

Chapter 17

Urban Health in Developing Countries

Insights from Demographic Theory and Practice

Mark R. Montgomery and Alex C. Ezeh

1.0. INTRODUCTION

This chapter is concerned with the health of the urban poor in developing countries. In focusing on urban dwellers, we do not mean to overlook the rural poor, but only to acknowledge the seemingly inexorable process of urbanization, whereby steadily greater fractions of national populations are coming to be found in cities. As developing countries continue to urbanize, their national-level dialogues about poverty and health will increasingly have to reckon with urban as well as with rural poverty. In what follows, we identify the gaps in knowledge of urban health that can be addressed in the next generation of research, and examine the conceptual tools and empirical methods that might be brought to bear on the cities of poor countries. To guide the discussion, we draw extensively from the Panel on Urban Population Dynamics (2003) volume, a recent review of urban poverty, demography, and health.

The chapter's principal theme is that a great deal can be learned about health by adopting the perspectives of social epidemiology. It may be helpful to consider why social factors need special consideration. An array of modern health resources—clinics, hospitals, and specialized practitioners—can be found in all but the smallest developing-country cities. Their presence has led both researchers and aid agencies to presume that urban residents must enjoy significant advantages in health by comparison with rural dwellers, from whose villages such resources are generally absent. Indeed, in developing countries such as Bangladesh, primary health care budgets have been largely given over to rural areas on the theory that urban residents already benefit from far easier access to services.

Yet when closely inspected, the health circumstances of the urban poor are often discovered to resemble those of rural villagers, with similarities evident in levels of health risk, in the limits and biases of health knowledge, and in the modes of

health-seeking behavior. On the whole, cities are doubtless better supplied than rural areas with modern curative health services, but in many cities the poor are not at all well-supplied with the basic infrastructure needed to protect their drinking water and assure acceptable environmental sanitation. Without such protections, the urban poor can face substantial communicable health risks stemming from spatial proximity and dependence on common resources—as was apparent in the nineteenth century to John Snow (1855) and other founding figures of modern epidemiology. Now as then, the political calculations that exclude the urban poor lie within the broad purview of epidemiology, as do the social factors that give some poor communities the confidence to mobilize and effectively press demands for services.

Social constraints can also undermine the confidence that individuals need to pursue aggressively their own health care needs. For reasons that are not yet well understood, the urban poor often fail to avail themselves of the modern health resources that are distributed about them in the wider urban environment. As Barua and Singh (2003) write for the urban poor of India, even those who have long lived in the city

are not able to fully decipher the clues that organized, sophisticated institutions present. . . . The poor find the use of health institutions daunting and most poor patients feel out of place when hospitalized. The sense of alienation is compounded by their lack of familiarity with the sophisticated environs of health institutions, which presume a level of *urban literacy* (familiarity with common urban technologies and institutions) and prior experience. . . . In the absence of a more “literate” person to guide them through the intimidating procedure in the government hospitals, they feel particularly vulnerable.

Uneasy about the modern health system and often uncertain of its benefits, the urban poor may meet their health needs by turning to the more familiar providers found in their neighborhoods, including traditional healers, purveyors of drugs in the markets, and local pharmacists or chemists with some form of professed expertise. Like rural villagers, the urban poor often experiment with both modern and traditional remedies, whether in combination or in sequence, as they strive to understand the meaning and origin of an illness and seek the appropriate cure. But unlike rural villagers, the urban poor may have access to many sources of advice and support. The social diversity of urban life can sometimes provide the poor with guidance from the educated members of their social networks, who have greater understanding of the modern health system, and urban diversity may also present them with a range of social reference groups, some of which will illustrate how that system can be approached.

In short, to understand the many constraints facing the urban poor and gain insight into their thinking about health, it is necessary to know something of the multiple social worlds that the poor inhabit. This is far from being a novel or controversial proposition. It is a view that has given impetus to much of the past decade’s multilevel health research, in which poor individuals and families are studied in relation to the social structures in which they are embedded—social networks and local associations, neighborhoods, and the wider social and political communities within which neighborhoods are nested.

A remarkable feature of this vigorous literature is the extent to which it has been dominated, thus far, by studies set in the cities of Europe and North America. No comparable surge of research on the cities of poor countries is yet in evidence. How

can such an imbalance have come about in research efforts relative to global health needs? The concepts of multilevel health analysis are not obviously parochial in nature; the methods being applied in Chicago and Los Angeles would appear to merit equal consideration in Shanghai and Lagos. Likewise, the health problems arising from poverty and social exclusion would seem to exhibit many common features. To be sure, it can be more difficult to assemble some of the data needed for empirical investigations in developing countries. But we suspect that the crux of the problem lies elsewhere. In urban health as in other scientific fields, compartmentalization is a fact of life, and to date only a few scholars have breached the wall separating research on developing countries from that concerned with developed countries. There are, however, indications of growing recognition and scholarly interest.

1.1. Organization of the Chapter

In the sections of the chapter that follow, we examine the concepts and tools of multilevel health research with an eye to discovering how they may apply to the urban poor of the developing world. “Households, Social Networks, and Neighborhoods” (Section 2.0) is concerned with the theory, that is, with the “micro-mechanisms” of social interaction that influence individual health, taking effect through social networks, the organizational structures of neighborhoods, and the organizational and network ties that cross the urban space. We also address here an important criticism of the current generation of multilevel health research, that it has not given sufficient attention to factors that could induce spurious associations between individual health and neighborhood characteristics (Oakes, 2004a). Much can still be learned about urban health from thoughtful programs of cross-sectional research, but if this criticism is to be addressed, longitudinal (prospective) approaches will also be needed. In concluding this section, we outline the methodological aspects of the argument.

The remainder of the chapter develops these ideas more fully, by considering the difficulties that will confront measurement and fieldwork in these settings. “Assessing Urban Poverty and Living Standards” (Section 3.0) addresses the measurement of urban poverty, with particular emphasis on methods for inferring household living standards from data lacking information on income and consumption. We also briefly survey what is known of neighborhood heterogeneity and the spatial concentration of poverty in developing-country cities. “Urban Social Networks and Social Capital” (Section 4.0) examines the techniques that have been used to map social networks and social capital in developing countries. “What Can Be Learned from Longitudinal Studies” (Section 5.0) investigates the prospects for longitudinal health research, drawing upon the experiences of the African Population and Health Research Center (2002) in the slums of Nairobi. Section 6.0. is the “Conclusion.”

2.0. HOUSEHOLDS, SOCIAL NETWORKS, AND NEIGHBORHOODS

In the health literature of the past two decades one sees a mounting interest in the social side of social epidemiology. Motivated by the writings of Wilson, Coleman and like-minded colleagues (Wilson, 1987; Coleman, 1988; Massey, 1990; White, 2001; Sampson, *et al.*, 2002), researchers interested in urban poverty and health have given increasing attention to the health effects of individual social networks, local

social capital, social reference groups, and various forms of social comparison. In much of the literature, these concepts are organized under the broad heading of “neighborhood effects,” although it is acknowledged that the mechanisms of interest are not necessarily as localized as this phrase would suggest (Wellman and Leighton, 1979). Indeed, one fundamental concern in this literature is how to specify and measure the concept of neighborhood, given that urban dwellers participate in multiple, spatially-distinct groups and communities. Only the core ideas of the literature will be described here.

As this literature matures, it is being confronted with a methodological challenge: how to eliminate selectivity biases in estimating the health effects of neighborhoods and related social mechanisms (Oakes, 2004a). The difficulty is that participation in social networks has a voluntary aspect; so does participation in local community groups; and through decisions about migration and residential mobility, individual households also make choices among alternative neighborhoods. How, then, are estimates of network, group, and neighborhood effects on health to be interpreted? To what extent might such estimates be contaminated by selection bias? In closing the section, we present the methodological arguments that favor longitudinal designs and discuss how to assess the magnitude of bias.

2.1. Theory

In its recent volume on the urban demography of poor countries, the Panel on Urban Population Dynamics (2003) provides an extensive review of neighborhood effects theory and its implications for health and demographic behavior. To briefly summarize this panel’s lengthy and complex argument—much of which is dependent on empirical examples from the U.S. experience—one expects neighborhoods to matter for several reasons. Where communicable diseases are concerned, it has long been recognized that the spatial proximity of diverse urban populations can generate negative *health externalities*. As we have seen for Nairobi (discussed in chapter 10), the externalities associated with environmental contamination and communicable disease could cause the health risks of slum life to rival or exceed those of rural areas, despite the generally easier access that urban residents have to emergency transport and modern health services (Harpham and Tanner, 1995; Timæus and Lush, 1995; African Population and Health Research Center, 2002).

Less often recognized, but potentially of equal importance, are the *social externalities* that figure into urban life. Individuals and households are connected to others in their neighborhoods through social network ties, and along these social circuits information may flow about how to recognize and respond to health threats, and where effective services can be found. Of course, social network ties often reach beyond the local neighborhood (Wellman and Leighton, 1979). It has been argued, however, that the social networks of women and the poor are spatially constrained by comparison with those of men and the more affluent. The relative costs of travel may well be greater for the poor, and women with children and domestic responsibilities may find their daily routines largely confined to local neighborhoods (McCulloch, 2003; Panel on Urban Population Dynamics, 2003).

Although we are aware of no recent research on social networks and the diffusion of health information in developing-country cities, the work of Behrman, *et al.*, (2001) and Casterline, *et al.*, (2001) document network effects on contraceptive use

in rural and periurban African contexts.* In analyses of mental health (Kawachi and Berkman, 2001; Boardman, 2004) social networks are viewed less as sources of information than as sources of support; in studies of sexually transmitted and contagious disease (Morris, 1993; Friedman and Aral, 2001), networks provide the social mechanisms by which contagion takes place.

On the whole, however, social networks have not received as much attention in the literature as has been given to *social capital* (Kawachi, *et al.*, 1999; Lin, 1999; Putnam, 2000; Sampson and Morenoff, 2000; Swaroop and Morenoff, 2004). Treatments of social capital have generally taken one of two forms.† Some authors stress its structural features, as evident in the range of formal and informal associations in a community and the extent to which residents participate in them. Others emphasize the “cognitive” aspects, that is, the feelings of mutual trust and collective efficacy that are fostered by robust and vibrant local associations (Harpham, *et al.*, 2002).

As with information exchange taking place within social networks, it is likely that information and advice bearing on health circulates within local organizations, such as parent–teacher groups, neighborhood sanitation committees, and local ward associations. To date, however, surprisingly few efforts have been made to measure the health content of exchange in local associations, or to trace the pathways by which generalized feelings of trust or efficacy lead to specific health perceptions and behavior. In a recent exception, Gilson (2003) has invoked the concept of trust to explain attitudes toward health care providers and institutions, which may be of special importance in developing countries where the poor do not necessarily identify with the modern health system and can be apprehensive about the attitudes of its professionals and elites. A related literature in demography explores the connections between *local health services* and health outcomes, with a particular focus on how services may either provide a substitute for, or alternatively complement, the beneficial effects of mother’s education. Education is an individual trait that (in this theory) expands the reach of social networks and improves individual capacities to decipher the information provided by modern bureaucratic health institutions. Hence, the presence of health institutions in a community might be thought to add to the advantages already possessed by the educated. However, if health institutions are sensitive to the needs of their illiterate clients, they can provide information in such a way as to disproportionately benefit these clients, thus compensating, at least to a degree, for their lack of “urban literacy”. Sastry (1996) gives an insightful review of this literature with attention to such mechanisms.

*One of the most influential randomized interventions in the history of family planning, the Taichung experiment of 1963, found strong evidence of information diffusion along social network lines in this small Taiwanese city (Freedman and Takeshita, 1969). See Casterline (2001) for an excellent summary of related findings on diffusion and social interaction in several areas of demographic research.

†Despite the efforts of theorists to bear down on the distinction, the dividing line between social networks and social capital remains elusive. Some authors have viewed social capital as a feature of neighborhoods rather than individuals, going so far as to construct social capital measures by aggregating individual data. The idea, it seems, is that social capital can function much like a locally non-excludable (i.e., public) good that is accessible, at least in principle, to all local residents. We know of no empirical assessments of this assumption. In any case, as Swaroop and Morenoff (2004) note, individual social networks—such as friendship networks—can assume much of the character of associations if the need arises, such as when perceived threats to the neighborhood cause neighbors to band together in block groups and neighborhood watches. Important dynamic feedbacks also link social networks and capital. For example, local associations facilitate the formation of social network ties among their members, whereas residential mobility, which breaks or stretches such ties, may reduce incentives for participation in community groups (Swaroop and Morenoff, 2004).

