

Health Behavior Change Models for HIV Prevention and AIDS Care: Practical Recommendations for a Multi-Level Approach

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INTRODUCTION

Abstract: Despite increasing recent emphasis on the social and structural determinants of HIV-related behavior, empirical research and interventions lag behind, partly because of the complexity of social-structural approaches. This article provides a comprehensive and practical review of the diverse literature on multi-level approaches to HIV-related behavior change in the interest of contributing to the ongoing shift to more holistic theory, research, and practice. It has the following specific aims: (1) to provide a comprehensive list of relevant variables/factors related to behavior change at all points on the individual-structural spectrum, (2) to map out and compare the characteristics of important recent multi-level models, (3) to reflect on the challenges of operating with such complex theoretical tools, and (4) to identify next steps and make actionable recommendations. Using a multi-level approach implies incorporating increasing numbers of variables and increasingly context-specific mechanisms, overall producing greater intricacies. We conclude with recommendations on how best to respond to this complexity, which include: using formative research and interdisciplinary collaboration to select the most appropriate levels and variables in a given context; measuring social and institutional variables at the appropriate level to ensure meaningful assessments of multiple levels are made; and conceptualizing intervention and research with reference to theoretical models and mechanisms to facilitate transferability, sustainability, and scalability.

Key Words: behavior change, HIV, socio-ecological model, factors, multi-level

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Attempts to slow the HIV epidemic worldwide have led to a clearer understanding that the battle is not simply about using condoms or adherence to medication. Rather, HIV risk and AIDS care involve complex behaviors influenced from multiple levels, from an individual's knowledge, attitudes, emotions, and risk perception, to power dynamics between partners, accessibility of services, economic inequalities, criminalization of vulnerable groups, and policies that make HIV a priority health issue.^{1–3} Although there have been some calls to be more inclusive of multi-level factors beyond the individual level (e.g., at the interpersonal, network, institutional, or structural levels),^{4,5} evidence addressing a more holistic approach to changing HIV-related behaviors is limited. Among such models, ecological models are a family of approaches seeking to describe the multiple levels of influence on individual behavior in the interest of creating environments conducive to health promotion.⁶ Although there seems to be little disagreement that ecological approaches are more comprehensive and potentially more explanatory and effective than frameworks or models only taking one level into account,⁷ such frameworks have received relatively little research attention, for at least three reasons.

First, assessing impact at multiple levels is often viewed as too difficult or expensive. For instance, an intervention in a low-income setting with the objective of increasing HIV counseling and testing may need to address (1) the stigma of being tested and/or of testing positive; (2) the quality of patient-counselor interactions; (3) facility capacity, supplies, and environment; and (4) access to those facilities by infrastructure, such as good roads and public transportation. Addressing all of those factors and measuring improvements of each is extremely ambitious for any one research project. Even in an individual-focused intervention, addressing multi-level factors has its challenges.

Second, multi-level interventions are diverse and often context specific,⁸ and thus, it is not easy, or even appropriate, to replicate them. Nor do they easily support generalizations across contexts.⁹ For instance, a “structural” intervention for people who inject drugs in Ukraine (eg, needle exchange programs) would seem to have little in common with a structural intervention for poor women in Ethiopia whose financial dependence on men often results in transactional or cross-generational sex (eg, cash transfer).

Finally, with randomized controlled trials (RCTs) still viewed as the “gold standard” in health research,

interventions addressing factors at multiple levels are often not attempted because an RCT is not feasible or even appropriate.¹⁰ Furthermore, combining individual-level and structural-level factors in one study is not straightforward. For instance, Kippax¹⁰ argued that structural influences, such as political will to implement harm reduction strategies or funding for mass media to lead public discussions about sensitive HIV-related topics, have a determining impact on HIV transmission and the likelihood that individual- or interpersonal-level interventions will succeed. But political will and vibrant mass media are rarely amenable to evaluation through an RCT, as the meta-analysis by Lacroix et al.¹¹ in this special issue documents.

