts (Paxson and Schady 1999). One indication of the success of FONCODES targeting is the fact that, by 1996, households in the wealthiest quartile of districts were receiving virtually no FONCODES educational funding. Moreover, better targeting of FONCODES educational expenditures is thought to have resulted in greater school attendance for *all* younger children (Schady 2000a, Paxson and Schady 2000).[47]

While FONCODES has been hailed by the government and donors as an important program to reduce Peruvian poverty, various concerns have been expressed. Schady (2000b) provides evidence that political considerations as well as poverty criteria have played a role in distribution of FONCODES funds. Spikes in the allocation of FONCODES funds, especially for "special projects," were found to be highly correlated with the November 1992, October 1993, and April 1995 elections. Furthermore, FONCODES funding disproportionately benefited areas of core support for the government of then president Alberto Fujimori: the study shows a high degree of correlation between FONCODES funding and 1990 Fujimori voters. Such politically biased distribution of funds was possible due in part to lax record-keeping and a lack of restrictions on FONCODES "special projects."

More recently, the 1999 MEF poverty map has been increasingly used in Peru (see Section 2). For example, the Ministry of Labor and Social Promotion used the map to improve targeting of its programs in urban areas (e.g., the *A Trabajar* program). In addition, the FONCODES recently started using the MEF poverty map (rather than the previously used FONCODES maps) to target its programs.

Encouraging the use of the 1999 MEF poverty map has been challenging, especially where various government institutions and programs already have their own established poverty targeting procedures (e.g., the FONCODES). Due to the large number of poverty maps in Peru, debate is increasingly focused on which poverty map to use—the FONCODES poverty map or the 1999 MEF imputed poverty map. In some instances, it is thought that this debate has prompted various agencies to avoid outright the use of *any* poverty map. However, Schady (2000a) finds that the use of different poverty indicators does not in fact result in statistically significant differences in outcomes. The study compares results (i.e., differences in poverty rates, leakage rates, and concentration curves) from three sets of poverty indices: the FONCODES poverty map, an imputed poverty map,[48] and an infant mortality index.[49] For highly aggregated regions (i.e., the

[47] This study indicates that, while expenditure on educational infrastructure has had an impact on some educational outcomes (e.g., attendance rates), it has not influenced other educational outcomes (e.g., the likelihood that children will be at the appropriate grade for their age).

[48] The study considered Peru's first imputed poverty map, rather than the more recent imputed map developed by the MEF (see Section 2).

[49] Developed by the INEI, the infant mortality rate index relies on information in the 1981 and 1993 census on the total number of children born and those surviving. Because the population of many districts is very small, the INEI first estimated infant mortality rates at the departmental level (enabling a larger sample size), which it regressed with various characteristics (e.g., women's education level, household characteristics, and place of residence). These coefficients were then used with the 1993 census to estimate district-level infant mortality (Schady 2000a).

Lima, other urban", and "rural regions), outcomes are shown to be very similar. The distributions of poverty generated by each of the three indicators are much the same (i.e., highest in rural areas, followed by urban areas other than Lima, and lowest in Lima).[50]

The current debate should be shifted from an emphasis on which poverty map to use to one focused on determining which programs will benefit most from geographic targeting. In fact, Schady (2000a) indicates that any targeting has the potential to result in substantial savings: expenditures required to close the poverty gap would be reduced by 288-353 million soles (US$82.6-101.3 million)[51] with targeting relative to untargeted expenditures.

Various decision-makers have stated that the FONCODES map and other Peruvian poverty maps do not adequately address economic viability. For example, investment in the poorest areas, with little infrastructure and the greatest need, often carries lower potential returns and is the least economically viable option. According to this view, geographic targeting should strike a balance between poverty and economic viability criteria. Decision-makers have also expressed concerns regarding the use of old data (i.e., 1993 census data) to develop poverty maps. Due in part to such concerns, a Peruvian nutrition program is considering the use of a "measure, height, and age" indicator based on 1999 INEI survey data. The use of such an index is considered simpler and more transparent as well as sector-specific.

The Peruvian example highlights three themes: 1) the use of any poverty map (regardless of methodology) may be preferable to using none at all; 2) effective use of poverty maps requires fiscal accountability; and 3) geographic targeting has the potential to produce substantial savings.

Bibliography

Amat y León, C. n.d. *Niveles de vida desiguales entre las provincias del Perú.* Processed.

Banco Central de Reserva del Perú. 1981. *El mapa de probeza*. Processed.

Escobal, J. and M. Torero. 1999. *How to face an adverse geography?: the role of private and public assets*. (http://www.wider.unu.edu/conference/conference-2002-2/papers/escobal%20&%20torero.pdf).

Instituto Nacional de Estadística e Informática (INEI). 1994. *Perú: mapa de necesidades básicas insatisfechas de los hogares a nivel distrital*. Lima: INEI.

[50] As noted above, the Schady study considers results for three highly aggregated regions. It would be interesting to see if similar results were obtained for more disaggregated areas.
[51] Based on the exchange rate as of September 26, 2001.

Schady, N. 2000a. *Picking the Poor: Indicators for Geographic Targeting in Peru*. Policy Research Working Paper 2477. Washington D.C.: The World Bank.

Schady, N. 2000b. "The Political Economy of Expenditures by the Peruvian Social Fund (FONCODES), 1991-1995." *American Political Science Review* Vol. 94, No. 2.

Webb, R. C. 1977. Government Policy and the Distribution of Income in Peru, 1963-1973. Cambridge, MA: Harvard University Press.

Experiences with the Development and Use of Poverty Maps

Case Study Note for BURKINA FASO*

1. Background information on the poverty mapping initiative

The development of poverty mapping in Burkina Faso has been predominantly research-driven. A methodology was developed by Bigman et al. (2000) that integrates data from several sources and uses econometric modeling to determine poverty distribution at a high resolution (e.g., rural village and urban community levels) (see Section 2). The methodology is particularly useful for countries where there are constraints—on the availability of census data on individual households or on the quality of census data—that make it highly desirable or even necessary to rely on additional data sources.

In Burkina Faso, as in many other developing countries, census data are available only as averages at the village (or even the district) level, but not for individual households. The poverty mapping method applied here combines survey data with additional data from other sources to estimate the incidence of poverty in small areas, such as districts, townships or even villages. The data from the different sources are brought together and arranged as GIS (geographic information systems) data. These data may include not only socioeconomic information (e.g., on the population in these areas, their income, etc.), but also agro-climatic information and geographic information (e.g., the distance from the village to other villages, the quality of the access road, the distance to the nearest town, school, and health clinic, etc).

2. Process of poverty mapping

The methodology used in Burkina Faso consists of collecting data from several sources at different geographical levels (e.g., the village, county, or regional level) and representing these data as a GIS according to their geographical coordinates. The data used for Burkina Faso included: the individual households' consumption data from the 1994 Household Income and Expenditure (HIE) Survey; demographic data from the 1985 census; household-level data from a variety of surveys;[52] community-level data on local road infrastructure, public facilities, and water points; and department-level data on agroclimatic conditions.

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[52] A variety of data sources were used including the Ministry of Water Management and Infrastructure (1995), Ministry of Education (1995), Ministry of Agriculture (1993), and Directorate of Meteorology (1961-95).

In the first stage of the analysis, an econometric model was used to estimate the impact of household-, community-, and department-level variables on the level of household consumption and the probability that this level of consumption falls below the poverty line. This step is aimed at identifying the key explanatory variables for household consumption and the incidence of poverty in rural and urban areas. Such econometric analysis can only be done for households included in the HIE survey.

In the second stage, the coefficients estimated for the explanatory variables, along with the values for these variables in communities not included in the HIE survey, were used to estimate the incidence of poverty in *all* communities. In Burkina Faso, several of the data sources were incomplete: the census missed one or more national regions,[53] and Ministry of Water data were limited to 25 of 30 provinces. For this reason, the analysis in this study was limited to 3,871 villages (57% of the country's total number of villages). The model's coefficients were used in the second stage to predict poverty indicators for the rural and urban communities in Burkina Faso for which the other data were available.[54] Constraints on data availability and quality may increase the prediction errors of these estimates and reduce the statistical significance of the results.

Finally, the villages were ranked in four categories according to the degree of poverty (i.e., poorest, lower-middle, upper-middle, and least poor). Results indicate that nearly two-thirds of poor people in Burkina Faso are concentrated in fewer than 20% of the villages.

Michael Lambotte of I-mage, a consulting group in Belgium, and two consultants from Burkina Faso compiled the data used in the poverty mapping exercise. Various data sources were used (e.g., Priority Survey, national census, and data from the Ministry of Water Management and Infrastructure, Ministry of Education, Ministry of Agriculture, and Directorate of Meteorology) at numerous agencies (e.g., *Institut National de Statistique et de Demographie*, Famine Early Warning Systems, *Institut Geographique du*

[53] Data were missing for approximately 15% of the country.