Theories of *social comparison and local reference groups* are often invoked in relation to the psycho-social aspects of health. The idea is that individuals may evaluate their own circumstances by comparing them with what can be observed of the circumstances of others (van den Eeden and Hüttner, 1982). Comparisons that are consistently unfavorable may provoke feelings of resentment and injustice, producing stresses and anxieties that undermine mental health. There is reason to think that such mechanisms can affect health more broadly. In the view of Wilkinson (1996),

It is the social feelings which matter, not exposure to a supposedly toxic material environment. The material environment is merely the indelible mark and constant reminder of one's failure, of the atrophy of any sense of having a place in a community, and of one's social exclusion and devaluation as a human being.

Repeated exposure by the poor to such social inequities could erode their feelings of social confidence, weakening the sense of personal efficacy that is needed to assert claims on health resources and engage in constructive health-seeking behavior.

The role of relative socioeconomic standing, as measured by individual income in relation to the income distribution of the surrounding community or wider social group, is still largely untested in health research, especially for spatial units as small as neighborhoods (Wen, *et al.*, 2003). In North American and European studies, some evidence has emerged indicating that inequality at the county, metropolitan area, and state level is linked to poor health at the individual level. But the literature presents no consensus on these effects—to appreciate its unsettled state, compare Blakely, *et al.*, (2002), Veenstra (2002), Blomgren, *et al.*, (2004), Gerdtham and Johannesson (2004), and Boyle, *et al.*, (2004).

Empirical studies of relative deprivation in developing-country cities are not yet common. For Rio de Janeiro, Brazil, research by Szwarcwald, *et al.*, (2002) examines a type of multilevel model in which infant mortality at the census-tract level is posited to depend on the proportion poor and the dispersion of poverty rates in the larger geographic areas within which tracts are nested. These authors find that the higher the mean poverty rate in the large areas, and the higher the variance, the higher is infant mortality at the tract level. These findings are suggestive of a link between local socioeconomic inequality and health, if not quite as persuasive as estimates from multilevel models with both individual and area characteristics. Other social mechanisms are examined in research on urban and rural India (Kravdal, 2003) which uncovers evidence that community levels of women's education (and autonomy) have a significant influence on child mortality rates with household variables held constant. Kaufman, *et al.*, (2002) find evidence of similar community effects in a study of adolescent reproductive health in urban South Africa.

2.2. What Is an Urban Neighborhood?

The geographical units for which aggregated data are available—in the U.S. these are block groups, census tracts, and the like—have boundaries that need not correspond closely, or indeed at all, with the sociological boundaries of neighborhoods as determined by patterns of social interaction, contagion, and comparison. Writing on health and reference group effects, Wen, *et al.* (2003) acknowledge, “It is not clear what spatial level is appropriate to examine this relationship.” For Sweden,

Åberg Yngwe, *et al.*, (2003) define reference groups on the basis of social class, age, and region, rather than in terms of local geography.

Coulton, *et al.*, (1997) and Sastry, *et al.*, (2002) show how difficult it is to mark the boundaries of urban neighborhoods. Coulton, *et al.*, (1997) asked residents of Cleveland to depict their local neighborhoods on maps and found that the perceived boundaries often departed substantially from the boundaries of census-based units. Furthermore, there was a good deal of variation among residents in the spatial extent of their perceived neighborhoods. Despite this variation, when averages of socioeconomic measures (e.g., poverty rates, crime rates) were calculated for the perceived neighborhoods and then compared to figures for the census tracts, the composition of the tracts proved to be similar to that of the units sketched out by local residents. However, Altschuler, *et al.*, (2004) found that residents of Oakland conceived of their neighborhoods as “safe zones” within which daily activities could be carried out without fear of crime or violence. In this way of defining neighborhood, the perimeters are determined by social forces operating across wider geographic areas, and neighborhoods would be expected to show risk profiles quite different from those of the wider areas.

A few studies of health have explored the implications of areal measures defined at varying spatial scales. Examining mortality and cancer incidence in two U.S. states, Krieger, *et al.*, (2002) document the information loss entailed in the use of larger units—measures calculated for these larger units (zip code areas) did not consistently detect the areal effects found to be statistically significant when smaller units (census tracts or block groups) were employed. An example is a study of areal effects on smoking conducted by Diez Roux, *et al.*, in 2003, which found no important differences between estimates based on census tracts and those based on block groups. No larger areal units were examined in this example. But, of course, smaller need not be better—the appropriate spatial scale for any given analysis must depend on the geographic extent of epidemiological and social interaction.

2.3. Neighborhood Heterogeneity

Much of the literature we have reviewed emphasizes the spatial concentration of poverty, but the effects of spatially concentrated affluence are also drawing attention. Wen, *et al.*, (2003) summarize Wilson’s work as showing the benefits of economic heterogeneity for urban communities:

In his [Wilson’s] model, the prevalence of middle/upper-income people positively correlates with the material and social resources necessary to sustain basic institutions in urban neighborhoods like the family, churches, schools, voluntary organizations, and informal service programs. . . These institutions are pillars of local social organization that help to nurture neighborhood solidarity and mobilize informal social control.

In their own study, Wen, *et al.* (2003) find that neighborhood affluence exerts a significant positive influence on health net of other covariates, including neighborhood-level poverty, income inequality, aggregated educational attainment, and lagged levels of neighborhood health. However, Pebley and Sastry, (2003) could find no separable, significant effect of neighborhood affluence in their Los Angeles study of children’s test scores, given controls for the median level of neighborhood family income, which is a significant positive influence on these scores.

In work on developing country cities, there has been some limited recognition of neighborhood heterogeneity, but as we have mentioned, little by way of quantitative investigation into its extent and nature (UN-Habitat, 2003). In principle, socioeconomic heterogeneity can bring a diversity of urban resources within the reach of the poor. Mixed-income communities may be able to supply more volunteers for community-based organizing activities, and they may also possess a stronger base of local associations. The middle- and upper-income residents of such communities could conceivably serve as “bridges” to politicians, government agencies, and sources of outside funding and expertise. For these reasons, neighborhood social and economic heterogeneity could well amplify the beneficial effects of health program interventions. In theory, at least, programs set in heterogeneous neighborhoods could yield more benefits for the poor than those located in uniformly poor neighborhoods. But there are also risks in situating health interventions in mixed-income communities. Program benefits can be siphoned off by upper-income residents, and it could prove difficult to sustain community motivation for activities for the poor when better-off residents have the private means to purchase health care. These are obviously difficult and situation-specific issues.

The intertwined roles of health programs, social capital, and community mobilization are addressed in a small but growing and highly instructive literature for developing-country cities, much of which has appeared in the journal *Environment and Urbanization*, a steady supplier of evocative case-study material on communities and the urban poor (see in particular its October 2001 issue). As would be expected, there are cases in which well-designed alliances between community organizations of the poor and professional NGOs have proven highly successful (e.g., Appadurai, 2001 for Mumbai) and other instances in which seemingly well-designed efforts could not be sustained (e.g., de Wit, 2002 for Bangalore). The literature on India is especially rich in material of this sort (see, for instance, Burra, *et al.*, 2003 on community sanitation in Mumbai, Kanpur, and Bangalore), but experiences from Africa, Latin America, and other Asian settings also show that poor urban communities are fully capable of mobilizing their social resources and engaging with government and NGOs to improve sanitation, housing, and health. The concept of collective efficacy is, if anything, more vividly illustrated in these cities than in the cities of the West.

2.4. How Strong Is the Empirical Evidence?

Many studies in the emerging multilevel literature on health—though not all, to be sure—have uncovered evidence that community contexts make a difference to health (Timæus and Lush, 1995; Ginther, *et al.*, 2000; Szwarcwald, *et al.*, 2002; Åberg Yngwe, *et al.*, 2003; Drukker, *et al.*, 2003; Wen, *et al.*, 2003; Boyle, *et al.*, 2004; Curtis, *et al.*, 2004). But as evidence of significant community effects has mounted, so has the intensity of criticism. Some critics (notably Oakes, 2004a; 2004b) express doubt as to whether any multilevel study of community factors and health has identified true causal linkages. The essence of the argument is that the vast majority of such studies are cross-sectional “snapshots” of individuals and communities, and such studies cannot control for the many unobserved factors that could generate spurious associations between individual health and observed community characteristics. Similar criticisms have been leveled at studies of group membership, social networks, and other forms of social capital (Manski, 2000; Durlauf, 2000a; 2000b). The

problem in teasing out the causal effects of group membership is that unobserved individual-level factors may be expressed in two ways: in propensities for social engagement and in propensities to experience good (or poor) health. The associations that arise from such common unobservable factors are easily mistaken for causal links.

2.4.1. Addressing Selectivity Bias

In what follows, we outline how selectivity biases can stem from the choices made by respondents—whether in terms of migration, residential mobility, or group participation—and discuss the statistical tools available to assess the importance of this bias and protect inference against it. Cross-sectional designs provide only a few such tools, whereas longitudinal data much expand the possibilities.

The essence of the problem can be seen in a highly simplified depiction of locational choice. Let the subscript i index individuals and let $c=1, \dots, C$ index communities. Suppose that individuals decide to move to (or remain in) a given community by comparing the well-being (“utility,” in the language of economists) they would experience in residing there with what can be attained elsewhere. The utility possibilities are represented in a set of C equations,

$$\begin{aligned}
 U_{i,1}^* &= Z_1 \alpha + u_1 + v_{i,1} \\
 &= \\
 U_{i,c}^* &= Z_c \alpha + u_c + v_{i,c}
 \end{aligned}
 \tag{1}$$

where $U_{i,c}^*$ denotes the level of utility that can be attained in community c , which depends in turn on a community characteristic Z_c , a community-specific unobservable u_c and an idiosyncratic disturbance $v_{i,c}$. If community 1 happens to offer the highest utility in this set, then $Z_1 \alpha + u_1 + v_{i,1} \geq Z_c \alpha + u_c + v_{i,c}$ for all c , or, to put it differently,

$$u_1 + v_{i,1} \geq (Z_c - Z_1) \alpha + u_c + v_{i,c} \quad \forall c \neq 1.$$

Consider individuals residing in community 1, for whom this relationship holds. The expected value of the composite disturbance $u_1 + v_{i,1}$ conditional on residence in community 1 is a function of Z_1 , the observed community variable. With $\alpha > 0$, the community variable Z_1 and the composite disturbance $u_1 + v_{i,1}$ will be negatively correlated.

Let the health equation of interest be specified as

$$H_{i,c} = X_{i,c} \beta + Z_c \delta + u_c \gamma + \omega_i + \epsilon_{i,c},
 \tag{2}$$

such that in addition to the observed individual determinants $X_{i,c}$, health is also affected by the community variable Z_c and the same unobservable u_c that figures into locational choice. We also reserve a role in the health equation for ω_i , a time-invariant individual disturbance, and $\epsilon_{i,c}$, an idiosyncratic disturbance.

By the argument above, migration-related selectivity causes Z_c and u_c to be correlated, and the parameters of the health equation cannot be estimated consistently without taking this into account. If only cross-sectional data are available, the researcher has three main ways of obtaining consistent estimates of the health equation. One of these is to introduce community-specific dummy variables to control

for $u_c\gamma$, the community unobservable that is posited to influence both locational choice and health. Unfortunately, if ω_i is correlated with the $v_{i,c}$ disturbances of the location choice equations (1), the introduction of community dummy variables will not eliminate all sources of selectivity bias.

Instrumental-variables methods can also be deployed, if any variables can be found that meet the demanding requirements for instrument validity. A third strategy is to make use of the structure of equations (1) and (2) to estimate the conditional expectation of the composite disturbance term $u_c\gamma + \omega_i + \varepsilon_{i,c}$ given residence of person i in the c -th community. This strategy relies upon locational selectivity correction terms—see Schmertmann (1994) and references therein for an application to polytomous logit equation systems.

If longitudinal data are available, a wider array of techniques becomes available. Inserting a time subscript t in the health equation, so that

$$H_{i,c,t} = X_{i,c,t}\beta + Z_{c,t}\delta + \omega_i + u_c\gamma + \varepsilon_{i,c,t}, \quad (3)$$

and taking first differences within individual records, we obtain

$$H_{i,c,t} - H_{i,c,t-1} = (X_{i,c,t} - X_{i,c,t-1})\beta + (Z_{c,t} - Z_{c,t-1})\delta + \varepsilon_{i,c,t} - \varepsilon_{i,c,t-1}, \quad (4)$$

an expression from which the fixed individual factor ω_i and community factor $u_c\gamma$ are eliminated. Boyle, *et al.*, (2004) apply this first-differences technique to good effect in their longitudinal analysis of health in an English sample. Unfortunately, the differencing method sweeps away all time-invariant individual and community determinants of health, and some of these will be of prime substantive interest. (Interactions between time-varying and time-invariant variables remain.) Even so, the differences approach can provide useful diagnostic information. With consistent health equation estimators from equation (4) in hand (though only for a subset of the β and δ parameters), Hausman, (1978) tests can be applied to determine whether the correlation between $Z_{c,t}$ and the health equation composite disturbance $u_c\gamma + \omega_i + \varepsilon_{i,c,t}$ brings about any significant inconsistencies. In this way, one can gauge whether the selectivity bias criticism is indeed of substantive importance.