Multi-level approaches, thus, are in many ways at odds with contemporary HIV-related policy, which often favors brief, replicable, and easily disseminated interventions. Individual-level or interpersonal-level interventions are most amenable to such constraints. However, this article is guided by the current literature and theory, rather than by policy constraints. Indeed, it is in line with simultaneous policy

shifts (contradictory to the emphasis on brevity and replicability) in favor of structural interventions. Although the field of behavior change research in HIV seems to accept that change means going beyond the individual level,⁴ there is still only a small literature on models taking multi-level approaches. This article aims to contribute to the shift to a more holistic approach by synthesizing and making sense of a complex literature, leading us to outline the next steps required as clearly as possible. Specifically, we (1) list potentially relevant variables/factors related to behavior change at all levels of the individual–structural spectrum, (2) identify characteristics of important recent multi-level models and compare them, (3) identify challenges in using such models, and (4) identify next steps and make actionable recommendations.

A Menu of Behavior Change Factors

Figure 1 provides a menu of the various influences on behavior change at each level of the socio-ecological

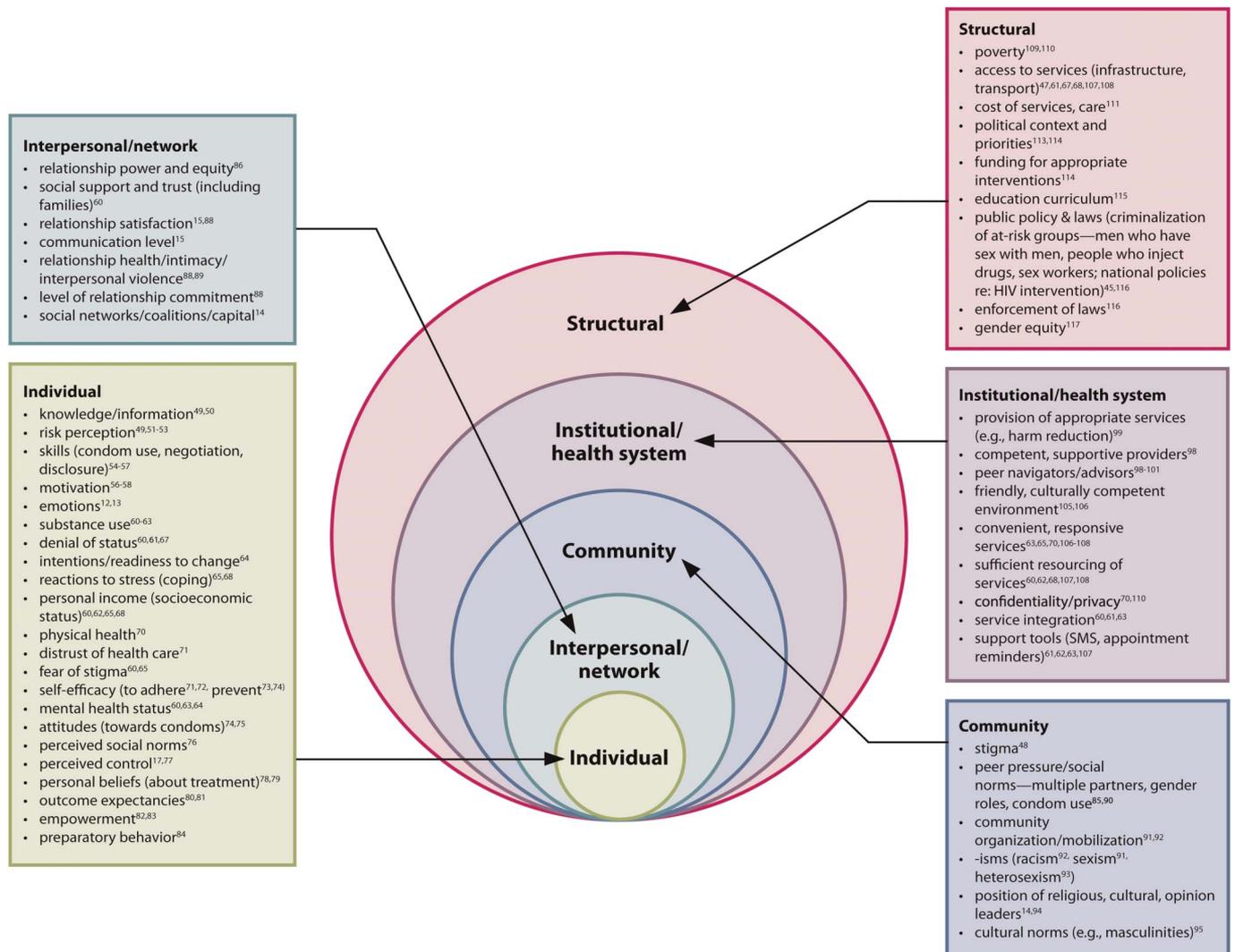


FIGURE 1. Factors influencing HIV-related behavior and/or behavior change at each level of the socio-ecological model.

framework based on our review of existing literature on behavior change interventions related to HIV prevention, treatment, and care. The *individual* level includes factors comprising the micro-level, such as individual perceptions, beliefs, or emotions. The *interpersonal/network* level includes dyadic or family influences, such as relationship satisfaction or social support. The *community* level includes influences at a larger group level, such as social capital or community norms. The *institutional* level focuses on factors within the health system, such as quality of service providers, confidentiality, or sufficient resources. Finally, the *structural* level includes the most macro-level factors affecting behavior, such as the economy, political climate, enforcement of policies and laws, or funding environment. Some structural factors may be more removed from individual control than others. For instance, wars, famines, or droughts are important structural factors further removed from the individual than, for instance, the availability of transport to access a clinic or income-generating opportunities in a particular community. Moreover, although we distinguish between “levels,” they are highly interactive, with processes ranging between micro and macro. Structural influences function only with the cooperation of individuals and their interpersonal relationships, and vice versa.