[54] More specifically, poverty incidence in all communities in the country was determined in two steps: (1) Using the Priority Survey data, together with the pre-selected data from all the other sources on the characteristics of the 'areas' in which the households reside, a probit analysis was conducted to determine the probability that individuals in a given community are poor as a function of their own personal characteristics and the characteristics of the community:
$P\{y_{ij} < z\} = F(H_1 \ldots H_m; A_1 \ldots A_k)$
(where y_{ij} is the income (expenditures) of the i-th individual that resides in the j-th 'area' (community)). This probability is a function of the individual/household characteristics ($H_1 \ldots H_m$) and the community/area characteristics ($A_1 \ldots A_k$). The household's characteristics include all the relevant information on the individual households that was collected in the Priority Survey, such as the number of persons/children in the household, the age/gender of the head of the household, etc. The community/area characteristics include information from all the other sources on the household's own community (village/township) or on the wider administrative region and agro-climatic area, such as the distance to the nearest town, the road conditions, the crops grown in that area, the soil conditions, etc..
(2) To provide complete mapping of all the poor communities in the country, the coefficients of the probit function, that were estimated in the first step, were applied with the information on the community/area characteristics ($A_1 \ldots A_k$) that was available for all communities in the country from all the other sources.

Burkina Faso, and *Direction Generale de l'Hydraulique*).[55] Econometric modeling was conducted by David Bigman of the International Service for National Agriculture Research and by Stephan Dercon and Dominique Guillaume from the Department of Economics at the Catholic University of Leuven in Belgium. Michael Lambotte was involved in GIS-related work and the development of the poverty map itself. Aside from data compilation, the statistical estimations and poverty mapping were conducted outside Burkina Faso. The development of the poverty map took approximately one year (1996-97). The World Bank and Belgium Trust Fund provided funding for this initiative.

3. Use and impact

As one of the earliest research initiatives on poverty mapping, the Burkina Faso poverty mapping exercise placed little emphasis on the ultimate use of the poverty data. Rather, the initiative focused on developing a methodology that could be used to estimate the distribution of poverty in instances where detailed census data are not available (see Section 1).

A paper describing the methodology and results was published by the World Bank (Bigman et al. 2000) and included in a book on geographic targeting for poverty alleviation (Bigman and Fofack 2000). In addition, a workshop was organized by David Bigman in late 1997 that entailed primarily World Bank participation (e.g., country economists within the Africa region). The Burkina Faso poverty map methodology and results, as well as other papers on the use of mapping and econometric modeling, were presented at the workshop.

The workshop and Burkina Faso papers helped raise awareness among various groups of poverty mapping and its potential uses in targeting national development programs. This work is thought to have helped spark long-term interest in further exploration of poverty mapping methodologies. The methodology used in Burkina Faso has been referenced by several poverty mapping initiatives (e.g., see the Malawi case study) and is being used in other countries, especially those with data constraints. David Bigman is currently involved in using a similar methodology to develop highly disaggregated poverty data for India, which are expected to help improve the targeting of poor areas in India's agricultural development strategy.

Dissemination of the Burkina Faso methodology and results have been focused primarily on an international and donor-community audience (e.g., World Bank country economists). Although results of this study could potentially be used to target villages for anti-poverty and cost-recovery programs in Burkina Faso, there have been no specific

[55] Specifically, household-level income and expenditure and village level infrastructure and communal services data were obtained from the 1994 Priority survey; village-level demographic data were obtained from the 1985 National census; health, water infrastructure, distances to infrastructure, public administration, and social groupings 1995 data were obtained from the Ministry of Water Management and Infrastructure; primary school infrastructure and teacher-pupil ratio 1995 data were obtained from the Ministry of Education; 1993 cattle per household and average vegetation indices to literacy rates was obtained at the Ministry of Agriculture; and temperature, evapotranspiration, and rainfall data were obtained from the Directorate of Meteorology.

efforts to disseminate poverty map results in Burkina Faso and no uses of the map are known. The Burkina Faso effort did, however, provide evidence that the use of village- and urban community-level targeting by decision-makers can substantially reduce leakage (inadvertent inclusion of non-poor in poverty reduction programs) and under-coverage (inadvertent exclusion of poor people). By conducting a simple simulation experiment, Bigman et al. (2000) indicated that the use of targeting could reduce leakage by 56% relative to an untargeted transfer.

Bibliography

Bigman, D. and H. Fofack. 2000. *Geographical Targeting for Poverty Alleviation*. World Bank: Regional and Sectoral Studies. The World Bank, Washington D.C.

Bigman, D., S. Dercon, D. Guillaume, and M. Lambotte. 2000. "Community Targeting for Poverty Reduction in Burkina Faso." *The World Bank Economic Review* 14 (1): 167-93.

Experiences with the Development and Use of Poverty Maps

Case Study Note for MADAGASCAR*

1. Background information on the poverty mapping initiative

Following conversations with World Bank staff concerning poverty mapping and its various methodologies, a technical advisor based at the Ministry of the Interior's Risk and Disaster Management Unit (CNS) in Madagascar recognized that a poverty map would substantially contribute to a risk analysis being developed by CNS in collaboration with CARE, a non-governmental organization (NGO). The CNS analysis, conducted with funding from CARE, incorporates an assessment of vulnerability and hazards. The vulnerability assessment portrays socioeconomic fragility using a combination of approximately 80 indicators, ranging from vegetation indices and agricultural production data to malnutrition. The hazard assessment integrates data on natural disasters, such as the extent and frequency of cyclones, floods, droughts, and locust and cholera outbreaks. A poverty map would better inform the risk analysis regarding socioeconomic conditions in Madagascar.

CNS, CARE, INSTAT (*Institut National de la Statistique*) and the World Bank held several discussions to explore the possibility of developing a poverty map for Madagascar. The World Bank agreed to provide technical assistance, if the Government of Madagascar would commit technical expertise and a budget for poverty mapping. Like many other government agencies in Madagascar, CNS faces budget constraints, but was able to negotiate provision of in-country funding from CARE. Specifically, CARE will contribute US$7,000 to cover staff costs to conduct statistical estimations for poverty mapping (see Section 2). Madagascar represents the only known case in which NGO funding has been used to facilitate in-country poverty mapping activities, and indicates a potential source of support for poverty mapping initiatives, especially where government budgets are constrained. It was decided that the poverty mapping would be conducted under the CNS umbrella and that the final poverty maps and reports would be identified as joint products of CNS and CARE.

2. Process of poverty mapping

INSTAT was subcontracted by the CNS and CARE to conduct the statistical estimations for the poverty map. Two staff at INSTAT and one consultant are working part time to

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develop the statistical estimations, while the World Bank is providing technical support.[56] The development of the poverty maps relies on the Elbers, Lanjouw, and Lanjouw (2001) methodology. Data from the 1993 census[57] and 1993 *Enquête Permanent auprès des Ménages* (EPM) household survey[58] are being used to impute consumption. Furthermore, spatial environmental variables (e.g., vegetation index and drought data) provided by CARE at the *fivondrona* (district) level are being used (see Section 1). Development of the statistical estimations began in March 2001 and is to be completed by March 2002. Since INSTAT does not have extensive GIS (geographic information systems) expertise, CNS and CARE have volunteered to develop the poverty maps themselves and to train the INSTAT staff as required. The poverty maps will be developed at the *fivondrona* (district) and *firaisana* (commune) level.[59] A presentation was recently given on the current status of the poverty mapping exercise at a meeting of the Risk and Disaster Committee meeting, which consists of NGOs and government agencies involved in risk- and disaster-related work. Various NGOs and government agencies are aware of and have expressed interest in the poverty map (see Section 3).

3. Use and impact

The poverty map is expected to help the CNS and CARE target hotspots for risk and disaster management. The use of the poverty, vulnerability, and hazards maps should help allocate and better target all future risk and disaster management programming, including approximately US$3.5 million in CARE funds annually. Specifically, CARE plans to use the maps to inform projects ranging from urban water and sanitation to natural resources to risk and disaster management. The poverty map, in conjunction with the vulnerability and hazard maps, are expected to be important lobbying tools for all future CNS and CARE programming.

At present, CNS and CARE, like many other organizations, do not systematically use such information tools such as poverty mapping to target initiatives. Rather, projects are often developed primarily in response to specific concerns, events, or donor-driven needs. The use of the poverty, vulnerability, and hazard maps should result in more transparent, objective, and effective decision-making within CARE and CNS. While it has often supported CARE-funded initiatives, the CNS has expressed particular interest in and is eagerly awaiting the poverty, vulnerability, and hazard map results.

[56] Tiaray Razafimanantena and Jean Razafindravonona from INSTAT and Johan Mistiaen from the World Bank are developing the statistical estimations, while technical assistance is being provided by Berk Özler from the World Bank.
[57] Data for the census were collected in 1993 by the *Direction de la Démographie et Statistique Social* (DDSS) of the INSTAT.
[58] The EPM survey is based on data collected from 4,508 households in May 1993 and April 1994 by the *Direction des Statistiques des Ménages* (DSM) of the INSTAT.
[59] There are 111 *fivondrona* (districts) and 1,332 *firaisana* (communes) in Madagascar.