To be sure, if the unobserved factors governing locational choice and health (u_c and ω_i in our illustrative model) vary over time, or if there is reason to suspect the $\varepsilon_{i,c,t}$ component of the health equation disturbance of being correlated with $v_{i,c}$, the utility disturbance in the location equations, further adjustments are in order. Instrumental variables methods may still be required. (See Baltagi, (1995) for a review of dynamic panel data instrumental variables models, and Maluccio *et al.*, (2000) for an application to the role of social capital in determining household consumption expenditures in South Africa.) Our point is that while access to longitudinal data does not eliminate the need to think carefully about selectivity bias, it greatly expands the set of tools that can be brought to bear on the problem.

3.0. ASSESSING URBAN POVERTY AND LIVING STANDARDS

The discussion thus far has been concerned with the organizing concepts of multi-level health research, the working assumption being that these concepts have broad applicability to urban populations in poor countries. Because the multilevel litera-

ture has been tilted so heavily toward developed-country urban research, much remains to be learned about applicability. In this and the next two sections of the chapter, we consider the empirical tools that have been developed for three key areas of multilevel health research: measures of poverty and living standards; measures of social networks and social capital; and techniques for gathering longitudinal data on these domains. Although much of our discussion of poverty measurement is focused on its household-level manifestations, we also describe empirical efforts to map poverty at the level of neighborhoods.

3.1. Overview

Much as in the U.S. and Europe, the official measures of poverty employed in developing countries are often framed in terms of income- or consumption-based poverty lines—in developing countries, however, these lines have been defined mainly with reference to food (Satterthwaite, 2004). The general approach is to specify a “basket” of basic food needs and calculate the money income required to purchase this basket at prevailing prices. With the food poverty line thus established, an allowance for all non-food items is then added (typically in an ad hoc fashion, without reference to a basket of non-food needs as such) to determine the overall poverty line. As Satterthwaite argues, there is good reason to question whether such procedures give sufficient consideration to the non-food needs of city dwellers. It is not unusual for the urban non-food allowance to be only 30–40 % of poverty-level food expenditures in developing countries, whereas the implied allowance is typically much greater in the poverty definitions adopted in the West.

A deeper concern is that real income and consumption expenditure offer only one perspective on the multiple dimensions of poverty. In developing countries a household whose money income exceeds the poverty line may not be able to secure access to a steady supply of electricity, or assure itself of safe drinking water, decent environmental sanitation, and protection from crime and violence (Mitlin, 2003). Table 1 outlines some of the elements of the more expansive view of poverty that is coming to be characteristic of research in the developing world. The central roles of income and consumption are duly recognized here, but additional dimensions of poverty are also highlighted. As we will discuss, several of the elements listed in the table—household assets, access to adequate infrastructure, even political voice—could well be measured in the course of household surveys focused on health. By contrast, dedicated surveys are needed to gather reliable data on income and consumption, with interview times running to several hours at the minimum. As a result, much of what is known from survey data on the relationship of living standards to health is based on proxy measures for income and consumption.

In what follows we briefly discuss the use of monetized poverty measures using income or consumption data, and then describe the conceptual and statistical issues that arise when proxy measures are employed in their place. We proceed to outline efforts currently underway to quantify several of the elements of Table 1 in the form of questions suitable for household surveys, and ask whether these measurement tools can be expected to register changes in household living standards over time. This section closes with an examination of the multiple levels of poverty, drawing attention to what little is known of the associations between household and neighborhood living standards.

Table 1. The Multiple Dimensions of Urban Poverty*Income and consumption*

Poverty is conventionally defined in terms of incomes that are inadequate to permit the purchase of necessities, including food and safe water in sufficient quantity. Because incomes can be transitory and are difficult to measure, levels of consumption are often used as indicators of the longer-term component of income.

Assets

The nature of household assets also bears on the longer-term aspects of poverty and the degree to which households are shielded from risk. A household's assets may be inadequate, unstable, difficult to convert to monetized form, or subject to economic, weather-related, or political risks; access to credit may be restricted or loans available only at high rates of interest. For many of the urban poor, significant proportions of income go to repay debts (see, e.g., Amis and Kumar, 2000).

Time costs

Conventional poverty lines do not directly incorporate the time needed for low-income households to travel to work or undertake other essential tasks. Such households often try to reduce their money expenditures on travel by walking or enduring long commutes (Moser, 1996). Time costs also affect the net value of some goods and services.

Shelter

Shelter may be of poor quality, overcrowded, or insecure.

Public infrastructure

Inadequate provision of public infrastructure (piped water, sanitation, drainage, roads, and the like) can increase health burdens, as well as the time and money costs of employment.

Other basic services

There can be inadequate provision of such basic services as health care, emergency services, law enforcement, schools, day care, vocational training, and communication.

Safety nets

There may be no social safety net to secure consumption, access to shelter, and health care when incomes fall.

Protection of rights

The rights of poor groups may be inadequately protected, there being a lack of effective laws and regulations regarding civil and political rights, occupational health and safety, pollution control, environmental health, violence and crime, discrimination, and exploitation.

Political voice

The poor's lack of voice, and their powerlessness within political and bureaucratic systems, may leave them with little likelihood of receiving entitlements and little prospect that organizing and making demands on the public sector will produce a fair response. The lack of voice also refers to an absence of means to ensure accountability from public, private, and nongovernmental agencies.

Source: Panel on Urban Population Dynamics (2003).

3.2. Monetized Measures of Poverty

Researchers investigating the determinants of urban health in the U.S. or Europe often take for granted the availability of income data for households and aggregated data on median incomes, rates of poverty, and the like for census tracts and other geographic entities. In developing countries, however, data such as these are seldom available in general, and are almost never available from censuses. In part this is because wage and salary work is far from being the dominant form of employment in such economies, and it is a difficult and error-prone exercise to estimate income net of costs for those who are self-employed, engaged in family business, or

working in several occupations. Detailed multiple-round surveys, such as those of the World Bank's Living Standards Measurement Surveys (LSMS) program, are required to assemble defensible estimates of household net incomes and consumption expenditures. (Basic documentation on this program of research can be found in Grosh and Glewwe from 1996. For an updated description and access to many of the surveys, see <http://www.worldbank.org/lsm/>.)

Even where such data are available, considerable caution is needed in interpreting them. Measurement error is one source of concern. Another is the extent of locational differentials in prices, which in developing countries stem from pervasive market imperfections and the higher relative costs of transport and communication. Since prices cannot be assumed to be uniform across the urban space, household survey data on nominal income and consumption must be supplemented with detailed location-specific price data. In the LSMS program, these data are gathered through spot surveys of local retail markets, conducted so as to ensure that the prices refer to goods of similar quality across markets and with enough items included to constitute a sensible "basket of goods" for urban dwellers. But retail markets inevitably give something less than the full picture. City residents face charges for rent, transport, and many other non-food items that are not purchased in organized retail markets. It is difficult enough to devise a means of collecting prices for these heterogeneous items, let alone to account for their differences by neighborhood within cities. (Imputing the rental equivalent of owner-occupied housing is just one of the many difficulties). Prices can also vary considerably across cities, according to city size and related factors.

Further effort is needed to establish with tolerable accuracy the prices that poor households must pay, especially when the poor are spatially concentrated in slums. The urban poor often lack the ability to buy in bulk, and they can face prices for staples that can be well above those prevailing in areas frequented by the urban middle class (Satterthwaite, 2004). Poor households living in poorly-serviced neighborhoods may be forced to buy essential items that are provided by the public sector in better-serviced neighborhoods. (For instance, water may need to be purchased from vendors or tanker trucks.) Relatively few developing countries have addressed these issues in defining urban poverty, and researchers should therefore exercise caution in making use of the official poverty lines.

3.4. Measures Based on Proxy Variables

As we have noted, much of what is known of health conditions and poverty in developing countries comes from surveys that do not collect income and consumption data as such. The DHS program is perhaps the most prominent example of a survey design that gives detailed attention to health but must pass lightly over the measurement of living standards in order to do so. The Multiple Indicator Cluster Surveys (MICS), which is Unicef's survey program, has adopted a similar approach. (For more information on the MICS program and access to its survey datasets, see <http://www.childinfo.org/MIC2/MICSDataset.htm>). In surveys such as these, measures of poverty and living standards must be fashioned from what is, typically, a very small set of proxy variables. The living standards indicators common to most surveys in the DHS program include ownership of a car, television, refrigerator, radio, bicycle, and motorcycle; most surveys also record the number of rooms the household uses for sleeping and whether finished materials are used for flooring. These are the standard indicators available in the "core" questionnaires, but some

surveys supplement them with additional consumer durable items and, on occasion, with queries about land or producer durables. Also, many DHS surveys have included a question on the time required for households without piped water to reach a source of drinking water and return—this is a measure of the time costs and can also be interpreted as a proxy for water quantity.

A lively literature has emerged in the past few years on the merits of various statistical techniques that make use of such proxies (Montgomery, *et al.*, 2000; Sahn and Stifel, 2000; Filmer and Pritchett, 1999; 2001; Montgomery and Hewett, 2004). Interest has centered on two main approaches: principal components analysis, a very simple but atheoretical method for reducing multiple proxies to one or more indices, and several varieties of factor analysis, which is a better-structured but computationally demanding approach to much the same end. To touch on the essential features of this debate, we briefly describe the so-called MIMIC method (“multiple indicator, multiple cause”), which is a variant of confirmatory-factor analysis (Montgomery and Hewett, 2004).

The MIMIC approach assumes (as does the principal components approach) that a household’s standard of living is a theoretical construct that cannot be directly observed, but whose relative level may be inferred from a set of proxy indicators and determinants. Letting f denote the (unobserved) living standards factor, the link to the determinants X is specified as $f = X' \gamma + u$. The probable level of f is signaled through the values taken by $\{Z_k\}$, a set of K indicator variables, such as the ownership of a car, refrigerator, and the like. As in these examples, the indicators are typically yes–no variables, and it is conventional to represent them in terms of latent propensities Z_k^* , with $Z_k = 1$ when $Z_k^* \geq 0$ and $Z_k = 0$ otherwise. We write each such propensity as $Z_k^* = \alpha_k + \beta_k F + v_k$, and, upon substituting for f , obtain K latent indicator equations,

$$\begin{aligned} Z_1^* &= \alpha_1 + X' \gamma + u + v_1 \\ Z_2^* &= \alpha_2 + \beta_2 \cdot X' \gamma + \beta_2 u + v_2 \\ Z_K^* &= \alpha_K + \beta_K \cdot X' \gamma + \beta_K u + v_K. \end{aligned} \quad (5)$$

In this set of equations, the β_k parameters show how the unobserved factor f takes expression through each indicator. (Take note that no β_1 coefficient appears in the first of the indicator equations: it is normalized to unity). The estimation of systems such as these, which involve multiple binary indicator variables, is a non-trivial computational exercise, but estimation routines are available in commercial software. With estimates of equations (5) in hand, a predicted \hat{f} factor score can be calculated for each household to serve as a summary measure of its standard of living. As with other approaches based on proxy variables, the MIMIC specification yields a relative measure of living standards.

To implement the approach, the researcher must decide how the X variables, that is, the determinants of living standards, are to be distinguished from the $\{Z_k\}$ variables that serve as indicators of living standards. With proper consumption data lacking, it would seem reasonable to define the set of living standards indicators in terms of consumer durables and housing quality; taken together, these items are at least loosely analogous to measures of consumption. Producer durables should be excluded from the $\{Z_k\}$ set, because while they may help determine final consumption, producer durables are not themselves measures of that consumption. They are better viewed as inputs, or enabling factors, in household production functions.

Some publicly provided services can be viewed as inputs into consumption—notably, the provision of electricity—and these can also be grouped with the X living standards determinants. Adult education can be likened to a producer durable, and on these grounds the set of determinants should include the education (and age) of the household head and other household adults.