Many of these factors have been extensively researched and incorporated into successful interventions (eg, self-efficacy, behavioral skills, stigma reduction) while others have been discussed as important factors without much evidence to date on how they can be leveraged for behavior change (eg, emotions, sexual relationship power, community mobilization). The figure provides citations to key articles evidencing or arguing for each factor, where available.

The purpose of this figure is to provide an overview of the diverse influences relating to HIV risk or AIDS care. The figure does not represent a theory of the relationships among the variables at the different levels of analyses, nor can it be used to determine which variables might be most important to address in a particular intervention. Nonetheless, it does highlight some variables that have only recently been investigated, such as emotions,^{12,13} social networks/coalitions/capital,¹⁴ and relationship investment.¹⁵ Moreover, in recent years, theoretical models have begun to conceptualize how these variables and levels are linked together.

Recent Theoretical Frameworks Addressing Multi-Level Factors

Many individual-level theories have played prominent roles in past behavioral interventions focused on HIV prevention and AIDS care, including especially Social Cognitive Theory,^{16,17} the Theories of Reasoned Action¹⁸ and Planned Behavior,¹⁹ the Transtheoretical Model,^{20,21} and the Information, Motivation, Behavioral Skills Model²² (Table 1). Although these models primarily focus on the individual level, they have been associated with significant behavior change across a range of groups with varying risk levels (eg, men who have sex with men, adolescents, people living with HIV/AIDS, African Americans^{23–28}). Nonetheless, reviews of such models have concluded that, because they do not

explicitly consider high-level connections, their success is constrained.²⁹ Of note, meta-analyses of behavioral intervention trials routinely find that inconsistencies in study outcomes cannot be explained solely on the basis of moderators stemming from individual-level theories^{23–28}; until recently, these meta-analyses have rarely considered factors outside the intervention itself in efforts to explain heterogeneity.