Aside from use by CNS and CARE, the poverty map is expected to help guide planning in various other line ministries and NGOs. In particular, the high-resolution poverty map should help facilitate Madagascar's current decentralization of government activities by providing local-level decision-makers with highly disaggregated welfare information. For example, several administrators and provincial representatives of INSTAT have recently expressed interest in obtaining high-resolution poverty data, which may be used in local-level policymaking and to empower communities. As in other HIPCs (Highly Indebted Poor Countries), Madagascar's poverty maps will be used in the country's Poverty Reduction Strategy Program (PRSP). Moreover, donors are expected to use the high-resolution poverty information; for example, the World Bank plans to use the poverty map, in combination with information on local welfare and rural networks, to help allocate resources for road construction under its Rural Transport Project.

Bibliography

Elbers, C., J. Lanjouw, and P. Lanjouw. 2002. "Micro-Level Estimation of Poverty and Inequality". *Econometria*, forthcoming.

Experiences with the Development and Use of Poverty Maps

Case Study Note for MALAWI*

1. Background information on the poverty mapping initiative

Recognizing the growing demand for high-resolution poverty data[60] and with increased awareness of the possibilities of poverty mapping, the International Food Policy Research Institute (IFPRI) in 1999 developed a proposal soliciting funds to support the creation of poverty maps in Malawi and Mozambique. At the time, IFPRI was already involved in a Danish (DANIDA)-funded project in Malawi focused on providing technical assistance to develop a poverty monitoring system. As part of this project, IFPRI worked jointly with Malawi's National Statistics Office (NSO), National Economic Council (NEC), and Center for Social Research (CSR) to conduct a poverty analysis of the 1997-1998 Integrated Household Survey (IHS) data. Funds earmarked for poverty mapping were successfully obtained from the Rockefeller Foundation. Development of the poverty map began in earnest in January 2001 and is due for completion in March 2002.

While poverty mapping is new to Malawi, the country did conduct Vulnerability Assessment and Mapping (VAM) in 1996 as part of a USAID-funded Famine Early Warning Systems (FEWS) project. The VAM developed three vulnerability maps—on poverty, food deficiency, and malnutrition—based on a principal components analysis using numerous variables (such as agricultural yields, percentage children enrolled in school, and access to safe water).[61] A composite vulnerability map was also developed at an Extension Planning Area (EPA) level (Moriniere, Chimwaza, and Weiss 1996).[62] The VAM maps have been used by various agencies, particularly FEWS and the Ministry of Agriculture, to help identify areas in need of food security interventions.

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[60] There is considerable and growing demand for highly disaggregated poverty data in Malawi, particularly due to considering the country's current move toward decentralization. In 1998, the Local Government Act gave new responsibilities to district- and local-level government, ranging from infrastructure planning and development to making and enforcing local- and district-level policy.

[61] Various data sources were used in this analysis, including the 1991 census, UNICEF data, and NASA's Normalized Differentiated Vegetation Index (NDVI) data.

[62] In addition to principal components analysis, time-series analysis was used for variables for which data were available (e.g., on agricultural yields) to offer a greater understanding of the temporal patterns of vulnerability.

2. Process of poverty mapping

IFPRI has been working primarily with two staff at NSO to develop statistical estimations for the poverty maps.[63] In addition, the Department of Surveys (DOS) produced district, Traditional Authority (TA), and Enumeration Area (EA) boundary digital maps used to create the poverty maps[64]. The Malawi Electoral Commission furthermore provided boundary descriptions for local government wards by listing the EAs found in each ward (a geographic information systems (GIS) coverage of local government wards was built on this basis). Progress on developing the poverty maps has been relatively slow, as the project involves very large data sets (see below) and none of the staff mentioned above is working solely on poverty mapping.

The development of the Malawi poverty map relied on 1997-98 IHS survey data and 1998 Population and Housing Census data.[65] The poverty map was constructed using the Hentschel et al. (2000) methodology, with reference to Statistics SA (2000), Minot (2000), and Bigman and Fofack (2000). For rural and urban areas, a stepwise regression procedure was used on all candidate household-level variables. The development of the poverty map underwent three iterations. Due to the poor quality of IHS data, almost 50% of households sampled had to be removed from the survey data set.[66] Thus, the first iteration imputed consumption based on 22 districts/strata,[67] the second on 17 strata,[68] and the third for 23 strata.[69] To improve the predictive power of the consumption model and to eliminate some econometric problems, Enumeration Area (EA) variables were integrated to refine the consumption model. Such EA variables included distance to the nearest market center, health facility, urban center, *boma* (town), and primary or secondary road. Finally, the model's coefficients were applied to national census data to determine household-level poverty rates. Error (e.g., heteroscedasticity of the model) was estimated for each TA and local government ward in the third iteration. A fourth iteration of the poverty map is currently being developed in which additional analysis will be conducted on four or five districts that reflected slightly different poverty measures from the IHS poverty analysis in the third-iteration poverty map. This last iteration is due for completion by March 2002.

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[63] Technical assistance has been provided by Todd Benson, while Richmond Chinula and Shelton Kanyanda from the NSO are developing the statistical estimations.

[64] With Japanese (JICA) funding, Geoffrey Mzembe from the DOS developed the digital maps. DANIDA provided additional funds to clean the digital data.

[65] The Population and Housing census surveyed 2.4 million households (approximately 9.8 million persons). The IHS is a survey resembling the Living Standards Measurement Survey that provides detailed information on consumption and expenditure as well as other data. The IHS was administered in all districts and was carried out during the same period as the decennial 1998 census.

[66] Of the original 12,960 households, only 6,586 could be used to impute consumption.

[67] While the IHS was designed to provide data on 29 districts, due to unreliable consumption information, several sample households had to be removed from seven strata/districts. These seven strata were lumped with households in adjoining districts, leaving 22 strata.

[68] In this case, another five districts were "lumped" with districts showing similar characteristics.

[69] This involved 22 strata used in the first iteration plus separate strata for urban areas in rural zones (*bomas* (towns) and rural trading centers).

Three "poverty incidence" maps have been developed for each of the initial three iterations. The poverty maps have been developed using four spatial scales: district, TA, local government ward, and EA.[70] The EA poverty map results should be viewed with caution since the number of households surveyed at the EA level is about 250; some economists involved in poverty mapping argue that reliable poverty estimates can only be generated for groupings of 500 households or more. A range of poverty and inequality measures has recently been generated for each TA and local government ward (including poverty headcount, depth of poverty, poverty severity, and ultra-poverty). Most widely distributed and referred to have been poverty headcount measures. Preliminary results (based on the second iteration) show that poverty is widespread throughout Malawi. Highest poverty rates are found in the northern districts of Mzimba, Rumphi, and Chitipa; the central districts of Ntcheu and Nkhotakota; and the southern districts of Phalombe and Chiradzulu.[71]

Preparation of an *Atlas of Social Statistics*—including poverty maps, census results, and sector-specific information (e.g., education and health facilities)—is underway. The atlas is slated for wide dissemination so that this information may be incorporated in planning and policymaking. To encourage effective dissemination of the atlas, both digital (CD) and hard-copy versions of the atlas are to be produced, possibly including poverty and poverty-related time-series data sets (based on 1978, 1988, and 1998 census data). A draft atlas is scheduled for completion by March 2002. Furthermore, the poverty mapping results will also be posted on the National Statistical Office website.[72]

While a final poverty map is still in development, current challenges may help redirect future efforts. Data quality, especially with respect to the IHS, has been a major concern. As noted above, poor data quality necessitated the elimination of approximately 50% of households sampled in the IHS from the consumption model. Concerted efforts will need to be made to provide sufficient logistic support so that future IHS data collection in the field is thorough and reliable. Lessons learned are already being applied in developing the second IHS; a pilot IHS-2 survey is planned for March/April 2002.

Data access has been another source of unease. Access has been obtained to digital files containing data at the district, TA, and EA levels that were being developed for a different project. However, the government currently has no policies concerning tabular release of spatial data. The development of such policies is vital to help ensure continued access to data.

[70] Malawi contains 27 districts (excluding four urban centers), 368 TAs and urban wards, 851 local government wards, and 9,218 EAs.
[71] IHS survey results, including from the poverty analysis, can be found at the National Statistical Office website (http://www.nso.malawi.net). The poverty mapping results will eventually be posted at this site.
[72] http://www.nso.malawi.net.

Analytical capacity, particularly at the NSO, also is a concern. It will be important for academic and related institutions (e.g., the Center for Social Research) with stronger analytical capacities and mandates to participate in future analysis of poverty map results.

3. Use and impact

Since the Malawi poverty map is still in development, no current uses of the poverty map exist. There are, however, a number of anticipated uses. In particular, the poverty map may help target Malawi's "starter pack" program. The program was initiated in 1998 as a poverty alleviation effort with a goal of universal distribution of fertilizer and seeds to all of Malawi's rural households. In the 1998-1999 and 1999-2000 fiscal years, the program successfully distributed fertilizer and seeds to approximately 2.8 million rural households, albeit at a high cost. The program cost about US$30 million, most of which was covered by donors. While the "starter pack" program has been looked upon favorably, donors have expressed concerns that the program is currently too expensive. It is anticipated that the poverty maps could be used to improve the targeting of this program, for example, by identifying poor areas (e.g., districts or TAs) in which the "starter packs" could be distributed.