Montgomery and Hewett (2004) have estimated MIMIC models of this kind and found that the household living standards score \hat{f} is strongly related to several measures of health. Similar specifications using the principal components approach have also yielded strong predictors of health, access to public services, and children's schooling (Filmer and Pritchett, 1999; 2001; Hewett and Montgomery, 2001; Panel on Urban Population Dynamics, 2003). But much remains to be learned about the meaning of these generally strong empirical associations. According to the findings of Montgomery and colleagues (2000) and Sahn and Stifel (2001), the correlations between the proxies-based living standards scores and consumption expenditures are, though positive, not as high as might be wished. Possibly measurement error in consumption data biases downward its influence on health; for this and other reasons, perhaps, the proxy methods somehow succeed where consumption fails in identifying the core elements of the living standards concept. It is also possible, however, that upward biases are embedded in the proxy variables approach.

3.5. New Strands of Research on Measurement

Table 2 which is adapted from work currently being undertaken by Shea Rutstein of ORC/Macro, and which also draws from the questionnaire fielded by Harpham, *et al.*, (2004) in Cali, Columbia, a survey on social exclusion in Fortaleza, Brazil (Verner and Alda, 2004), and the World Bank social capital questionnaire presented in Grootaert, *et al.*, (2004), illustrates survey questions that could further this line of research. The questions are divided into four sets: qualitative assessments of consumption; additional consumption indicators and determinants; measures that include elements of both consumption and health; and questions that go beyond consumption to probe into additional dimensions of well-being.

Qualitative, subjective assessments of consumption are being explored in a newly-developed and promising line of research, in which the household head (or another member) is simply asked for an assessment of the adequacy of consumption overall and adequacy of food, housing, and clothing consumption. When such subjective measures are compared with monetized measures based on consumption or income data in data sets that have both—ingenious statistical methods are required to establish a basis for comparison—the two approaches are found to agree reasonably well in identifying the households that are poor. It seems, however, that to be properly interpreted the subjective measures need to be adjusted for factors such as urban or rural residence, education of household adults, household size, and the like. Evidently this is because “adequacy” is a subjective concept much influenced by current standards of living and current income. With such adjustments, the subjective method closely resembles the MIMIC factor-analytic approach that was described above, although with fewer indicators. Only a few subjective–objective comparisons of this sort have been made to date (Pradhan and Ravallion, 2000; Lokshin, *et al.*, 2004; Carletto and Zezza, 2004) but if these early studies are any guide, the subjective approach may well provide a useful alternative to detailed consumption and income modules.

Table 2. Supplemental Survey Questions on Living Standards

SUBJECTIVE ASSESSMENTS OF CONSUMPTION	
Adequacy of consumption	Concerning your family's food consumption over the past one month, which of the following is true: It was less than adequate for your family's needs, just adequate, more than adequate? (Similarly for housing, clothing, health care, children's schooling, and overall standard of living.) In each case, "adequate" means no more and no less than what the respondent considers to be the minimum consumption needs of the family. (Pradhan and Ravallion, 2000; Ravallion and Lokshin, 2002; Lokshin <i>et al.</i> 2004; Carletto and Zezza, 2004).
ADDITIONAL INDICATORS AND DETERMINANTS OF CONSUMPTION	
Electricity	Is electricity normally available all day? In the last two weeks, was it unavailable for an entire day or longer?
Quality of housing	How many rooms does this household occupy, not counting bathrooms, closets, and passageways? How many rooms are used for sleeping? Is there a separate kitchen or a room used mainly for cooking?
Consumer durables	Ownership of a functioning radio, television, mobile telephone, other telephone, refrigerator, clock, watch, fan, bicycle, motorcycle or motor scooter, car or truck; the number of tables, chairs, sofas, and beds.
Producer durables	Ownership and amount of agricultural land (by type, e.g., irrigated, wet or dry crop land); amount of non-agricultural land; availability of a room or property that can be rented.
Financial assets	Ownership of a cart, sewing machine, grain grinder, electric generator, boat with motor, and livestock. Does any member of the household have a bank account? A pension? Health insurance? Life insurance?
INDICATORS OF BOTH LIVING STANDARDS AND HEALTH	
Drinking water	Is water normally available all day from this source? In the last two weeks, was water unavailable for an entire day or longer?
Water storage	Do you store the water for drinking? (Examine container) Do you do anything to the water to make it safer to drink? What do you do?
Toilet facilities	Where is this facility located? Does your household share this facility with other households? How many?

Hygiene Where do members of this household wash their hands? (Examine and record presence of water, soap, hand cleanser, basin, clean towel or cloth.)

Disposal of food wastes What is the principal way you dispose of garbage? How frequently is the garbage collected?

Air quality Does your household cook mostly indoors or outdoors? What type of fuel does your household mainly use for cooking? (Record the number of windows and whether they are covered by screens or glass.)

DIMENSIONS OF LIVING STANDARDS OTHER THAN CONSUMPTION

Eviction risk How likely is it that you could be evicted from this dwelling? Would you say that it is very likely, somewhat likely, or not at all likely?

Crime In general, how safe from crime and violence do you feel when you are alone at home? How safe do you feel when walking down your street alone after dark? In the past year, has any member of this household been the victim of a violent crime, such as assault or mugging? How many times? In the past year, has your house been burglarized or vandalized? How many times?

Political voice To what extent do local government and local leaders take into account concerns voiced by you and people like you when they make decisions that affect you?

Do local residents frequently talk to authorities or local organizations about local problems? Do people in this area actively participate in elections for the neighborhood and borough committees?

Does the health center provide a service whenever the community needs it? Do the police provide a service whenever the community needs it? Does the borough committee provide a service whenever the community needs it?

Do you think that over the next 12 months, you and your family will live better than today, about the same, or worse?

Expectations

Substantial efforts are also underway to understand the merits and limitations of abbreviated versions of consumption expenditure schedules. In a rural study Morris, *et al.*, (1999) show that the measures of consumption derived from such short forms are reasonably highly correlated with the totals from fully-elaborated consumption modules. The abbreviated measures are not substitutes for full consumption expenditures, because by construction they understate totals (Pradhan, 2000). But like the proxy variables methods described above, the short-form consumption schedules are of potential value in defining relative measures of living standards and in testing hypotheses about the effects of living standards on health.

A number of the items in Table 2 add to the number of indicators already gathered in demographic surveys—e.g., the elaborated lists of consumer and producer durables, the inclusion of service adequacy indicators for electricity, water supply, and sanitation. These questions are likely to show variation across urban neighborhoods and households, and should reveal inadequacies in service delivery that would not otherwise be apparent. In some countries, employees of government and formal-sector firms will have health insurance and some form of pension; even in a Côte d'Ivoire slum, some 10% of households were found to have health insurance (Bossart, 2003). Much more could be done to assess the productive value of urban housing and the economic benefits derived from security of tenure (Field, 2003). Useful survey questions and methodological tools might also be drawn from the literatures on microfinance and program targeting; see Falkingham and Namazie (2002) for an introduction. These literatures offer a range of techniques for assessing household living standards, including both simple and elaborate forms of means-testing, community appraisals of relative living standards, and systems for classifying household living standards on the basis of age, gender of head, land ownership, and household demographic composition (Coady, *et al.*, 2004; Zeller, 2004).

The third set of questions in the table is as closely tied to health as to the household's standard of living. If an index of living standards includes such items, it should not be employed as a determinant of any closely-related health behavior or risk. Circular reasoning is a concern here, as is statistical endogeneity. The remaining set of items measure aspects of poverty and living standards that have not yet featured in much survey research—e.g., questions on the perceived likelihood of eviction, and insecurities related to violence and crime.

Notably missing from Table 2 are questions touching on perceptions of inequality and social exclusion. A large literature on such topics exists in the field of social psychology (see Walker and Smith, 2002), but the empirical approaches pursued in this literature do not appear to have been systematically exploited in studies of health. Much of this literature is concerned with the conditions under which relative deprivation is interpreted in strictly personal terms or is understood in terms of groups. As Tyler and Lind (2002) explain,

If people feel that they are not doing well relative to other people, they [may] react in individualistic ways. If they think change is possible, they might go to school or work harder. If they think change is not possible, they might drink or use drugs. In either case, they respond to feelings of deprivation by taking individual actions. . . . In contrast, if people feel that their group is deprived relative to other groups, they are more likely to become involved in actions that focus on changing the situation of their group. It is of particular interest if they engage in collective behavior. . . .

The concept of relative deprivation thus touches on personal as well as collective efficacy. According to Wright and Tropp (2002), the way in which individuals interpret deprivation and form a response to it depends on their sense of whether individual upward mobility is possible. Smith and Ortiz (2002) argue that deprivation interpreted in personal terms may bring on physiological stress, reduce self-esteem, and induce depression.

An important distinction in this literature, which comes to the fore when individuals engage with institutions, is between relative deprivation in outcomes as against deprivation in procedures (Tyler and Lind, 2002). It is especially interesting to consider the procedural injustices experienced by the urban poor—long waits for care, the dismissive or abusive attitudes exhibited by staff—when they seek care from the modern health system. Differences in health treatments and procedures experienced in the modern system may be viewed by the poor as unjust and illegitimate, whereas the poor might well tolerate substantial inequalities in health outcomes if they believed that they have been treated fairly and impartially.

Much of the theory of relative deprivation has been developed in the context of racism in the U.S. As far as we are aware, the core concepts have not been explored in any depth in empirical studies of health in developing countries. A South African study of the attitudes of blacks, Afrikaans whites, and English whites (Duckitt and Mphuthing, 2002) gives one example of the empirical approaches that might be pursued. Respondents were asked to place each of these groups on a rung of a socioeconomic ladder, and also to indicate where the group should be placed if it were to receive its fair and rightful share of the wealth of the country. The differences in ranking were taken to be a measure of group deprivation.

3.6. Monitoring Change Over Time

Little is yet known of the dynamics of poverty in the cities of developing countries. The study of change requires longitudinal data, and, as we discuss later in the chapter, such data are far from being common in the developing world. But longitudinal studies are now beginning to appear in greater numbers. Although the literature on poverty dynamics has been dominated by studies of rural areas thus far (for an introduction, see Baulch and Hoddinott, 2000), urban poverty dynamics are also coming into focus.

In some recent research, full-scale income and consumption expenditure modules have been fielded for urban populations.* The results indicate that household transitions into and out of poverty are common in urban as well as rural areas. In the Herra and Roubaud (2003) comparison of urban Peru and Madagascar in the late 1990s, for example, some 40% of initially poor urban Peruvians were found to have escaped poverty one year later, whereas 13–20% of those initially nonpoor had fallen into poverty. The corresponding transition rates for urban Madagascar were 10% for exiting poverty and 33–40% for entry. In KwaZulu–Natal (South Africa), a panel study conducted over a 5-year interval found that roughly two-thirds of households in the bottom two quintiles of the 1993 income distribution had graduated to

*See Maluccio et al. (2000) and Bigsten et al. (2003) for recently published work. A number of studies on this theme were presented at a 2003 University of Manchester (UK) conference on chronic poverty (Amis, 2003; Henry-Lee, 2003; Herra and Roubaud, 2003; Kedir and McKay, 2003; Lalita, 2003; Mitlin, 2003; Parnell and Mosdell, 2003; Pryer et al., 2003; Stevens, 2003; Woolard and Klasen, 2003).

higher quintiles by 1998 (Woolard and Klasen, 2003). If figures such as these are broadly characteristic of urban dwellers in other settings, they would suggest a good deal of volatility in urban standards of living.

As Herra and Roubaud (2003) note, the literature has been less successful in isolating the determinants of transitions than in identifying the factors producing chronic poverty. (Among other things, errors in measuring consumption and income can mislead by masking real transitions to and from poverty or giving the appearance of such transitions when none occurred. The authors Woolard and Klasen in a paper from 2003 lead a discussion in this.) Education seems to exert something of a protective effect in urban settings, making transitions to poverty less likely and reducing the length of spells in poverty. The demographic composition of households, which can be remarkably fluid, also affects poverty dynamics through routes such as the addition or loss of an adult income-earner and changes in household dependency rates (Woolard and Klasen, 2003). Just how these changes in living standards influence health is not yet known. Some reciprocal influence is to be expected—adult ill health or death can precipitate a household economic crisis, and of course poor households will tend to face higher health risks. (For example, in Pryer, *et al.*, (2003), an examination of both causal pathways in the slums of Dhaka, Bangladesh is examined.)