Several recent models have taken up the challenge of expanding from individual-level features to be inclusive of higher levels. The Multiple Domain Model (MDM)³⁰ proposes that there are multiple domains of influence on health behavior, with situational/contextual variables being the most proximal to behavior, followed by preparatory behaviors, behavioral intentions, normative, attitudinal, and self-efficacy beliefs, personality and social environmental factors, and finally social structural variables. Essentially, the MDM starts with the Theory of Planned Behavior, replacing perceived behavioral control with self-efficacy. It then adds structural factors in the sociological sense (race, gender, age, social class) and variables that address personality, the social environment (school connectedness or family relationships), and social situational variables (substance use, relationship status, or hormonal contraceptive use). The MDM allows each of these to have direct (not merely indirect) relationships with behavior. Hence, factors outside of the individual are explicitly modeled as factors shaping one’s behavior.

Three recent efforts embraced ecological frameworks as an overarching theme. First, the Network-Individual-Resource Model (NIRM) recognizes and addresses the substantive reciprocal ties of individuals and important social networks across their lifespans—ties that have their basis in the tangible and mental resources individuals and networks possess.²⁹ Second, the Dynamic Social Systems Model (DSSM)³¹ conceptualizes resources, science and technology, formal social control, informal social influences and control, social interconnectedness, and settings as aspects that dynamically intersect to create structural realities ranging from micro- to meso- to macro-levels. Third, the Transmission Reduction Intervention Project (TRIP)³² rests explicitly on the fact that HIV transmission requires body fluid exchange and is spread through community sexual and injection networks. Current expositions related to TRIP emphasize the need to simultaneously intervene at higher levels than the individual (eg, care providers) and rectify power imbalances (eg, ensure they understand patients’ social and economic realities).

All 4 multi-level approaches concur that factors outside the individual relate to risk and the ability to change behavior. For example, a great deal of recent research confirms that social stigma creates health risks and worsens health care.^{33,34} The DSSM, TRIP, and NIRM agree in focusing on resources as critical for sustaining behavior change; they also emphasize power dynamics between individuals and surrounding social forces. The DSSM and NIRM also agree in focusing on the dynamic interplay between levels, although the former focuses only on the structures people face and the latter implies reciprocal interactions between individuals and realities constructed by networks. To the NIRM, networks cannot exist without individuals *and* vice versa. The MDM and the NIRM agree in emphasizing social environmental factors

TABLE 1. Synopsis of Selected Individual HIV Prevention Models on Key Considerations