There has been concern, however, that the poverty maps may not ultimately be used to influence decision-making in the "starter pack" and/or other programs, especially since Malawi does have a more limited track record on emphasizing the use of technical information to support its decision-making. While information has influenced some decisions (e.g., food security initiatives that have used FEWS data; see Section 1), political motivations have often been unduly emphasized. In the "starter pack" program, various decision-makers have already indicated that, given budget constraints, they would rather the "starter pack" be distributed universally (i.e., to all rural households) but less frequently rather than target distribution only to poorer households. (Note that the former strategy holds the potential for greater electoral gains than the latter.)

Aside from potential use in the "starter pack" program, the poverty map may be used by government, NGO, and donor agencies to help target various programs, especially poverty reduction initiatives. However, the poverty map will likely not be developed in time to be integrated in Malawi's Poverty Reduction Strategy Program (PRSP), due for completion in September 2001.

Bibliography

Bigman, D. and H. Fofack. 2000. *Geographical Targeting for Poverty Alleviation*. World Bank Regional and Sectoral Studies. Washington, DC: The World Bank.

Hentschel, J., J. Lanjouw, P. Lanjouw, and J. Poggi. 2000. "Combining Census and Survey Data to Trace the Spatial Dimensions of Poverty: A Case Study of Ecuador." *The World Bank Economic Review* 14(1): 147-65.

Minot, N. 2000. "Generating Disaggregated Poverty Maps: An Application to Vietnam." *World Development* 28(2): 319-31.

Moriniere, L., S. Chimwaza, and E. Weiss. 1996. *Malawi Vulnerability Assessment and Mapping (VAM) Baseline 1996: A Quest for Causality.* World Food Programme, Government of Malawi, and Famine Early Warning Systems.

Statistics SA. 2000. *Measuring Poverty in South Africa*. South Africa: Statistics SA.

Experiences with the Development and Use of Poverty Maps

Case Study Note for MOZAMBIQUE*

1. Background information on the poverty mapping initiative

One of the many impacts of Mozambique's civil war (1977-92) has been the general lack of in-country data from the early 1980s through the mid-1990s. This lack of data with nationwide scope became particularly evident to the Ministry of Planning and Finance (MPF) as it developed a poverty reduction strategy in 1995. Due to the inadequate supply of in-country data, in 1995 the government commissioned the National Directorate of Statistics (now known as the National Statistics Institute, or INE) to develop the National Household Survey of Living Conditions (conducted in 1996-97) and the National Population and Housing Census (conducted in 1997).

In 1998, a national poverty assessment used the newly available household survey data to develop a national poverty profile; a coarse, provincial-level[73] poverty map; and several analyses (both formal and informal) relating poverty to food security, human capital development, and safety nets. While the provincial-level poverty map was eventually included in the assessment report, reservations were expressed. Some considered information regarding the geographic distribution of poverty too politically sensitive: the first multiparty municipal elections were to be held soon after the informal presentation of the poverty mapping results. The objectives of the national poverty assessment were to: estimate the extent of absolute poverty; identify the characteristics of the poor; distinguish vulnerable groups; formulate policy actions to reduce poverty; and develop capacity within Mozambique for poverty analysis. More generally, the goal was to provide a sound empirical basis for the elaboration of poverty reduction policies. The national poverty assessment report was a key input for the National Action Plan for the Reduction of Absolute Poverty (PARPA) and the government's Poverty Reduction Strategy Program (PRSP).

The results of the national poverty assessment, presented at a national conference in October 1998 and published in early 1999, generated substantial interest on the part of numerous ministries and donors to develop more highly disaggregated poverty data. This led to the elaboration of provincial poverty profiles in early 2000, which were based on the 1996-97 household survey data. The availability of high-resolution data was intended to help refine the poverty database and poverty reduction policies. In 1999, the International Food Policy Research Institute (IFPRI) developed a proposal to construct

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[73] There are 10 provinces in Mozambique, with the capital city, Maputo, often treated as a separate, 11th province.

high-resolution poverty maps for Mozambique and Malawi. Funding for this purpose was successfully obtained from the Rockefeller Foundation.

2. Process of poverty mapping

Mozambique's first poverty map was developed—albeit at a coarse, provincial level of resolution—in 1998 by staff from the MPF, Eduardo Mondlane University (UEM), and IFPRI. This map used 1996-97 national household survey data[74] and relied on a household welfare indicator based on food consumption (i.e., food produced, purchased, earned, or received as gifts) and non-food goods and services earned as wages or received as gifts. The poverty map indicated that the incidence of poverty was at 69% in Mozambique, with especially high rates in the central provinces. This coarse, provincial-level map could help target national resources *among* provinces, but could not provide information to help direct funding to the poorest areas *within* a given province. Hence, the development of the 1998 poverty map stimulated substantial interest in creating higher-resolution poverty data.

To respond to this demand, IFPRI and the MPF are currently developing, with Rockefeller Foundation funding, high-resolution, district- and administrative post-level poverty maps.[75] The Hentschel et al. (2000) methodology is being used to estimate welfare measures for these smaller geographic units. First, the 1996-97 national household survey data are being used to develop a welfare model based on variables found in both the survey and census. The estimated coefficients from the model are then applied to 1997 census data to predict welfare for all households in Mozambique. Maps indicating the poverty headcount, poverty gap, and inequality measures are being developed.[76] Standard error is being estimated and heteroscedasticity will be corrected for. Error assessments are being conducted to determine if the survey and census data can be used to develop a more highly disaggregated poverty map at a local level (*localidades* in rural areas and *bairros* in urban areas).[77]

Development of the district- and administrative post-level poverty maps began in earnest in late December 2000 and a preliminary set of poverty maps was produced in mid-March 2001. A complete set of poverty and inequality maps is anticipated by the end of October 2001. The statistical estimations and poverty mapping are being conducted by Ken Simler of IFPRI and Virgulino Nhate of the MPF. Work on the poverty mapping by IFPRI and MPF staff has been primarily part time. The involvement of the MPF in poverty mapping is thought to have helped substantially in obtaining full access to census data, an unusual request in Mozambique, as in many other countries. In an effort to broaden poverty mapping capacity and to support continued collaboration between MPF

[74] The national household survey was conducted between February 1996 and April 1997. It resembles the Living Standards Measurement Survey (LSMS) and includes information on consumption patterns, sources of income, health, education, agriculture, and quality of housing. The survey sampled 8,250 households that are representative of Mozambique's ten provinces and the Maputo metropolitan area.
[75] There are 141 districts and 418 administrative posts in Mozambique.
[76] Preliminary work indicates that the regression fits are quite good, with adjusted R^2 of between 0.47 and 0.63.
[77] There are 1,933 *localidades* and *bairros* in Mozambique.

and INE, two MPF staff (one of them Mr. Nhate) and one from INE attended a recent poverty mapping workshop in South Africa.

Concerns have been raised regarding the long-term sustainability of poverty mapping in Mozambique, due to a potential lack of sufficient staff resources and capacity. The MPF is expected to take the lead in future poverty analysis and mapping initiatives, while the INE will continue to compile and provide core data sets. The high level of analysis required to assess poverty map results may be particularly challenging. Mozambique's 15-year civil war has created a dearth of educated individuals, let alone university-level environmental and poverty analysts. A concerted effort should be made to build a cadre of broadly trained analysts who can work on future poverty mapping and analysis initiatives.

3. Use and impact

Mozambique's high-resolution poverty maps are still in development and hence have not yet been used. Potential uses of the maps are expected to include the targeting of various programs to increase responsiveness to poor areas, as well as efforts to explore the spatial determinants of poverty. The availability of high-resolution poverty maps should contribute to decisions that are more firmly based on empirical evidence. In addition, future poverty mapping initiatives will likely stimulate demand for poverty data analyses and the analysts themselves (see Section 2).

Although coarse, the 1998 provincial-level poverty map was used by the Ministry of Health to help allocate some of its funds. The ministry developed a budgeting formula that took into account the results of the 1998 national poverty assessment. The coarse resolution of this map is thought to have limited its use; this concern then helped to generate demand for a higher-resolution poverty map (see Section 2). It is hoped that the new high-resolution, district- and administrative post-level poverty maps currently in development will be more extensively used to better inform and target future poverty reduction initiatives in Mozambique.

Bibliography

Hentschel, J., J. Lanjouw, P. Lanjouw, and J. Poggi. 2000. "Combining Census and Survey Data to Trace the Spatial Dimensions of Poverty: A Case Study of Ecuador." *The World Bank Economic Review* 14(1): 147-65.

Experiences with the Development and Use of Poverty Maps

Case Study Note for SOUTH AFRICA*

1. Background information on the poverty mapping initiative

The development of poverty maps in South Africa was originally initiated due to an interest in exploring their possible use in facilitating the allocation of municipal grants. Since 1998, the Division of Revenue Act (#28) has required the equitable distribution of nationally raised revenue to municipalities based on poverty levels. Under this act, unrestricted municipal grants are allotted based on the number of poor households and costs associated with providing household-level basic services. Originally, census data on income were used to determine the number of poor households in each municipality. However, the use of these data raised concerns, as the South African census, unlike most income surveys, did not use a detailed module, but rather relied on one brief question on income (Alderman et al. 2001).