In circumstances where full income and expenditure data cannot be gathered, the measurement of change in living standards can be expected to present difficulties. It is unlikely that brief inventories of consumer durables and housing quality will exhibit sufficient variability over time to track changes in household standards of living. More extensive lists of consumer items, as itemized in Table 2 are perhaps more likely to register change. Attention needs to be given to supplementing these proxies with indicators that are apt to vary over time with the household's standard of living. For example, the household head might be asked whether, over the past weeks, any member has had to forego a full day of meals for lack of income, or whether the household has had to borrow food. Likewise, the household could be queried on whether it has been forced to sell assets or has taken on additional debt to cover living expenses (examples of such coping strategies are given in CARE/Tanzania, 1998). Simple, subjective measures of change also merit consideration, such as whether in the view of the head or another member, the household is better off than it was a year ago. There is ample scope here for creative application of both qualitative and quantitative techniques (Lalita, 2003; Pryer, *et al.*, 2003; Stevens, 2003). But caution is also in order—Kedir and McKay (2003) find that subjective measures of change in household well-being are only weakly correlated with changes in income and consumption.

Another over-time dimension needing study is the cumulative exposure by households (or their individual members) to the risks that are presented by poor neighborhoods. It is unusual for demographic surveys to collect information on residential mobility; the DHS program, for instance, limits attention in its migration histories to moves into and out of cities and does not inquire about moves taking place within cities. But the implications of short-term spells of residence in poor neighborhoods could be quite different from the implications of prolonged exposure to neighborhood disadvantage. Even if households are to be followed prospectively in a health study, there may be a need to devise retrospective questions that probe into residential mobility and ascertain, up to the limits of respondent recall, something of the character of the neighborhoods inhabited earlier.

3.7. Measuring Neighborhood Poverty and Affluence

The discussion has been mainly concerned with the measurement of living standards at the household level. But with reference to the point just made, how might similar techniques be employed to define relatively poor and relatively advantaged neighborhoods and communities? As with the household-level analyses, it must be taken as given that income and consumption data from censuses will generally be lacking.* One might have thought that, in view of the frequency with which the term “slum” appears in the urban poverty literature, a substantial body of research would provide guidance on precisely this issue.

In fact, as UN-Habitat (2003) makes clear, there is a surprising dearth of quantitative research bearing on slum definitions and assessing the internal composition of slums. It is not known, for example, what proportion of the developing-country urban poor live in slums or what proportion of slum dwellers can be counted as poor in terms of income and other socioeconomic criteria. These gaps in understanding are acknowledged by the UN-Habitat (2003): “[S]lum dwellers are not a homogeneous population, and some people of reasonable income live within or on the edges of slum communities. . . . In many cities, there are more poor people outside the slums than within them.”

The extent of heterogeneity within slums is of prime importance to health program targeting. If slums are heterogeneous, then geographically-targeted programs may not distribute program resources effectively. (Although this research does not have any specific focus on slums, the work-in-progress by Fenn, *et al.*, (2004) shows lower than expected levels of spatial clustering in child nutrition, calling into question the benefits of geographic targeting.) In the next stage of urban multilevel health research, it will be vitally important to gain insight into the socioeconomic diversity marking slums and other neighborhoods of the urban poor.

Figures 1 and 2, taken from Montgomery and Hewett (2004), convey a sense of this heterogeneity. In this research, household living standards were estimated using the MIMIC approach described above, and both households and their neighborhoods were placed in quartiles based on their factor scores, with poverty defined in terms of the lowest quartile and affluence in terms of the uppermost quartile. Figure 1 characterizes the neighbors of poor households. If poor households were indeed generally surrounded by other poor households—as in the images of slums and shantytowns that are invoked in so many discussions of urban poverty—then we would expect to find that their neighbors are predominantly poor. As the figure shows, however, this is far from being the case. In Latin America, the average poor household lives in a neighborhood in which about 44 % of its neighbors are poor. To be sure, this is well above the percentage of poor in the urban population as a whole (25% by the relative defini-

*Recent research on poverty mapping has explored the possibilities of combining census data with data from household surveys that have detailed information on income and consumption. The essential idea is to estimate models of income or consumption with the survey data, using as explanatory factors the variables that are also collected in the country's census. The coefficients from the estimated models are then applied to the census data to generate estimates of consumption (or related measures of poverty) on an areal basis. See Henninger and Snel (2002) for an accessible treatment and Lanjouw *et al.* (2002) for an application to Nairobi and other developing-country urban areas. The method appears highly promising; unfortunately, the number of cases in which it can be used have been limited by the reluctance of national statistical agencies in developing countries to release census microsamples.

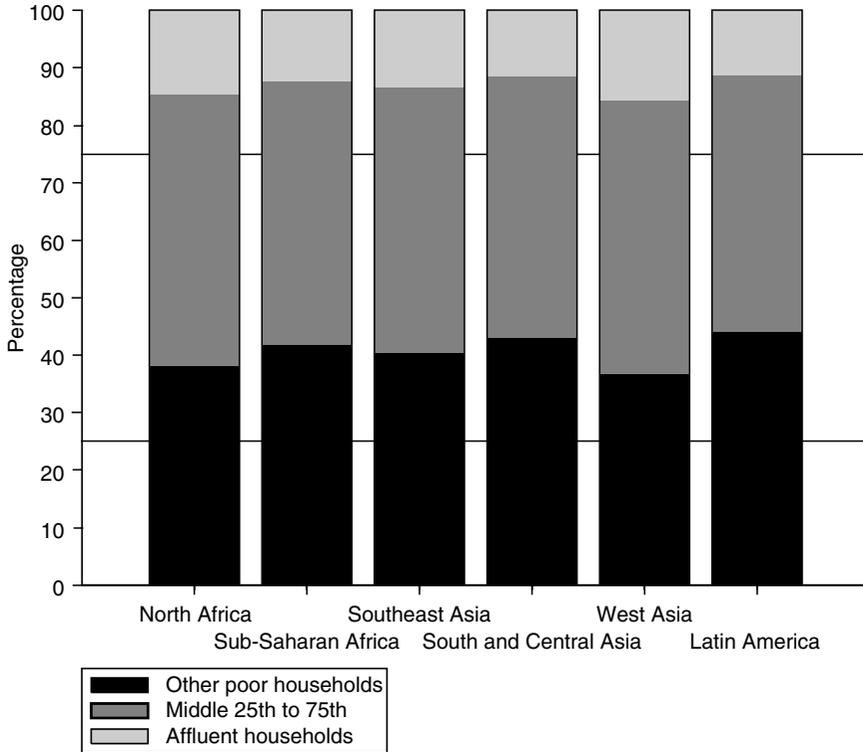


Figure 1. Who Are the Neighbors of the Urban Poor?

tion of poverty adopted here), but it leaves substantial room for neighbors who are in the 25th–75th percentiles of the living standards distribution (in Latin America, this “middle” group accounts for about 45% of a poor household’s neighbors) and even for neighbors who are affluent, those who are in the top-most quartile of the urban distribution. A poor Latin American household has, on average, about one neighboring household in ten that is affluent.

Figure 2 depicts the neighbors of these affluent households. Again, as expected, slightly more of the neighbors are themselves affluent than in the urban population at large, and affluent households have somewhat fewer poor neighbors (who make up about 20 % of the neighbors of affluent families). But a household’s affluence is not strongly predictive of its neighborhood composition—these are minor departures from the 25th and 75th percentile benchmarks. The spatial concentration of affluence is less clearly evident than would be anticipated given the images of extreme social–spatial polarization that appear so often in the literature.

Figure 3, which summarizes predictions from multivariate models, illustrates the impact of household and neighborhood living standards on one measure of health, whether a woman’s labor is attended by a doctor, nurse, or trained midwife. [The figure summarizes estimates from a number of surveys; see Montgomery and Hewett (2004) for the details.] As this figure indicates, with other things held con-

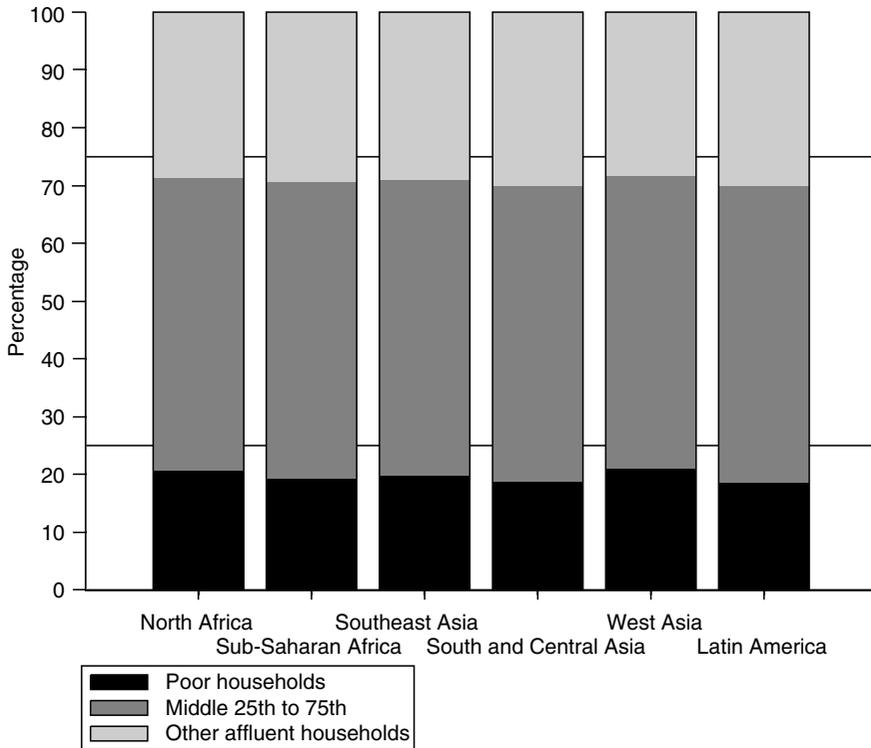


Figure 2. Who Are the Neighbors of the Urban Affluent?

stant, poor women living in nonpoor neighborhoods are much more likely to have their births attended than are poor women in poor neighborhoods. It would appear that social and health resources are available in nonpoor neighborhoods that bring benefits to poor households.

As we have mentioned, little is known about the extent of neighborhood heterogeneity. A detailed study of Cali, Colombia in the mid-1990s (World Bank, 2002) found considerable income heterogeneity within *manzanas*, which are small blocks of housing that are classified into socioeconomic strata for the purpose of targeting subsidy programs and delivering public services. The assumption had been that such strata are internally homogeneous. However, even in the lowest socioeconomic stratum of *manzana* in Cali, one household in five was found to have a per capita income level placing it in the top forty percent of the distribution for the city as a whole. In the highest stratum of *manzana*, about one household in ten had a per capita income in the bottom forty percent of the city income distribution. Unfortunately, detailed studies of neighborhood heterogeneity such as these are not yet widely available for developing countries.

Perhaps it is not, on reflection, greatly surprising that urban neighborhoods in developing countries are heterogeneous. Some of the tools used to enforce social exclusion in high-income countries—i.e., exclusionary zoning—are either unavailable or ineffective in developing-country cities, and affluent families in these cities

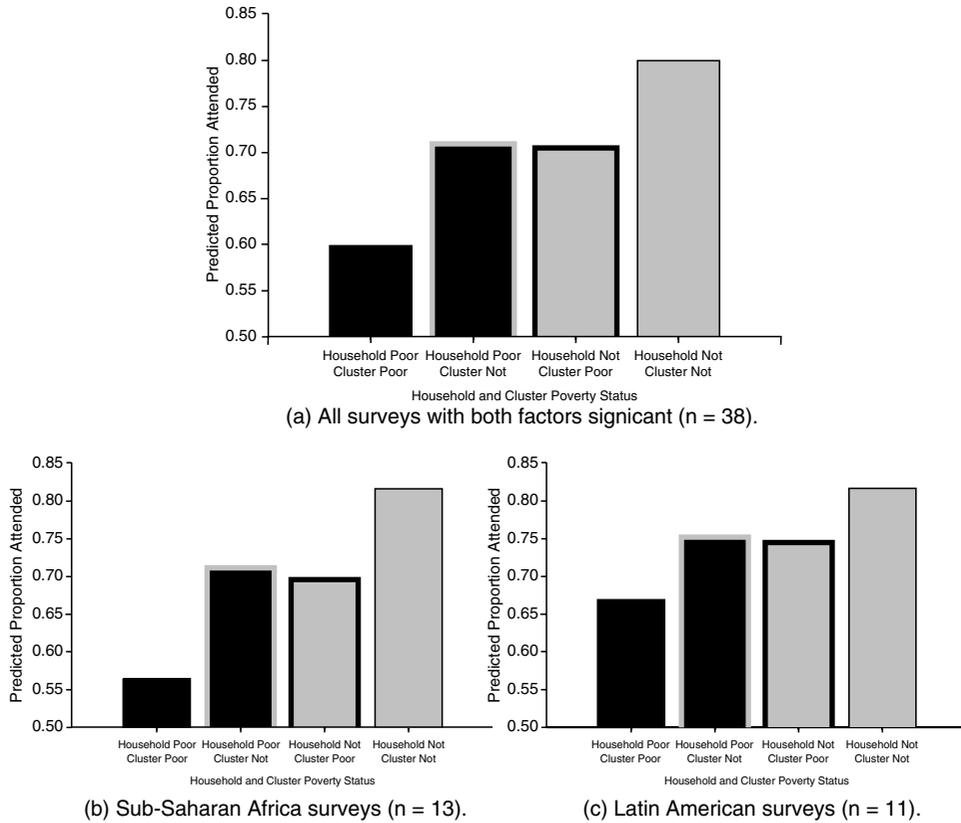


Figure 3. Predicted Proportion of Births Attended by a Doctor, Nurse or Trained Midwife, by Household and Cluster Poverty (*Source:* Montgomery and Hewett [2004]).

benefit from the spatial proximity of the poor, who provide them with a ready source of domestic labor and other services. Moreover, as the Latin American literature shows, social exclusion can be enforced aggressively through non-spatial means (Caldeira, 1999; 2000). Even for the U.S., it has long been known that spatial segregation by income has been less severe on the whole than has segregation by race (e.g., White, 1987; Hardman and Ioannides, 2004).