Model	Depiction	Consideration		
		Social Emotional Dimensions	Micro-macro Process Linkages	Explaining Structural Influence
Social Cognitive Model ^{16,17}	Individuals who have high efficacy to enact safe behaviors do so, limited by barriers	May be relevant to the barriers that individuals face	Focus is micro with no explicit macro linkage	Epidemiological trends help to identify groups at risk, but the model has no role for structural factors per se
Theories of Reasoned Action ¹⁸ and Theory of Planned Behavior ¹⁹	Individuals intending to act safely do; perceived control over action (TPB), also facilitates action; other factors are more distal (attitude; descriptive, injunctive, subjective norms)	May be part of belief structure related to attitudes, subjective norms, and perceived control, but other measures routinely omit them	Focus is micro with no explicit macro linkage except that descriptive and injunctive subjective norms may reflect the realities of others important to the individual	Posits structural factors' influence is only indirect, mediated by impact on variables that underlie intentions (attitudes, subjective norms, perceived behavioral control), but the model has no role for structural factors per se
Transtheoretical Model ²⁰	Individuals who understand the need to change, are ready to act safely, see the benefits, and are confident change their behavior, limited by barriers	May be considered in relation to key variables but routinely omitted in measures	Focus is micro with no explicit macro linkages except that helping relationships, social liberation, and environmental re-evaluation are assessed at individual level	Model proposes same individual-level factors generalize across cultures, with some variability; model assessed support for social policies, but no clear role for structural factors per se
Information-Motivation-Behavioral Skills Model ²²	Individuals who have correct information, sufficient motivation, and behavioral skills act safely; other deficits determined through surveillance	May be part of the motivational deficits that individuals experience	Interactions with macro-levels are targeted at individuals if elicitation research identifies them as important (eg, safer sex negotiation skills) but no necessary linkage to networks	Epidemiological trends help to identify groups at risk, but the model has no role for structural factors per se
Multiple Domain Model ³⁰	Social structural, social environmental, and situational/contextual potentially influence behavior directly	May be present in situational variables, such as relationship status, and self-efficacy	Modeled in the relationship between the social environment and situational context and attitudes, norms, and self-efficacy	Structural variables (race, ethnicity, social class, age, and gender) may directly impact behavior
Network-Individual-Resource Model ²⁹	Congenial to individual-level models but isolates mental and tangible resources of individual/networks as moderating how individual-level variables influence behavior	Are a part of the mental and tangible resources for both individuals and networks tied to them and thus may affect risk positively or negatively	Exchanges between individuals and networks are the mechanism underlying HIV risk and must be targeted to decrease risk behaviors and increase safe behaviors	Networks create structural realities that may have either direct or indirect and positive or negative impact on risk behavior
Transmission Reduction Intervention Project ³²	HIV transmission requires exchange of bodily fluids and is spread through sexual and injection networks in communities	May be part of the challenges communities face	Individuals may avoid health-care organizations if barriers such as provider stigma toward AIDS patients interfere	Organizations possess resources that facilitate or impair individual behavior
Dynamic Social Systems Model ³¹	Resources, science and technology, formal social control, informal social influences and control, social interconnectedness, and settings dynamically intersect to create structural realities that influence risk	Social interconnectedness may affect risk positively or negatively	Primarily focused on macro-level factors	Structural influences may affect risk behavior directly or indirectly

directly influencing behavior, even when the individual may wish to act differently.

The NIRM is the only 1 of these 4 models directly addressing development across the lifespan, which characterizes both individuals and networks. Thus, the NIRM holds that prevention needs, and risk itself, depend importantly on the life stage and circumstances. Individuals with great needs or little autonomous power (eg, infants and children) are vulnerable to others' influence and can be positively (eg, sustenance from caregivers) or negatively affected (eg, harmed by poor care). In parallel, networks that might improve health gain strength when more individuals actively participate in them and promote their goals.

Finally, of these models, TRIP and the NIRM most embrace the perspective that individuals must find ways to cope with stressors. In short, one reason behavior change efforts may fail is because those addressed by an intervention live in circumstances filled with stressors such as demanding physical environments or stigmas associated with minority status, HIV-positive status, or both. Reid et al³⁵ recently showed that both residential segregation and prejudice levels of majority members toward minorities interfered with the success of behavioral interventions meant to decrease sexual risk behaviors. Logically, the stress created by unfriendly social environments—in this case addressed at the U.S. county level—interfered with individuals' ability to improve habits. Understanding how to promote positive coping with environmental stressors and how to make communities more supportive would thus offer considerable hope for larger behavior change effects.

Table 1 compares recent behavior change models and how they attempt to address factors beyond the individual. Because individual and structural elements clearly are relevant to HIV risk and transmission prevention, a strength of the NIRM is that it recognizes the linkage between levels, where *micro* connotes processes or variables solely within individuals, and *macro* implies linkages between individuals and others.³⁶ Thus, the NIRM recognizes that individuals (micro) enact risk behaviors with those to whom they are linked in networks (macro). In contrast, individual-level HIV prevention theories either have no explicit linkage to macro-levels or do so only indirectly. Finally, the individual-level models have little ability to explain structural influences, whereas the other 4 models at least permit a direct influence of such factors on risk behavior. The NIRM and TRIP recognize that networks or organizations possess resources that bear on risk behavior; the NIRM explicitly addresses how networks create structural realities that interplay with risk. Although addressing these high-level factors creates challenges for brevity and replicability, doing so is more likely to result in sustainable behavior change.