In 1999, Harold Alderman, resident World Bank staff in South Africa, approached the then Deputy Director General of Statistics South Africa (Statistics SA) about using a new methodology combining census and survey data to estimate the number of poor households and generate highly disaggregated poverty maps (Hentschel et al. 2000). The process would involve two stages: 1) determining whether poverty estimates based on census data were comparable to those based on the Income and Expenditure Survey (IES) data (the best available data on income in South Africa at the time, but limited to provincial aggregates only), and 2) producing a highly disaggregated poverty map based on the better measure of poverty. If the outcome of the first stage revealed that census income data were a poor measure of household welfare compared to IES income data, then a highly disaggregated poverty map would be created by imputing expenditure from the census data using IES data. (In general, consumption expenditure produces more reliable household welfare descriptions than household income.) Initially, there was some reluctance to conduct this assessment, because of data compatibility concerns (e.g., between the 1991 and 1996 censuses) and data access issues (e.g., releasing census data to an external organization) (see Section 2). However, senior-level support was eventually obtained.

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2. Process of poverty mapping

Comparing poverty estimates generated from census income data to those based on the IES showed that census data produced unreliable estimates of welfare. The census income data were found to differ substantially from the IES income data and to heavily understate poverty in rural areas. Because census income data are a weak proxy for poverty rates, a poverty map was developed based on 1995 IES and October Household Survey (OHS) data combined with 1996 census data. With technical assistance from the World Bank, a team of four individuals at Statistics SA developed the poverty map.[78] Activities included: development and application of statistical estimations; producing poverty rates based on imputed expenditure of census households; creating the final poverty map; and co-authoring papers (Alderman et al. 2001, Statistics SA 2000). The assessment took approximately one year to complete (from March 1999 to March 2000). Emphasis was placed throughout on developing skills (such as development and application of statistical estimation techniques, data exploration, editing and handling large statistical data sets, and writing technical reports) and building ownership of data results. This was particularly important since there had initially been some senior-level concern over data ownership, particularly in a context in which a large international organization (i.e., the World Bank) would be handling in-country data. The use of this capacity development approach helped build trust between the two organizations and reassure senior-level South African staff that the research was intended to respond to country needs.

Development of the poverty map posed some unexpected challenges. The 1995 OHS and IES survey data were based on apartheid administrative units used in the 1991 census. Linking the OHS and IES survey with the new 1996 census data, which was based on post-apartheid administrative areas, required comparing and matching different geographic units; for example, various homeland areas were no longer used as of the 1996 census. Furthermore, the 1991 census had not been conducted uniformly, leading to a controversy over the actual population count. While there was some skepticism about the ability to match the different administrative units, the poverty mapping initiative gave impetus to an effort to make these spatial data sets compatible. The Statistics SA team succeeded in matching the different geographic areas by relying on geographic technologies and techniques. This exercise built capacity within Statistics SA to conduct a number of subsequent poverty assessments based on other geographical configurations (e.g., for police areas, municipalities, and health districts; see Section 3). In addition, the effort gave Statistics SA an opportunity to organize and improve its spatial databases. The matched 1991 and 1996 geographic areas have subsequently been used in several other assessments (e.g., in the development of the South African census time-series database at the University of Pennsylvania for Pan African Census Explorer (PACE)).

[78] Miriam Babita, Nthabiseng Makhatha, Amina Mohammed, and Olivia Qaba from the Statistics SA were involved in conducting the assessment and developing the poverty maps. Miriam Babita was involved primarily with the census data and poverty map production, while Nthabiseng Makhatha conducted most of the survey-related work. The World Bank's Harold Alderman and Berk Özler provided technical assistance.

After cleaning and matching the data sets, small-area estimation methodology was used to develop a prediction model for expenditure using OHS, IES, and 1996 census data (Elbers et al. 2000, Hentschel et al. 2000).[79] Initially selected were variables in the OHS and IES that were also found in the census.[80] A regression model was run on the OHS and IES (exogenous) variables and consumption expenditure. In turn, the model's parameters were applied to census data to impute expenditure for all South African households covered by the 1996 census. Poverty rates were subsequently estimated using poverty lines.[81] The calculated poverty statistics were disaggregated to province, district council, and magisterial district levels.[82] Poverty statistics were based on the headcount index; work is underway to develop other poverty measures, such as poverty gap and inequality measures.

To raise awareness of the poverty map results, several papers were written (Alderman et al. 2001, Statistics SA 2000) and presentations were made to various national, international, and local agencies. These agencies included the staff of Statistics SA, the President's office, Health Ministry, Department of Provincial and Local Government, U.S. Agency for International Development, various academic institutions, and numerous provincial-level government agencies. In addition to in-country presentations, briefings were given at the request of various international agencies and regional organizations, including in Ethiopia (ECA/CODI II, September 2001), Kenya (ILRI/Rockefeller/IFPRI/AERC Poverty Mapping Workshop for Kenya, Malawi, Mozambique, Tanzania, and Uganda, January 2001), Uganda (PARIS21 for East Africa and the Horn, July 2001), and Zambia (SADC/PARIS21, December 2000). Furthermore, a presentation will be given at a SADC/EASTC workshop on poverty mapping. Miriam Babita, a Statistics SA staff member who has been integrally involved in the development of South Africa's poverty map, was an instructor at the AERC/WB poverty mapping training course in Nairobi (December 2001).

Aside from geo-data compatibility concerns (e.g., matching the apartheid and post-apartheid administrative units) and having to add geographic codes to over nine million households in the census (i.e., province, district council, magisterial district, place name, transitional local council, and municipality codes), few challenges were faced in developing the South Africa poverty maps. Statistics SA had sufficient computer facilities and expertise to conduct the statistical estimations and to develop the poverty maps. A small group (three individuals at the head office and one at the provincial level) was trained to develop the statistical estimations and poverty maps; this may become a concern in the future, especially as staff are promoted or leave the agency. This concern

[79] When combined, the 1995 OHS and IES surveys include approximately 28,585 households, while the 1996 census covered over nine million households.
[80] Note that results of the IES and OHS were designed to be merged. While the IES was conducted slightly later, the same households were interviewed for both surveys.
[81] Two poverty lines were used to estimate household and individual poverty rates. The household-level poverty line was 800 rand; households with incomes below this level were considered poor for the purposes of the municipal grants program. The per capita poverty line was set at 250 rand.
[82] South Africa contains nine provinces, 45 district councils, and 354 magisterial districts.

is being addressed by training additional provincial-level staff to handle information requests from provincial-level users.

3. Use and impact

Poverty maps have been used in several applications in South Africa, ranging from allocating municipal grants to containing a cholera outbreak. Described below are the most notable uses that have produced the greatest impact. These by no means form a complete list: other uses not reported here include poverty profiles for NGOs (such as the Women's Development Bank) as well as private-sector uses (e.g., in commercial banks).

First, the poverty map has been used to allocate municipal grants; an inquiry concerning this program sparked development of the poverty maps in the first place (see Section 1). The equitable shares grant is a system of intergovernmental transfers based on an objective formula. The program is intended to embody the principles of equity, efficiency, and democracy. It is specifically provided for by sections 214(1)(a) and 227(1)(a) of the South African Constitution, which state that:

(i) an Act of Parliament must provide for the equitable division of revenue raised nationally among the national, provincial, and local spheres of government; and
(ii) local government is entitled to an equitable share of revenue raised nationally to enable it to provide basic services and perform the functions allocated to it.[83]

The formula used to distribute grants among individual municipalities takes into account several factors, including the number of poor households, average household size, number of households without access to basic services (e.g., sanitation, safe water), and the estimated cost of providing such services in each municipality.[84] The poverty map results were used for the first time in the 2001-2002 fiscal year to improve information on the number of poor households, replacing previous estimates based on census income.[85] The total allocation for the 2001-2002 fiscal year amounted to approximately SA Rand 2.6 billion (US$305 million, based on the June 2001 exchange rate).[86] In addition to use for the 2001-02 fiscal year, poverty maps provided the municipal grants program with a basis for the program's first ever medium-term, three-year budget (2001-04).[87] The current use of poverty map data has led to better targeting and budgetary planning at the municipal level.

Another notable use of the South Africa poverty map has been to help contain the spread of cholera in Kwazulu-Natal province in early 2001. In formulating a disease control

[83] For more information on the equitable municipal grants program see http://www.local.gov.za/DCD/dcindex.html
[84] This distribution of grants is determined by the Department of Provincial and Local Government.
[85] Note, however, that census and other data were used to obtain baseline demographic and socioeconomic information, such as average household size, number of households without access to basic services, and the estimated cost of providing services.
[86] Although allocations are determined annually, municipal grant transfers are made on a quarterly basis.
[87] There are plans to revise and update this provisional budget as more information becomes available.

strategy, the Department of Health (DOH) worked with Statistics SA and other government departments in the so-called Social (sector) Cluster to acquire the necessary information for targeted intervention. The DOH provided disease data, Statistics SA provided poverty map data and information on sanitation, and the Department of Water Affairs (DWAF) provided information on safe and clean water in the country. The DWAF combined the various data sets and produced maps of high-risk areas. The combined poverty and cholera outbreak maps were very revealing. First, it was evident that the cholera outbreak was following a river flood plain and moving through and toward poor areas. Second, the combination of variables (e.g., illiteracy, informal/shack dwelling type, lack of basic services like sanitation, clean water, electricity, etc.) provided a good mechanism for targeting health education.