4.0. URBAN SOCIAL NETWORKS AND SOCIAL CAPITAL

This section is devoted to the tools needed to study social networks and social capital in developing-country cities. Large literatures—mainly though not exclusively concerned with developed countries—have considered social networks and capital, and we will not attempt to give a comprehensive account here. Fuller treatments are available in Panel of Urban Population Dynamics (2003), which explores the implications of social networks and capital for developing-country health and demographic behavior, and in Grootaert, *et al.*, (2004), which offers thoughts on the implications for economic development. Both sources contain extensive references to the social networks literature, which is too large to be adequately summarized

here. To bring focus to the discussion, we concentrate mainly on the tools that will be needed in fieldwork and the context-specific difficulties that can be anticipated in the application of such tools.

A recurring theme in what follows is the need to establish plausible mechanisms through which social interaction can affect health. The difficulties in precisely identifying mechanisms is, of course, a longstanding concern in social epidemiology. In studies of sexual networking and HIV-AIDS (Morris, 1993; Friedman and Aral, 2001), the viral transmission mechanism is understood well enough to justify extensive sociological analysis of networks. Pathways for contagious disease—contamination of water or food, airborne transmission—are also sufficiently well established to allow research to concentrate on the kinds of social interaction that raise the risks of contagion. In other dimensions of urban social epidemiology, however, the mechanisms are not yet so well understood. There is a continuing need to explore just how the general factors of interest in social network and social capital research—weak and strong network ties, bridging connections, notions of trust, collective efficacy, and the like—could come to exert an influence on health.

4.1. Measuring Social Networks

The basic elements of a social networks survey module can be thought of as a series of “who, where, when, what” questions, with “what” referring to the health content of interactions in networks. The survey module often opens with a “name-generator” question that elicits the names of the respondent’s network partners. This question can be general or it can make specific reference to health. A common strategy is to record as many names as are volunteered, and then to proceed with more detailed queries on a subset of these partners. Because urban dwellers interact in multiple settings within and outside their residential neighborhoods, it is important that each network partner’s location be determined in relation to the community in which the respondent lives. This, in turn, means that respondent’s own views of community boundaries must be recorded before the social network question sequence begins. The “when” question is also significant. In longitudinal studies, the time since the previous interview establishes a frame that may help respondents to recollect when it was that significant interactions with their network partners took place; otherwise a time frame must be adopted to focus attention.

The respondent-centered approach to delineating networks quickly runs up against the limits of interview time and respondent patience. If, for instance, the respondent has mentioned five network partners and four questions are to be asked about each partner, the interviewer confronts a bank of twenty questions to work through. In the Casterline, *et al.*, (2001) study of social networks in Ghana, it was found that only one set of network questions could be tolerated in any given interview. If the survey is embedded in a larger demographic surveillance system with basic demographic records for all residents (see Section 5), some interview time can be saved by skipping questions for the network partners already covered by the system. For partners living elsewhere, however, there is little alternative but to proceed with all of the questions.

The Casterline, *et al.*, (2001) analysis illustrates how network data can throw light on the health content of social interactions. This study was concerned with modern contraceptive use and how the experiences and views of social network

partners affected the motivations of the respondent.* Such information was recorded over seven survey rounds at intervals of about six months. An analysis using statistical methods for longitudinal data uncovered strong evidence that contraceptive use by a respondent's network partners exerted substantial influence on the likelihood that the respondent herself would use contraception. The techniques employed in this study could well be adapted for research on other forms of preventive health behavior.

What roles might urban social networks play in health more generally? Networks could provide their members with information about the location and quality of health services, of both the formal and informal varieties. A member who is ill could turn to her network for advice on interpreting the origin of the illness—e.g., whether the illness is due to “natural” causes of a kind likely to respond to modern-sector care or to other causes requiring traditional interventions—and evaluations of its severity. By sharing their own experiences and those of which they have heard, network partners could estimate the probable effectiveness of various forms of treatment. As Barua and Singh (2003) observe with reference to the urban poor in India, such social groups constitute what has been termed a “lay referral network”. As often conjectured in the mental health literature, networks can also make some material assistance available to their members or at least lend to the ill person a measure of comfort and moral support. Furthermore, network partners

*In the opening round of this longitudinal undertaking, a name-generator question referred to conversational networks. Women were given a general frame of reference:

We all talk to others about important matters in our lives. I would like to ask about the people other than your husband/partner whose opinions are important to you. They are people with whom you discuss your personal affairs or private concerns, such as children's illness, schooling, pregnancy, work, and church. They can live nearby or far away, and you might talk to them frequently or infrequently. Other than your husband/partner, can you please give me the names of people whose opinions matter to you?

In later rounds of the survey, the name-generator question focused specifically on conversations about modern contraception:

I would like to ask you about the people other than your husband/partner with whom you discuss modern contraception. These are people with whom you have discussed the costs and benefits of modern contraceptive methods, where they can be obtained, their side effects, and how the methods are used. These people can live nearby or far away, and you might talk to them frequently or infrequently. Other than your husband/partner, can you please give me the names of people with whom you have discussed modern contraception in the last 12 months [since the last survey]?

In each case, the interviewer recorded all the names that the respondent volunteered. In the context of general social networks (the names supplied in the first name-generator), the respondent was then asked whether she had discussed childbearing matters with the network partner, whether she felt the network partner approved of modern contraception, and whether she believed the network partner had ever used modern contraception (with a probe into the basis for this belief). In reference to modern contraception networks (second name-generator), the respondent was asked whether she felt the network partner approved of modern contraception, whether she believed the network partner had ever used modern contraception (again with a probe into the basis for the belief), which method she believed the network partner had used, and whether the respondent and network partner had ever encouraged or discouraged each other from using modern contraception.

and others whom they know provide a web of personal connections that may include staff in health clinics and hospitals located throughout the city. Such personal connections take on special importance when healthcare workers have a reputation for exhibiting dismissive, rude, and abusive behavior toward patients they do not know. This discussion has emphasized the connections between individuals and the health system, but social network analysis can also add value to studies of referrals and other linkages among health providers. In research on the slums of Delhi, Jha, *et al.*, (2002) find considerable evidence of interaction between slum households and their local headmen (*pradhans*), other community leaders and elders, and even municipal councilors. The local leaders themselves interact with political and bureaucratic figures across the city. Political connections such as these may offer opportunities for poor households to gain access to health-related public services. A good deal of insight could be secured into the role of “bridging” networks by tracing the connections from households to their local leaders and from these leaders to powerful actors in the wider municipal arena.

Although these propositions about social networks sound plausible enough, their implications for health do not seem to have been investigated empirically. Some conjectures in the literature doubtless overstate the health significance of urban social networks. For example, Janzen (1978) depicted social networks as actively rallying around when a member falls ill. But in an analysis of response to illness in an Abidjan (Côte d’Ivoire) slum, Bossart (2003) found that network members outside the household were not, in fact, much involved in the provision of financial assistance—the obligation to assist in this way fell mainly upon family members in the ill person’s household. To be sure, the Abidjan analysis was concerned only with material assistance in times of illness, and left open the possibility of a social networks role in providing information about services and shaping individual interpretations of illness.

Because the empirical literature on the health roles of urban social networks is so thin, new network studies must be preceded by substantial qualitative work. The techniques of urban anthropology (Obrist, *et al.*, 2003a; 2003b; Obrist, 2003) could be usefully brought to bear. Focus group discussions, semi-structured interviews, participant observation, the compilation of community histories, and related methods could reveal the features of social networks that warrant further quantitative study.

4.2. Measuring Social Capital

Much the same preparation would be required for analyses of the structure of local social capital. Before querying individuals about their participation in community groups, a research team will need to take an inventory of the organizations operating in the community, and determine which among these serve as likely forums for exchanges of health information or for collective action (Agyeman and Casterline, 2003; Grootaert, *et al.*, 2004). As Casterline, *et al.*, (2001) discovered in the Ghana study mentioned above, special efforts are required to identify the full range of informal associations in the community. The small villages and peri-urban neighborhoods examined in this study were found to be rife with associations, including many with cultural or religious orientations, occupational and economic groups, various political associations, groups with educational objectives (e.g., parent–teacher associations), general philanthropic and community welfare organizations, and a few groups concerned specifically with health or family life education.

With the organizational terrain thus mapped out, lists of groups in any given community can be incorporated in that community's survey questionnaires. As with the member-by-member inquiries for social networks, the research team will need to decide whether to pursue questions about group participation on an organization-by-organization basis, or to single out only the "most important" organizations. If the latter course is taken, the team will need to consider how importance should be established, given the tendency for organizations to be segregated by sex. An older male household head might have a very different view of organizational importance than a young married woman.

In their work on Chicago, Swaroop and Morenoff (2004) distinguish "expressive" from "instrumental" motivations for community participation and classify community groups accordingly. The expressive motivations have to do with a sense of neighborly identity and obligations, and these motives would be evident in participation in groups that promote social interaction and neighborliness. Examples would include neighborhood religious organizations and those based on ethnicity or (in the case of migrants) regional or national identity. Instrumental motivations, by contrast, arise from desires to protect investments in one's home or local business and to meet threats facing the neighborhood as a whole; these would be evident in involvement in neighborhood watch groups, local sanitation committees, local political organizations, and other types of problem-solving associations.

As Swaroop and Morenoff (2004) observe, it is not easy to understand why it is that one poor community can sustain a rich associational life brimming with energy and collective commitment while another entirely fails to cohere and socially disintegrates. Factors discouraging group participation include the general lack of resources and extra-community ties that may be characteristic of most poor communities; but poor communities also face more threats to health and this should intensify the motivation for participation and collective action. In any case, the fact that participation in some community associations is voluntary, and thus dependent on motivations that go at least partly unmeasured, raises concerns about identifying the causal influence of participation itself on health (Durlauf, 2000a; 2000b).

Substantial knowledge of urban community life may be needed to see how group membership could be related to health. For example, consider a woman who is a member of a rotating savings and credit group (an *esusu* group, as it is known in much of sub-Saharan Africa). This group's main function might seem to be narrowly economic in nature—it helps members to accumulate small amounts of capital and makes modest loans available to members in distress, thus providing a buffer against shocks and risks. How, then, might membership in this group influence individual health? By reducing the anxieties and stress stemming from the anticipation of health shocks and income volatility? By providing material assistance when illness actually strikes? Or might the mechanism be unrelated to the group's main function, having to do instead with the informal exchange of health information and ideas that could take place spontaneously in almost any group setting?

4.3. The Overlap of Social Networks and Capital

In a full portrait of social organization that depicts both individual social networks and community groups, it will be possible to identify mutually reinforcing connections among networks and groups. These connections are illustrated in Figure 4. Respondent 1 (denoted "R1") has a personal network tie to Respondents 2 and 4, and she also participates with Respondent 2 in an informal community group.