Because these multi-level models are all relatively new, there have not been extensive empirical studies evaluating their assumptions. Another consideration in our discussion is that various versions of socio-ecological models have typically been discussed as *organizing frameworks* rather than as *testable* (ie, falsifiable) *empirical models*. Indeed, at this writing, of the broader, relatively new models we discuss

here, we are aware of research supporting predictions only of the MDM and the NIRM. MDM research so far has generally shown that situational and preparatory behaviors add significant predictive power for behavior beyond attitudes, norms, intentions, and self-efficacy. The MDM research also suggests that social-structural variables (eg, gender, age, socioeconomic status) seem to have primarily indirect effects on behavior through attitudinal and situational factors.^{28,37,38} NIRM-related meta-analyses have supported its hypotheses: (1) individual resources are crucial to the success of interventions (eg, interventions were more successful if they also reduced depression³⁹) and (2) the structural dimensions of economic resources and community support in the locales where individuals are targeted by health promotion relate to the success of these efforts.^{11,35,40,41} Only time will tell whether DSSM and TRIP function more as organizing frameworks or begin to be tested empirically. Finally, we have also noted that evaluating multi-level theories is routinely more complex than evaluating individual-level theories.

DISCUSSION

The Art and Science of Understanding Health Behavior

In this article, we have sought to map out the state of the art and science of theorizing the contextual shaping of health behavior. The summary of variables presented in Figure 1 is intended as a useful source to help expand the details of more abstract models when it comes to applying them to intervention design relevant research. One of the lessons to emerge from the growing movement to embrace multi-level and ecological models of HIV-related behavior is their complexity and context specificity. For this reason, coupled with the paucity of evidence directly comparing the influence of the variables in question, we refrain from endorsing any particular single comprehensive model and from producing another. Instead, we believe that it is better to offer a variety of options.

Figure 1, consonant with the majority of the ecological literature, maps out a very broad range of variables at multiple levels, serving as a useful heuristic but one that is oversimplified. Separating out factors into distinct levels can obscure the mechanisms linking the structural, institutional, community, interpersonal, and individual in dynamic systems of influence.^{10,42} For instance, laws criminalizing injecting drugs or same-sex behavior may make health care institutions inaccessible because people fear discrimination or arrest. They may affect the capacity of communities to organize, as members fear identification as groups breaking the law. They may affect stigma at the community and interpersonal levels and impact perceived control at the individual level.⁴³ Similarly, economic inequalities at the macro-social scale may divide communities, encourage transactional sex, and introduce vast interpersonal power inequalities in the negotiation of safer sex.⁴⁴ The benefit of using "levels" to draw explicit attention to the macro-social and community-level influences on health behavior comes at the cost of obscuring some of the mechanisms through which these levels are interlinked (Table 1).

One of the strengths of the theoretical models reviewed is that they explain links between individual behavior and social structures. The NIRM and TRIP emphasize the *networks* in which individuals are embedded and link them in relationships with others and thereby to power dynamics and resources. Such models also highlight the complexity of modeling the social–structural shaping of health. While individual-level models pinpoint a relatively few psychological mechanisms to be targeted by interventions, multi-level interventions seem to differ. As the DSSM argues, HIV-related behavior is contextual and dynamic, and the identification of the most relevant dimensions and variables for any one intervention rests on assessment of the local context.

Different aspects of the ecology of influences on behavior may be relevant in different settings or at different times,^{5,45,46} which complicates the challenges of making policy recommendations, designing interventions, and planning evaluations. It implies all these activities may need to be undertaken in a way that is increasingly flexible and responsive to local conditions. Such flexibility and context-specificity raises challenges to the current *modus operandi* for HIV policy, which often strives for universal statements of policy goals and evaluation standards.