The integrated information and maps were used by the DOH, other Social Cluster departments, and local government authorities to develop a collaborative strategy to help stop the spread of cholera. The strategy included: provision of portable toilets and tankers of safe water to affected areas; refresher epidemiological training and redeployment of health personnel to affected areas; health education and awareness of good hygiene practices in affected and potentially high-risk areas; and provision of health promotion materials and additional health services in affected areas. The collation and use of information from diverse research and administrative sources encouraged the collaboration of various institutions, providing an opportunity to offer integrated services. The DOH's speedy and well-coordinated response led to effective containment of the cholera within three months, resulting in a very low fatality rate of 0.22% (among approximately 100,000 cases). This work helped prevent an outbreak of epidemic proportions across the country. This particular case study prompted calls by various service providers for further research on and provision of vulnerability and natural disaster maps to help in planning and responding to floods, fires, drought, and other natural disasters.

Another known use of the poverty map results is in an ongoing study of the socioeconomic factors correlated with crime. This information will be used to help develop crime prevention strategies in South Africa. The poverty map has also been used as a major input in the formulation of nodal areas for priority work under the Integrated Sustainable Rural Development Programme (ISRDP) and for the Urban Renewal Programme (involving integrated and fast-track provision of services such as education, health, and infrastructure). Furthermore, communities and their political representatives are making use of poverty profiles and maps to assess and evaluate their development status. Planners and researchers in both the public and private sectors and NGOs continue to use the poverty map data to plan interventions and to help ensure the efficient and effective use of resources. In general, the poverty map data have helped fill a gap for development information and are being directly used in policy, program planning and design, and monitoring and evaluation. Current trends show that, as poverty maps are updated and improved, their use will continue to grow.

The poverty map results have had a significant impact on decision-making in South Africa. Various government departments have indicated that their use of the poverty maps has helped highlight poor areas that had previously gone unnoticed as well as helping to substantiate intervention in areas previously assumed to be poor but for which there was no supporting evidence. The poverty maps provide an easily understandable format and are an important communication tool (one that is easier to interpret than spreadsheets or tabular data) to focus attention on poor groups and to encourage integration of the issue of poverty in policy and program design.

Moreover, the development of poverty maps has had tremendous institutional impact on Statistics SA. The agency's involvement in the development and provision of the poverty map data has improved its institutional credibility. Traditionally, Statistics SA was considered a *data* provider; however, the use of the poverty maps and data has broadened and enhanced Statistics SA expertise to include analyses. Increasingly, the institution is being viewed as a *knowledge* provider. Since the development of the poverty map, Statistics SA has been asked to contribute to the development of numerous strategies (e.g., a crime prevention strategy; see above). The production and utilization of poverty map data has contributed to a change in the Statistics SA's image, from an agency that prior to 1994 provided finely disaggregated information for selected, often urban areas, to an institution committed to contributing to the socioeconomic development of South African society as a whole. The institution's success in matching the geographic areas in the 1991 and 1996 censuses has led to other collaborative projects (e.g., the development of a time-series database on the South African census; see Section 2). Furthermore, the development and wide utilization of poverty map data have enhanced the skills and capacity of Statistics SA staff, who are undertaking progressively more challenging tasks.

Aside from in-country impacts, the South Africa poverty mapping initiative has influenced the development of poverty mapping initiatives elsewhere. Several presentations—including in Ethiopia, Kenya, Malawi, Mozambique, Tanzania, and Uganda (see Section 2)—have been given on South Africa's experiences in poverty mapping. Due in part to such awareness building, the International Food Policy Research Institute (IFPRI) became involved in developing poverty mapping initiatives in Malawi and Mozambique. Owing to an approach that has emphasized genuinely working as partners, building in-country capacity, and developing national ownership of the poverty map and data results, the use of the poverty maps in South Africa is widespread and its impact substantial.

Bibliography

Alderman, H., M. Babita, G. Demombynes, N. Makhatha, and B. Özler. 2001. *How Low Can You Go? Combining Census and Survey Data for Mapping Poverty in South Africa.* mimeo, DECRG. The World Bank.

Elbers, C., P. Lanjouw, and J. Lanjouw. 2002. "Micro-Level Estimation of Poverty and Inequality" *Econometrica*, forthcoming.

Statistics SA. 2000. *Measuring Poverty in South Africa*. Pretoria: Statistics South Africa.

Experiences with the Development and Use of Poverty Maps

Case Study Note for CAMBODIA*

1. Background information on the poverty mapping initiative

When Cambodia's first elected government was established in 1993, in-country data were lacking; for example, no census had been conducted since 1960. Due to this lack of data, the World Food Programme (WFP), with a mandate to provide food aid, has since 1995 developed poverty maps—relying primarily on qualitative assessments (see Section 2)—as an important tool to help target the most food-insecure communes in the country.[88] Once the poorest communes have been identified, provincial-level field staff from WFP and the Cambodian Ministry of Rural Development are mobilized to provide food aid in these communes. WFP's use of poverty maps is expected to help allocate US$50 million in food aid for 2001-03 (see Section 3).

2. Process of poverty mapping

Methodologies used to develop poverty maps in Cambodia have evolved over time, ranging from the use of qualitative assessments to econometric modeling using small-area estimation. In 1997, for example, commune-level poverty maps were developed based on qualitative assessments conducted by experts in government, NGOs, and donor agencies. These assessments were used to select the poorest 550 communes. To produce a more detailed socioeconomic picture of poverty in these areas, half the villages in each commune (a total of 2,751 villages) were surveyed using a detailed questionnaire. Compilation and and weighing of 27 socioeconomic indicators yielded a poverty score for each of the 550 communes. Communes falling in the poorest quartile were identified as being in need of "food for work" interventions, a program that accounts for 85% of WFP's food aid in Cambodia. Other methodologies were used to develop WFP's poverty maps in 1998, 1999, and 2000. Most of these methodologies have heavily relied on the use of qualitative assessments.

With increased availability of in-country data, WFP used a more sophisticated methodology to develop its 2001 poverty map. A small-area estimation technique was used to combine data from the 1999 Cambodia Socio-Economic Survey (CSES) and the 1998 National Population Census. The CSES was used to develop a prediction model of

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[88] Cambodia contains four municipalities, 20 provinces, 183 districts, 1,609 communes, and 13,406 villages (Population Census 1998).

consumption, where consumption was based on self-production and purchased consumption expenditures. The model's coefficients were in turn applied to 1998 census data to estimate consumption for all 2.1 million households in Cambodia. Due to time constraints, the detailed statistical tests required by this methodology were not conducted. The results were, however, extensively crosschecked with previous poverty analysis results from 1997, 1998, 1999, and 2000.[89] In addition, field staffs' local-level knowledge of poor communes was used to crosscheck the 2001 poverty map results.

While the 2001 poverty map provides the most comprehensive and reliable data set on poverty in Cambodia, there are some concerns. Poverty is inadequately depicted for some communes, especially those near the border (such as Banteay Meanchey, Battambang, and Oddar Meanchey) where there has been significant immigration and resettlement.[90]

The statistical estimations and poverty maps themselves were developed by a small group at WFP's Vulnerability Analysis and Mapping Unit.[91] Field verification of the poverty mapping results and qualitative assessments have been carried out jointly by field staff at the Ministry of Rural Development and WFP. In addition, WFP has worked closely with the Ministry of Planning (which includes the National Institute of Statistics) throughout its vulnerability assessments. Institutional collaboration has helped ensure data access, such as access to the full 1998 census, for the development of the 2001 poverty map.

Lack of skilled staff raises concerns about the long-term sustainability of poverty mapping-related activities in Cambodia. For example, the WFP consultant involved in developing statistical estimations was an expatriate. When WFP ultimately phases out its work in Cambodia (within five or 10 years), poverty mapping at the current level of sophistication will likely be implemented at agencies with strong analytical skills, such as the Asian Development Bank (ADB), the United Nations Development Program (UNDP), and the World Bank.

3. Use and Impact

Cambodian poverty maps have been used primarily by the WFP to target communes in need of food aid, especially for WFP's "food for work" programs (see Section 2). Once the poorest communes as depicted in the poverty map have been identified, provincial officers and field staff (e.g., at the Ministry of Rural Development) are mobilized to provide food aid to the selected communes. The field staff are responsible for further identifying the poorest villages and households that qualify for food aid within the selected communes. In 2001-03, the "food for work" program is expected to entail the

[89] Results from the 1997, 1998, 1999, and 2000 poverty maps were combined to identify three poverty categories (see map): 1) areas categorized as poor in 1997, 1998, 1999, and 2000; 2) areas categorized as poor in 1997, 1998, and 2000; and 3) areas categorized as poor in 2000. These maps were used to validate the 2001 poverty results.
[90] Note that 1998 census data do not reflect immigration and resettlement into communes since 1998.
[91] Work on poverty mapping at this unit has been conducted by primarily Mack Ramachandran, Boreak Sik, and Venkatesh Sundararaman (a WFP consultant).

allocation of approximately US$50 million of food aid. The use of the poverty maps has helped establish WFP as a reputable institution whose decisions are viewed as objective and transparent.