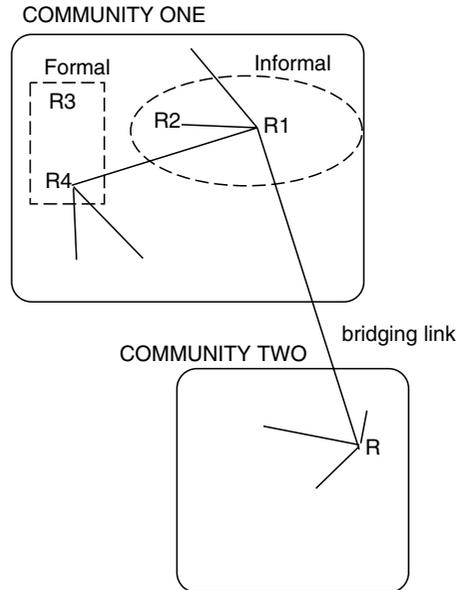


Figure 4. Community Organizations and Personal Networks

Respondent 1 has no direct personal link to Respondent 3, but because Respondents 3 and 4 are both members of a formal community organization, it is possible for information exchanged in this organization to make its way back to Respondent 1 through her R4 network tie. The figure also depicts an outside, or bridging, link between Respondent 1 and a person in another community. One can imagine overlaying the organizational structure of an urban neighborhood on a fully-specified set of social network data such as that shown in the figure, to understand how information may circulate within and across neighborhoods. As far as we are aware, however, no such comprehensive treatment of urban networks and organizations has yet appeared in the developing-country literature.

For at least three reasons, the bridging link shown in Figure 4 is likely to be of considerable significance in urban contexts. First, even poor slum dwellers may have political connections and the sophistication needed to exploit them, which could attract the attention of government and bring health resources to the community (for India, see Parker, *et al.*, 2003; Jha, *et al.*, 2002). However, as we have argued above, mixed-income neighborhoods are likely to have more bridging links of this type (Altschuler, *et al.*, 2004). Second, as Swaroop and Morenoff (2004) note, individual social networks and some community associations can span and thereby link geographically-distinct neighborhoods, providing pathways for information transfer across communities. Moreover, as they suggest, motivation for joining a local association in Community 1 may stem from observation of nearby neighborhoods such as Community 2, which may provide examples of what may befall one's own neighborhood if action is not taken. Third, health interventions in urban communities can deliberately aim to establish bridging links, as embodied in local community health workers whose role is to act as referral agents. Barua and Singh (2003) discuss such "link" workers in the slums of Ahmedabad (India). Here volunteer community workers conduct regular home visits and direct those with the symptoms of tuberculosis to the

appropriate health facility in the city; another community agent follows up to encourage compliance with the treatment regimen. A similar strategy is being pursued in efforts to treat malaria in Burkina Faso (Pictet, *et al.*, 2004). In the programs reviewed by Barua and Singh, a community-based organization serves as an umbrella group for these workers and helps to cement their linkages to the formal health system.

4.4. The Cognitive Component of Social Capital

Much of the effort in devising measures of social capital has been devoted to what Harpham, *et al.*, (2002) term the “cognitive component,” that is, its manifestations in perceptions of community support and collective efficacy, expectations of reciprocity, and interpersonal trust. The cognitive component is conceptually and empirically separable from membership in organizations—perhaps for the reasons outlined in Swaroop and Morenoff (2004), membership need not be associated with trust in any monotonic fashion. Penetrating discussions of these concepts and suggestions on measurement methods can be found in Harpham, *et al.*, (2002), Harpham, *et al.*, (2004), and Grootaert, *et al.*, (2004), the last of which offers a comprehensive and well-organized list of survey questions on the cognitive component, some of which have been field-tested in developing countries. Some examples include:

Networks: If you suddenly needed a small amount of money, equal to about one week’s wages, how many people beyond your immediate household could you turn to who would be *willing* to provide this money? If you suddenly had to go away for a day or two, could you count on your neighbors to take care of your children?

Trust: Agree or disagree: In this neighborhood, one has to be alert or someone is likely to take advantage of you.

Collective efficacy: If there was a water supply problem in this community, how likely is it that people will cooperate to try to solve the problem?

Conflict: In your opinion, is this neighborhood generally peaceful or marked by violence? As noted earlier in this chapter, variants and extensions of such questions were fielded in the Cali, Columbia study of mental health (Harpham, *et al.*, 2004). Presumably the cognitive component influences individual morale and the sense of personal efficacy, and in this way could influence motivations for many forms of health-seeking behavior.

5.0. WHAT CAN BE LEARNED FROM LONGITUDINAL STUDIES?

In research on urban health, longitudinal (prospective) designs offer many advantages over cross-sectional and retrospective designs. We have already discussed some of the methodological benefits in addressing selectivity bias, and in what follows will discuss additional considerations that favor a longitudinal approach. But a longitudinal program of data collection requires heavy resource commitments and faces limitations of its own. Below we describe the benefits and costs in more detail, drawing upon the experiences of the African Population and Health Research Center (2002) in Nairobi, which since the year 2000 has maintained a demographic surveillance system in several of this city’s largest slums. In describing this case, we hope to draw out examples and lessons that are of wider applicability.

5.1. The Benefits of Longitudinal Designs

The advantages of longitudinal approaches to health research are well understood, and we need only briefly restate them here. First, longitudinal designs allow the temporal ordering of behavior, exposure to risks, and health outcomes to be established. For instance, the benefits of vaccination for child survival can be traced from the point when a particular child receives the vaccine. During the course of follow-up, a host of time-varying factors may come to impinge on the child's health (stemming from changes in the social, demographic, environmental, or health system environment) and if the dates of each change are recorded, such factors can be incorporated in the analysis of risks and estimates of hazard rates.

Knowing the time-order of events is of particular importance when the nature of an intervention (or illness) makes retrospective recall either impossible or of doubtful value. Where infectious childhood diseases are concerned, the accumulation of risks that comes about through disease synergies (as in cycles whereby infection and nutritional debilitation lead to heightened risks of re-infection) all but demand a prospective approach, because such complex histories are difficult even to describe by other means. In research on reproductive tract infections (RTIs), women are often found to be unaware that they are infected, either because the infection itself is asymptomatic or because its symptoms are not understood by women to indicate disease. Individual recollection can be of little value here. Likewise, mental health is not reliably determined by retrospective methods. Here, too, knowing the sequence of events is critical: without such data, the associations between good mental health and social support networks at a point in time could be attributed not to the protective influence of networks but rather to the withdrawal of those in poor health from social interaction and engagement.

Second, longitudinal designs, can reduce some of the costs of data collection. For health determinants that vary across people but not over time (or which change only occasionally) data-gathering can take place over the course of multiple interviews, whereas in a cross-sectional study all such determinants would need to be addressed in one interview. The ability to stage a sequence of data collection activities can give researchers the luxury of dedicating survey rounds to special topics. A survey round could be largely given over to a detailed examination of household incomes and expenditures, which would have crowded out other high-priority items in a single cross-sectional survey. Also, while data are being collected over time, opportunities will arise to respond to unexpected findings, whether through focused qualitative research or further quantitative probes. On-going data collection programs provide a vehicle to which such investigatory studies can be attached.

Third, a longitudinal approach provides ways of keeping measurement errors and potentially confounding factors in check. Longitudinal questionnaires can be designed so as to concentrate the attention of the field worker and interviewee on the time since the last interview, with the first order of business being to reconfirm the essential items reported in that interview. When combined with appropriately programmed data-entry software, this approach allows cross-checking procedures to be instituted that substantially reduce error. As an example, in Ghana, Casterline, *et al.*, (2001) employed similar procedures in their longitudinal social networks research to determine whether network members mentioned in a given interview had already been mentioned in a previous interview, if so, repetitive questions on the member's age, sex, and education were skipped. See Beckett, *et al.*, (2001) on the use of such methods to aid long-term recall and Pierret (2001) on the loss of information entailed

in lengthening the gap between survey rounds. A very important advantage of longitudinal designs—to many researchers this is the decisive advantage, as we discuss below—is that these designs enable statistical controls to be put in place for otherwise unobservable individual, household, and community factors, whose effects might be hopelessly confounded with the effects of interest in a cross-sectional study.

Demographic surveillance systems (DSS) are an important special case of longitudinal designs. (The INDEPTH network links a number of demographic surveillance sites in developing countries, several of which are urban or mixed urban-rural sites. More information on this research network can be found at www.indepth-network.org.) The distinguishing feature of the DSS approach is the collection of data on all individuals (or households) residing in the study sites. Typically these are large undertakings, involving visits to each household every three to six months. The scale of the operation implies that only the most important demographic and health variables can be updated at each round of surveillance. To supplement these data, DSS programs often adopt a hybrid approach whereby more detailed information is obtained through periodic panel surveys administered to a subset of residents.

Surveillance systems offer several advantages. For analyses of the dynamics of disease transmission, the full population coverage achieved by a DSS is obviously very important. Some of the diffusion and “social contagion” mechanisms that were described earlier may also benefit from full coverage. (Not all contagion mechanisms are localized in urban settings.) In addition, because the core household and individual characteristics are gathered in each surveillance round, reliable and up-to-date sampling frames are automatically generated for precisely-targeted studies of population subgroups, such as the elderly or school-age children.

5.2. The Costs of Longitudinal Approaches

None of the advantages from longitudinal research comes without cost, especially if long durations of observation are needed to monitor the health outcomes of interest. Consider studies of seasonal variations in health, the effects of climate or ecological change, mortality and morbidity due to diseases with long latency periods, and the impact of behavioral interventions whose effects are slow to develop. In rich countries such as the U.S., the extra costs have not precluded longitudinal studies of health. Is there any reason to think that the costs might be prohibitive in developing countries? In these settings, what is really entailed in the construction and maintenance of a longitudinal research program?

To begin, there are distinctive demands placed on the research team in the conduct of fieldwork. After multiple rounds of interviewing, respondent fatigue can be expected to set in and some respondents will begin to rebel at the repeated intrusions on their time. The opportunity costs of interview time can be especially high for poor urban dwellers, many of whom must juggle multiple jobs and endure exhausting commutes to work. As the editors of this volume have noted, many health studies have offered modest monetary incentives to compensate respondents for their time. In our experience, urban residents are often aware that they can demand to be compensated for an interview, and the research project may have no alternative but to institute an incentive system to secure cooperation. The many time pressures of urban life can make scheduling interviews exceedingly difficult. Field staff must be ready to call upon all of their reserves of flexibility, tact, and patience to address mounting complaints and to move effectively to defuse hostilities.

If the subjects of the research are to be monitored for any appreciable length of time, rigorous systems for tracking them must be embedded in fieldwork procedures and in the project's management and computer systems. Because telephones and the mail are of little use in developing-country contexts, monitoring is a highly labor-intensive exercise. Intense staff effort and meticulous attention to detail are essential to keep survey attrition in check and to diagnose the root causes of loss to follow-up. DSS programs, in particular, cannot be mounted without the use of sophisticated relational databases, and these require strong statistical and analytical skills on the part of senior staff. The nature of supervision also has some distinctive features. In prospective studies fieldworkers can come to know their respondents all too well and, unless carefully supervised, some will be tempted to substitute their own answers to survey questions for those of the respondent. Acquiescence bias—the tendency for respondents to anticipate what they believe the interviewer would like to hear—is also a mounting risk (Hill and Willis, 2001). Both tendencies can be counteracted, at least to a degree, by judicious reshuffling of interviewer assignments. Specific information about the respondent—such as how to locate the respondent's dwelling, reasons for reluctance to participate in previous waves of the study, and the persuasive techniques used to overcome initial refusals—can be kept in special log files that are transferred to new interviewers. For these reasons, the recruitment and retention of capable fieldworkers, supervisors, and computer staff will almost inevitably require higher levels of compensation than would be needed in one-off, cross-sectional studies.

Even with rapport building, incentives and painstaking supervision, some loss due to attrition must be anticipated. Measures will need to be taken to assess whether the loss threatens the representativeness of the sample. Urban populations are often said to be highly mobile and elusive, a perception that has doubtless dampened enthusiasm for urban longitudinal research. But such perceptions are not always solidly-grounded in field experience (as noted in section 5.6 in this chapter). Some urban longitudinal studies have succeeded in retaining very high percentages of their initial respondents. The Indonesian Family Life Survey (Thomas and Frankenberg, 2001) achieved remarkable rates of retention (over 94% four years after the initial survey) in urban and rural areas alike, in part because this study had the funding and staff resources to trace the initial respondents who moved. A three-year panel study of urban Ethiopia (Bigsten, *et al.*, 2003) lost only 7 percent of its respondents to attrition. A South African study relocated some 90% of its urban residents five years after the initial survey—this despite the fact that the study had not initially been envisioned as a panel (Woolard and Klasen, 2003). In other settings with higher attrition, however, the biases induced by attrition could undermine the statistical foundations of the research. As discussed by Thomas and Frankenberg (2001), longitudinal follow-up rates have been little better than dismal in some West African and Latin American surveys, although it is unclear how much of the problem in these cases stemmed from population mobility and how much from inadequate preparation and fieldwork.