Implications

The foregoing discussion suggests several ways researchers and practitioners can advance in understanding behavior related to HIV prevention and care and incorporate these multi-level approaches into behavior change interventions.

1. When trying to understand the process of behavior change or develop an intervention, consider *all* levels of influence and related variables from individual to structural. Figure 1 and Table 1 may help to identify potentially relevant variables.
2. Mapping out relevant variables is also helped by interdisciplinary collaboration. Multi-level theorizing hinges on using perspectives spanning disciplines: individual-level factors are commonly modeled using psychological and behavioral economic principles; interpersonal relationships need concepts from social psychology, anthropology, communication science, sociology, etc.; structural forces need concepts from sociology, economics, political science, geography, and engineering. Clearly, future scholarship needs to incorporate the richness multiple disciplines afford.
3. Based on the initial collaboration and mapping of potential variables, choose at least two levels to measure, test, and/or include in an intervention. Unless extensive resources are available, measuring or intervening at all levels will be too expensive and complex for comprehensive research.
4. Early formative work can usefully inform the selection of levels to measure and/or interventions to address. Such scoping might include exploratory research, review of existing data or reports on the population/community, and consultations with local practitioners, patients, clients or subjects. Although there is a wealth of information at the individual level, work on higher levels will often likely require exploratory research, given the paucity of current evidence.
5. Consider the direct and indirect levels of influence for the behavior(s) of focus. For example, sharing needles likely needs to include an understanding of social networks, condom use needs to include at least dyadic variables, medication adherence needs to include at least health practitioners and the patient, and all intervention efforts need to consider how difficult the environment is for the targeted populations. The lesson of multi-level theories of health behavior is that individuals and networks may have motivations in addition to those of good health outcomes or acting safely in any particular time and context.
6. Especially at levels beyond the interpersonal, it is valuable to search for the mechanisms by which influences occur (Table 1). For example, what is the mechanism whereby microfinance interventions may reduce risky sexual behavior (financial stability leading to work within a society's standard business model)? What is the mechanism whereby girls who complete school engage in less sexual risk-taking (empowerment, self-efficacy, a different view of gender roles)? Socio-ecological approaches are typically tested merely as lists of variables with little or no attempt to identify mechanisms (organizing frameworks). Understanding mechanisms is more likely to yield sustainable and replicable change than simply reporting associations between variables.⁴⁶
7. Measure variables at levels beyond the individual at the appropriate level where possible rather than at the individual level. For example, social class should be measured at the family level rather than at the level of an individual adolescent; state, provincial, community, or national policy should be evaluated with an appropriate and valid measure rather than researching perceptions of the policy.
8. Use analytic methods that attempt to look at relationships both within and between levels. At best, contemporary “tests” of socio-ecological approaches typically assess only the “proportion of variance” accounted for by variables at each level, usually measured at the individual level. But considering the linkage between levels may be critical to a full understanding of mechanisms and long-term behavior change.
9. Where possible, combine already existing theories at the various levels rather than creating brand new theories, until such time as the need for a new theory is clearly indicated. Competing tests between elements of theories will, over time, help to clarify which factors deserve the most attention.
10. Use theoretical models to inform considerations of scalability and sustainability of an intervention. To move toward “no new infections,” national governments and international donors need research evidence that is applicable on a large scale. Although the most important interventions and behaviors may be quite specific to a particular community, transferability across settings can be gained by conceptualiz-

ing those interventions and behaviors as instances of more widely applied models.

As for future research, in addition to focusing on needed behaviors and content areas, methodological and theoretical work is especially needed to help understand how to select levels at which to work, how theories can be combined across levels, and how processes can be best tested analytically both simultaneously and across various levels. We are beginning to make progress in broadening our behavior change theories and models, but much work remains to be done. Much stands to be gained in improving HIV prevention and care if we consider more comprehensive models of behavior change.

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