WFP has made a concerted effort to disseminate its poverty mapping results to other potential users. A WFP report containing the poverty maps has been disseminated (150 copies were distributed in 2001). Furthermore, numerous discussions have been held with and presentations given to various ministries, donors, and other agencies. Approximately 15% of the WFP Vulnerability Analysis and Mapping Unit's time is spent on assisting agencies with understanding and using poverty mapping results.

Besides WFP, a user of Cambodian poverty maps has been the ADB, which used the 2001 map in its Northwestern Rural Development Project. The project has three components: rural infrastructure, capacity building, and micro-enterprise development. In particular, the project's core component is the development of rural infrastructure, including the rehabilitation of tertiary roads; building of bridges, culverts, drifts, and other structures; reconstruction of primary schools; construction of wells; building of multipurpose community halls; and building of community storage and drying facilities. The poverty map has been used to: identify provinces with high incidence of poverty during the early stages of the project; confirm target districts proposed by provincial authorities during project preparation; and identify target populations within districts during the project design. Recognized as the most comprehensive and reliable data set on poverty in Cambodia, the poverty map provides a clear spatial estimate of poor areas and households. Over a five-year period, project expenditures will total approximately US$30 million.

The 2001 poverty map was also recently used by the Ministry of Planning to help select communes for focus group discussions on poverty as part of a Participatory Poverty Assessment (PPA).[92] The focus group discussions are geared toward finding the causes of and solutions to poverty. This nationwide assessment is intended to link the causality of poverty to specific poor areas. Participatory Rural Appraisals (PRA) and field-level assessments have been used to further identify villages within the selected communes in which focus groups will be conducted. While the poverty map was considered very helpful in identifying poor communes, a village-level map would have been preferable. The poverty map has been requested by a number of other organizations, such as the Ministry of Education, Ministry of Planning, European Union, UNDP, SEILA,[93] World Bank, and the International Fund for Agricultural Development. Several of these agencies have sent letters to WFP commending the poverty map and indicating their intention to use it.

Poverty maps are increasingly being compared to other data sets in Cambodia. For example, these maps have been overlaid with information on flood- and drought-prone areas under Cambodia's Qualitative Disaster Study, which is being conducted for the

[92] This assessment is funded by the ADB.

[93] SEILA is a Cambodian government program promoting decentralized governance and poverty alleviation. In Khmer, SEILA means "foundation stone."

World Health Organization's Western Pacific regional office. However, the full potential of the poverty maps has not yet been reached. For instance, the maps could influence decisions made by the Public Investment Program, the main Cambodian program targeting government investment and national expenditure for rural and urban social projects. Stronger coordination between institutions, such as the Ministry of Finance, Ministry of Planning, and Ministry of Rural Development, is needed to help ensure that the poverty maps and other available data are used to better target national development and planning. Another pressing need is to coordinate work among international agencies with poverty analysis mandates.

Experiences with the Development and Use of Poverty Maps

Case Study Note for VIETNAM*

1. Background information on the poverty mapping initiative

The development of the first poverty map in Vietnam was initiated in 1997 under a United Nations Development Programme (UNDP)-funded project focused on strengthening capacity for rural development. Implemented primarily by the Ministry of Agriculture and Rural Development (MARD), the project aimed to: 1) increase understanding of agricultural potential; and 2) identify poor communes and districts based on objective criteria and measurable indicators. To address the second goal, Nicolas Minot (a full-time staff member of the International Food Policy Research Institute who was working with MARD) developed a methodology using clear, objective criteria to estimate poverty at a disaggregated, district level.[94] This poverty map was based on the 1992-93 Vietnam Living Standard Survey (VLSS) and 1994 agricultural census data (see Section 2). This approach was developed concurrently with and similar to the work of Hentschel and Lanjouw (1996) examining the geographic distribution of poverty in Ecuador.[95]

Interest in an updated poverty map, particularly on the part of the World Bank, led to the creation of a province-level map in 2000 based on data from the 1998 VLSS and 1999 census.[96] It is hoped that the availability of the updated map will encourage the use of poverty maps in Vietnam, especially by the government (see Section 3). The 2000 poverty map examines the geographic distribution of poverty in both urban and rural areas and calculates standard error (see Section 2).

In addition to the poverty maps, commune-level poverty indicators were developed since 1998 by the Ministry of Labor, Invalids, and Social Assistance (MOLISA) and the Committee for Ethnic Minorities in Mountainous Areas (CEMMA).[97] Specifically,

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[94] At the time, Vietnam had 545 rural districts. Since data were missing for two of the rural districts, poverty rates were calculated for 543 rural districts.

[95] The approach used by Hentschel and Lanjouw (1996) is more accurate but requires household-level census data. Minot's (1998) approach uses aggregated census data and may be useful when household-level data are not available.

[96] Vietnam currently has 61 provinces. This study estimated the incidence of poverty for urban and rural areas in each province, yielding poverty estimates for a total of 122 geographic areas.

[97] The number of communes changes frequently. For example, there were 10,477 communes in 1999 and 10,551 communes in 2000 (GSO 2001, GSO 2000).

MOLISA maintains a list of poor communes, most of which are in coastal and lowland areas, while CEMMA is responsible for identifying poor communes in mountainous and remote areas. The commune-level indicators have been used to help target poor communes for poverty reduction programs (e.g., subsidy programs, exemption from social service fees, and credit programs; see Section 3). One concern about the commune-level indicators is that the criteria used to identify poor communes vary widely. These indicators are collected from a system of commune- and district-level agencies and are based on different welfare estimates, different poverty lines, and different units of analysis. The development of the poverty maps is intended to provide a more objective measure of poverty in Vietnam. However, bureaucratic inertia concerning the use of existing, home-grown, commune-level indicators seems to have limited use of the new imputed 1998 and 2000 poverty maps (see Section 3).

2. Process of poverty mapping

The first imputed poverty map in Vietnam was developed in 1998 using probit regressions based on 1992-93 VLSS data and district-level means for comparable variables in the 1994 agricultural census.[98] First, the relationship between poverty and 25 household-level variables was estimated, using data from the VLSS for which there were equivalent variables in the census data. Then, the average values of these same 25 variables were calculated for each rural district based on the 1994 agricultural census. (Mean district values were calculated because household-level agricultural census data were not available.) The regression parameters were then applied to the census variables to estimate district-level poverty rates.

Statistical estimations for this district-level poverty map were developed by Nicholas Minot and two individuals from the General Statistics Office (GSO). The poverty map itself was developed by a GIS (geographic information systems) specialist at the National Institute for Agricultural Planning and Projection (NIAPP). Funded by UNDP, development of the statistical estimations and poverty map took approximately five months. Without access to the household-level census data, it was not possible to estimate standard error for the district-level poverty estimates (Minot 1998).

The 1998 poverty map results indicated that the poorest districts are concentrated in the North, in hilly areas far from large cities and the coast, such as the northern and western edges of the Northern Uplands, the western edges of the North Central Coast, and in the northern part of the Central Highlands. Generally, these areas have large ethnic minority populations. Results of the 1998 poverty map were presented to various ministries (e.g., MOLISA and MARD), international agencies (e.g., UNDP, the Food and Agriculture

[98] The 1992-93 VLSS was developed using a stratified random sample of 4,800 households, including 3,840 rural households and 960 urban households. The survey involved collecting information on household members, housing, fertility, assets, employment, agricultural production, income, and expenditure (Minot 2000, Minot 1998). The VLSS was conducted by the Vietnamese State Planning Committee (SPC) and the General Statistical Office (GSO). The 1994 agricultural census covered 11.5 million rural households (including nonagricultural households). The census was developed by the GSO and included questions on household members, housing, land use, animal ownership, and assets (GSO 1995, Minot 2000, Minot 1998).

Organization of the United Nations, and the World Bank), and NGOs (e.g., Oxfam and CARE).

The Vietnamese poverty map was updated in 2000 using the Hentschel et al. (2000) methodology and relying on data from the 1998 VLSS and 1999 census.[99] A 3% sample of household-level census data was used;[100] thus, the analysis was restricted to estimating poverty in rural and urban areas at the province level (a total of 122 geographic areas). First, the VLSS data were used to estimate expenditure as a function of household characteristics, such as household composition, education, occupation, housing characteristics, and asset ownership. A regression equation was developed based on the relationship between expenditure and the household characteristics and then applied to census data on these same household characteristics. Nicholas Minot, Bob Baulch, and three GSO staff (two from the Population and Labor Statistics Division and one from the Social and Environmental Statistics Division) conducted the statistical estimations. Three consultants (two Vietnamese and one expatriate) from a local GIS firm were hired to arrange the poverty headcount data in map format. Funding for the development of 2000 poverty map was provided by the United Kingdom's Department for International Development (DFID) Poverty Trust Fund and the World Bank Development Economics Research Group.