In developing countries, it is difficult to mount any longitudinal research effort that does not in some fundamental way rely on continuing involvement with the communities in which the research subjects reside. At a minimum—for longitudinal and cross-sectional studies alike—local political leaders and other influential persons will need to give permission for the study to proceed in their communities. In longitudinal designs, however, community involvement is also required to establish mechanisms for following individuals over time and to ensure the success of

day-to-day fieldwork. Some consultation with local leaders and advice from community members (perhaps in the form of community advisory boards) may be needed to devise workable identification and tracking systems with adequate protections for confidentiality. As fieldwork gets underway, neighbors and others in the community will often be asked for their help in rescheduling interviews of residents who are temporarily absent. If these requests are not carefully framed, they can easily raise suspicions about the true intentions of the project team—especially if that team is also inquiring into the composition of individual social networks. The community may need to be reminded repeatedly of the purposes of the study and the benefits that are expected to come from it, and may also need multiple reassurances about confidentiality.

Given this, longitudinal designs must give careful consideration to the maintenance of community good will. If local residents are hired as survey fieldworkers—a practice that has both benefits and costs—the project will receive some credit for being a steady source of employment. (Among other things, the use of interviewers from the same community can make it difficult to assure confidentiality, so that careful training of staff on confidentiality is important). But further material contributions to the community may well be required to sustain good will, and health research projects will inevitably come under pressure to assist the community in the construction of its health center or its water and sanitation facilities, or to effect improvements in the provision of health information, drugs, and emergency care. Project staff may themselves feel an ethical obligation to respond to the community's needs. A balance will need to be sought between the maintenance of community good will, on the one hand, and the risk of compromising the research design through well-intended assistance, on the other. Still, some form of project investment in the community is likely to be needed in a longitudinal study, and for all but the most lavishly-funded research, this will set strict limits on the number of communities in which the project can reasonably expect to operate.

A central theme in this chapter's discussion is the need to develop multilevel analyses in which careful attention is given to the community features that have a bearing on health, such as the range and diversity of local social networks and the nature of community organizations. If only a few communities can serve as research sites, there may be too little cross-community variation to identify the effects of these features by statistical methods. Of course, other sources of variation could compensate—such as variation within communities in individual social networks or group participation, and over-time variation in certain community-level features. Moreover, the concentration of effort in a few research sites can much enhance a project's ability to provide rich qualitative descriptions of community organization and evocative illustrations of the connections between social organization and individual health. But for a multilevel analysis with a modest budget, it is at least worth asking whether a cross-sectional design involving many communities, with the features of each community being rather thinly characterized, might offer greater initial returns.

5.3. Longitudinal Research in Slums

Many factors will need to be weighed in selecting the communities to serve as study sites. There are considerations of feasibility. In some communities an unfriendly political climate or social disorganization may preclude the possibility of identifying study participants and following them over time; in other communities, the study population may be too mobile or simply too small in total to meet the research

goals. (But because residential mobility is often of independent interest in multi-level theories of health, a substantial degree of mobility may have to be tolerated despite the difficulties it entails for fieldwork.) In what follows we consider more closely the rationale for focusing on the health of slum populations, where these and other factors need consideration.

We have already discussed the social and economic heterogeneity that would appear to characterize the neighborhoods of poor urban dwellers in developing countries, and have emphasized how little is known of the overlap between urban poverty and slum residence. Where it is feasible to do so, comparisons of the health of poor households residing in neighborhoods of concentrated poverty to poor households in mixed-income neighborhoods could prove highly illuminating. But fully representative research designs are not necessarily the most efficient designs for understanding the health of the poor. Despite the ambiguity and imprecision that surrounds the term “slum,” and the potential payoffs from studying the poor in other types of communities, a focus on slum populations may be well justified.

Among other things, reliable health and demographic data are often lacking for these populations. Furthermore, existing census and survey data (such as provided by the DHS or by health facility data on service availability and utilization) may highlight health disparities that need closer inspection. In the case of Nairobi, for example, DHS survey data from the mid-1990s indicated that some health outcomes were decidedly worse in the slums than in rural Kenyan villages; this was a major motivating factor in the decision to situate the APHRC surveillance sites in the slums. The heterogeneities of slum populations can be exploited, at least to a degree, in choosing among slum research sites. For example, in a qualitative study of slum communities in Uttar Pradesh, India, Parker, *et al.*, (2003) chose sites to obtain variation in several dimensions: city size; the ease of access to employment and public services; the community’s legal status (the key distinction being authorized versus illegal squatter settlements); and whether the community was newly settled or long established. Within some slums, smaller enclaves can be found in which residents identify with one another on the basis of ethnicity, religion, or rural village of origin (Jha, *et al.*, 2002). In what follows we summarize some of the lessons learned from recent studies of slum populations.

5.4. Identifying Slum Communities

The maps provided by government agencies do not always depict the geographic extent of slum communities with any accuracy; indeed, in some cases these maps would appear to suffer from systematic omissions. As Parker, *et al.*, (2003, p23) describe their experience in identifying slums in Uttar Pradesh,

The most significant and serious urban disadvantages were encountered in settlements whose existence is not recognized by government. Many of these settlements are vast and have been in existence for twenty years or more. Officially, however, they do not exist and the land they occupy is identified as “vacant.” Since there is officially no one there, local government is under no obligation to provide public services. Water, sewerage, electricity, schools and health facilities are therefore absent from unrecognized settlements except when they have been established by NGOs or community initiatives.

Similar problems are found in many settings. In Indore, the largest city in the Indian state of Madhya Pradesh, a careful census conducted by the research team

found there to be 539 distinct slum communities, of which over 100 had gone officially unrecognized (USAID-EHP Urban Health Program, 2004b; 2004c). A similar study of Agra (USAID-EHP Urban Health Program, 2004a) uncovered about as many unregistered as registered slum communities.

If serious biases are to be avoided, such discrepancies from the official accounts must be anticipated and the boundaries of the communities of interest delineated through preparatory fieldwork. A number of useful steps are suggested in USAID-EHP Urban Health Program (2004d), the main one being to comb through all available data sources (census data and maps of enumeration areas, sample surveys, urban planning reports, other geographically-coded data) for clues on the location of communities of the urban poor. Slum residents themselves can provide useful information and help the project team to identify other slum communities not recognized in the official documents. Working together with the project team, local residents can walk the boundaries of their communities and take part in participatory mapping exercises; they can identify health problems that the researchers might have overlooked, clarify the role of local private providers, and point out health facilities situated outside community boundaries to which residents have access. Further insights can be obtained from interviews of officials charged with service delivery, such as municipal water and sewerage authorities. This phase of qualitative research is time-consuming and adds substantial up-front cost to a longitudinal research project, but without it the quantitative phases of the research are likely to founder.

5.5. Understanding Slum Dwelling Units and Households

In order to clearly demarcate household units for its surveillance system, the Nairobi pilot DSS defined households to be groups of individuals who share the same dwelling unit within a given structure. Most slum households in Nairobi occupy a one-room dwelling unit which serves as kitchen, bedroom, and sitting room, but in general, all rooms occupied by the same household within a structure were taken to constitute the residential unit for that household.

As the Nairobi team went into the field with these conventional definitions in hand, it encountered a bewildering variety of exceptions and difficult cases. It proved not uncommon for members of a single slum household to share eating arrangements while living in two distinct but adjoining (or nearby) structures. To handle such cases, in which conventionally artificial definitions of “household” would do violence to the social realities, a field was created in the project’s database to allow two households in different dwelling units to be linked for the purposes of analysis.

The difficulties did not end there. To achieve an adequate accounting of who lives where in the Nairobi slums, it proved necessary to assign unique locational identifiers to rooms, which became the lowest-reaching branches in the project’s elaborate classification system. Even these small units presented problems—in the clutter and confusion the fieldworkers could not always discern where one room ended and another began. The Nairobi pilot DSS was forced to further elaborate its system and assign unique identifiers to the external doors of each room. (In some cases, thankfully rare, slum residents had built their rooms without any doors, preferring to enter them from the roof or through a window, evidently to avoid being continually disturbed by their neighbors).

Rent difficulties and general flux in household membership caused the number of rooms occupied by a given household to vary considerably from one round of sur-

veillance to the next. Housing structures themselves proved to be far from durable. In Nairobi as elsewhere, slum neighborhoods are continually roiled by waves of construction and demolition. Residents of squatter settlements face frequent destruction of their housing as a result of arson, indiscriminate damage inflicted by government security personnel in pursuit of criminals, and periodic evictions of informal settlers from public or private land designated for other uses. This chaos presents a significant challenge to prospective studies: there is no guarantee that a structure present in one survey round will still be found standing at the time of the next round. As can well be imagined, a highly sophisticated relational database is needed simply to manage demographic data with this degree of complexity.

5.6. Residential Mobility

High residential mobility rates stem from many factors common to slum living conditions, including difficulties in meeting rent payments, job loss, evictions, flooding, and the like. With such high rates of mobility, a sizeable number of residents live for only short durations in the community. Whether such short-term residents ought to be included in a longitudinal research database is not obvious. In the case of the Nairobi DSS, a three-month period of stay was taken to be the minimum spell of residence qualifying for registration in the database, but the researchers understood that substantial numbers of short-term residents would nevertheless be missed.

There is undoubtedly a great deal of variation in mobility rates according to setting and the population age group being studied. For migrant heads of household, a study of Delhi slums (Jha, *et al.*, 2002) found that the median length of residence in the slum community was 13 years, and was 18 years for length of residence in Delhi. Research on adolescents aged 10–14 years in the slums of Allahabad, India, found that from 73 to 90% of girls reported having resided in these slums since birth (Mensch, *et al.*, 2004). The Allahabad figures—which do not include moves taking place within the slums—would seem to suggest relatively low levels of mobility. Yet of the adolescents who were interviewed in a 2001 baseline survey, only about 60% could be located and re-interviewed in a follow-up survey conducted two years later. In the chaotic conditions of the Allahabad slums, even a seasoned survey team found it difficult to track initial respondents moving within the slum communities.

Access to slum respondents can present yet further problems. In the Nairobi slums, where average household sizes are low, fieldworkers arriving for an interview often find no adult present to be interviewed (according to data from the Nairobi pilot DSS, one-third of households contain only one adult, the average number of persons per household being 2.9 for all households and 3.8 for households with at least two persons). The fieldworkers must then rely on the help of neighbors to arrange to revisit the household late at night, very early in the morning, or on weekends. If the interviewer teams had not been drawn from the same slum communities, the costs of all this could well have been prohibitive. In the Nairobi case, the logistical savings achieved by enlisting community members as interviewers outweighed the risks to respondent privacy and confidentiality.

Some of the difficulties inherent in urban longitudinal research are much magnified in studies of slum populations. For example, in the course of its work in the Nairobi slums, the APHRC team faced overwhelming demands from the communities to improve their social and health facilities. Many research groups and NGOs

may be operating projects and providing services in the slums, and the residents can feel somewhat under siege from multiple requests for interviews, which contribute to respondent fatigue. Moreover, with multiple interventions underway it can be difficult for a given research project to isolate the connections of greatest interest to it (the “attribution problem”). In addition, some of the social risks facing slum residents can afflict the research team. Slum crime rates are often high and, like the residents, research staff run the risk of being victimized. (This has happened more than once to APHRC fieldworkers in Nairobi; also see Verner and Alda (2004) on the problems posed by gang violence to fieldwork in the slums of Fortalenza, Brazil. In settings such as these, gang leaders are among the local “influentials” whose permission the research team may need to obtain to carry out its work.)

6.0. CONCLUSION

This chapter has reviewed the core concepts of urban multilevel health research and the empirical tools that have been used, mainly in North America and Europe, to shed light on the concepts. When these tools are finally brought to bear on the cities of poor countries, we expect they will unearth many similarities in behavior in rich and poor countries, but also many differences, each having the potential to enrich understanding of urban life and health. Several dimensions of comparison warrant consideration: the situations of large and small cities; the conditions of the urban poor relative to the nonpoor and rural residents; and among the urban poor, the circumstances of those who are spatially concentrated in slums and those who live in more heterogeneous communities.

If progress is to be made in understanding the demographic implications of spatial segregation, urban social networks, social capital, and the like, longitudinal research designs will eventually be needed. We would urge that much more attention be paid to the health implications of neighborhood social and economic composition, as reflected in the percentages of local residents who are educated, for example (Coleman, 1988; Kaufman, *et al.*, 2002; Kravdal, 2003). Theories of urban social and environmental interaction and externalities (Panel on Urban Population Dynamics, 2003) indicate a need for the collection of social network and spatial data that lie well outside the scope of current survey program, and that will require new sorts of surveys to be fielded in the cities of developing countries. There is much could be learned, we believe, through application to these cities of the conceptual and measurement tools now being applied to poor urban communities in the West.

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