Though disaggregated only to the province level, the 2000 imputed map provides a broader view of poverty in Vietnam by distinguishing between rural and urban areas and by calculating the standard error of the poverty headcount. Like the 1998 version, this map indicates that poverty is less severe in the southern regions and is concentrated in Vietnam's Northern Uplands (especially the six provinces bordering China and Laos), the North Central Coast, and the Central Highlands (Kon Tum and Gia Lai provinces). Rural poverty is shown to be particularly high in several northern provinces, including clusters in the North Central Coast and Red River Delta. As before, these are areas with high concentrations of ethnic minorities. Furthermore, the map indicates that the incidence of poverty in urban areas is consistently lower than in rural areas.

In addition to presenting the poverty map results, Minot and Baulch (2001) identified key variables that may be used as "quick and dirty" indicators of household-level poverty. Such indicators may provide MOLISA, CEMMA, and other initiatives with a cost-effective method to help target anti-poverty programs (see Section 3). Using Receiver Operator Characteristic (ROC) curves to portray graphically the accuracy of classification (i.e., as poor or non-poor) based on sensitivity and specificity tests, a diagnostic can be performed to determine which variable most strongly targets the poor. Based on the

[99] The 1998 VLSS used a stratified random sample of 6,000 households, including 4,270 in rural and 1,730 in urban areas. The GSO developed the VLSS with funding from the Swedish International Development Cooperation Agency and UNDP. The 3% sample of the 1999 census used a stratified sample of 5,287 enumeration areas, containing 534,139 households. The GSO conducted the census with financial and technical support provided by the United Nations Population Fund (UNFPA) and UNDP.

[100] The GSO is reluctant to release the entire household-level census data set—an unusual request in Vietnam, as in many other countries. Access to a 3% sample of the census was instead obtained; i.e., the data were extracted from a CD disseminated by the GSO). This 3% sample is representative at the provincial level.

ROC curve results, ownership of consumer durables, particularly televisions and radios, is one of the strongest predictors of per capita expenditure in both rural and urban areas of Vietnam. Other variables that may help improve targeting of the poor include demographic and housing characteristics (e.g., floor type).

Initial results of the 2000 imputed poverty map were summarized in a short draft paper for a three-day poverty strategy workshop (July 2000) and also presented to a joint Government-Donor-NGO poverty working group in early October 2000. Subsequently, these results were included in the *2001 Vietnam Development Report* (both Vietnamese and English versions), a widely disseminated report that attracts a great deal of interest, and in an article in the *Vietnam Investment Review*, an English-language newspaper. Minot and Baulch's draft paper (2001) has been accepted for publication in the World Bank's Policy Research Working Paper Series and will be included in a book/monograph (Dollar and Glewwe, forthcoming). Presentations on the 2000 poverty maps were given to approximately 100 individuals, some quite senior, at a Ministry of Planning and Investment (MPI)-World Bank workshop on economic growth and to about 30 participants at a DFID-funded training program on policy analysis using the VLSS.

Nicholas Minot and Bob Baulch are developing a proposal to update the 2000 poverty map at a finer scale. Access to a 33% sample of the 1999 census data has been granted, making it possible to extend poverty mapping to the district level and possibly to the commune level. Furthermore, with increased access to census data, incorporating additional variables (e.g., market access) into the econometric model should be possible. The proposal seeks to involve various in-country institutions such as the Information Center for Agricultural and Rural Development (ICARD, under the MARD), GSO, MPI, and MOLISA. Such in-country involvement is intended to build national ownership of the poverty map results and help encourage their ultimate use (see Section 3). There are plans to distribute the proposed new poverty map by conducting workshops and developing reports, posters, and a CD on the poverty map results.

3. Use and impact

Due in large part to bureaucratic inertia favoring the use of existing, home-grown, commune-level poverty indicators, the use of the relatively coarser imputed 1998 and 2000 poverty maps in Vietnam has as yet been limited. While the commune-level poverty indicators have been more extensively applied, the imputed poverty maps have mostly been used to help crosscheck identification of poor areas.

In particular, the commune-level MOLISA poverty indicators have been used by MOLISA's Programme 133 and CEMMA's Programme 135, two of the largest poverty reduction initiatives in Vietnam. These programs provide poor households with free or subsidized primary schooling for children, health cards, and sometimes exemption from local taxes. In addition to MOLISA and CEMMA, the World Bank-funded Northern Mountains Poverty Reduction Project, the Community Based Rural Infrastructure Project, and the Rural Energy Project have also used the commune-level poverty indicators for geographic targeting. These community-driven development programs are

targeting ethnic minorities, which are disproportionately poor (while ethnic minorities make up 15% of the population, they represent nearly 30% of the poor) and the poor in rural areas (most of Vietnam's poor are found in rural areas). The Northern Mountains Poverty Reduction Project used the commune-level indicators to select Vietnam's six poorest provinces,[101] while the Community Based Rural Infrastructure Project used the indicators to select the next 13 poorest provinces. These projects have typically verified targeted poor areas by crosschecking results using the commune-level indicators with results using the imputed poverty map. Over a five-year period (2001-05), an estimated US$120 million is expected to be allocated to the Northern Mountains Poverty Reduction Project,[102] while US$123.4 million will be provided to the Community Based Rural Infrastructure Project.[103]

Despite the more extensive use of the commune-level poverty indicators, there has been some use of the 1998 and 2000 imputed poverty maps, especially in projects for which district- and province-level poverty ranks are sufficient. Several organizations, including the NGOs Oxfam and CARE as well as the Food and Agriculture Organization (FAO) of the United Nations, have requested copies of the poverty maps and are thought to have used the maps to help target their initiatives. FAO, for example, used the 1998 poverty maps to help identify poor districts in need of food security interventions. Furthermore, various donors and international agencies, such as the World Bank, Asian Development Bank, Swedish Rural Mountains Development Program, and UNDP, have requested copies of the 1998 and 2000 poverty maps. As many as five copies of the draft 2000 poverty maps were given every week to various agencies during 2001.

While many users, especially government agencies, continue to rely primarily on the commune-level poverty indicators, there is increasing recognition of their flaws: namely, that they are based on different welfare indicators, different poverty lines, and different units of analysis. With growing awareness of the imputed poverty maps and their basis in objective criteria and measurable indicators, as well as the possible development of a commune-level imputed poverty map, interest in using these maps is expected to rise. It should be noted, however, that even if high-resolution maps were available, there would still likely be some resistance to using them, especially if a uniform poverty standard, as applied in the poverty maps, results in excluding from future poverty alleviation efforts communes in southern areas of the country that currently are eligible for anti-poverty programs.

The use of the commune-level poverty indicators and imputed poverty maps has been looked upon very favorably by numerous government, NGO, and international agencies in Vietnam. The poverty indicators and maps have been especially helpful in highlighting the need for poverty reduction interventions in the northern regions and areas with large ethnic minorities. As a result, allocation of funding has been focused on

[101] The ratio of the number of poor communes to the total number of communes in a given province was first used to select the 13 poorest provinces in Vietnam. Then, six additional provinces, in which there were few poverty reduction projects, were selected.
[102] The International Development Association (IDA, the World Bank's concessional lending window) will provide US$110 million , while US$10 million will be co-financed by DFID.
[103] Of this amount, US$102.8 million is being provided by IDA.

several such areas and a greater share of the population is now participating in poverty-related programs.

Bibliography

Dollar, D., and P. Glewwe. Forthcoming. *Economic Growth and Household Welfare: Policy Lessons from Vietnam.*

General Statistical Office. 2001. *Vietnam List of Administrative Divisions 2000.* Hanoi: State Publishing Office.

General Statistical Office. 2000. *Vietnam List of Administrative Divisions*. Hanoi: State Publishing Office.

General Statistical Office. 1995. *Statistical Data on Basic Situation and Infrastructure of Rural Regions in Vietnam.* Hanoi: Statistical Publishing House.

Hentschel, J. and P. Lanjouw. 1996. "Poverty Profile." In *Ecuador Poverty Report*, The World Bank, Washington D.C., pp. 53-91.

Hentschel, J., J. Lanjouw, P. Lanjouw, and J. Poggi. 2000. "Combining Census and Survey Data to Trace the Spatial Dimensions of Poverty: A Case Study of Ecuador." *The World Bank Economic Review* 14(1):147-65.

Minot, N. 2000. "Generating Disaggregated Poverty Maps: An Application to Vietnam." *World Development* 28(2):319-31.

Minot, N. 1998. *Generating Disaggregated Poverty Maps: An Application to Vietnam*. Discussion Paper No. 25. International Food Policy Research Institute, Markets and Structural Studies Division.

Minot, N. and B. Baulch. 2002. *The Spatial Distribution of Poverty in Vietnam and the Potential for Targeting.* Markets and Structural Studies Division. Discussion Paper 42. Washington, D.C., International Food Policy Research Institute.