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HIV CARE FOR GEOGRAPHICALLY MOBILE POPULATIONS

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Abstract

The interaction between mobility and HIV risk is well recognized, but what happens to those same individuals, once infected, as they transition to living with HIV? Does mobility affect their transition into HIV care? If so, do mobile and non-mobile populations achieve similar success with HIV treatment?

The definition of mobility has changed over the centuries to encompass a complex phenotype including permanent migration, frequent travel, circular migration, and distance from HIV treatment centers. The heterogeneity of these definitions leads to discordant findings. Investigations show that mobility has an impact on HIV risk, but fewer data exist on the impact of geographic mobility on HIV care and treatment.

This review will examine existing data on the impact of geographic mobility on access to and maintenance in HIV care and on adherence to antiretroviral therapy. It will also expand the concept of mobility to include data on the impact of the distance from residence to clinic on HIV care and treatment adherence.

Our conclusions are that the existing literature is limited by varying definitions of mobility and the inherent oversimplification necessary to apply a “mobility measure” in a statistical analysis. The impact of mobility on HIV treatment outcomes deserves further exploration to both define the phenomenon and target interventions to these at-risk populations.

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Geographic mobility is known to increase risk for HIV infection and is increasingly recognized as a potential barrier to HIV care and treatment.^{1, 2} This article will review selected studies relevant to HIV care and treatment for geographically mobile populations. It begins with an overview of how mobile or migrant populations have been identified over the past two centuries, discusses the current scope of geographic mobility in the modern world, and then examines selected literature on mobile populations and HIV care. The literature review is divided into three sections reflecting different aspects of the HIV care-mobility relationship: 1) the effect of geographic mobility on HIV diagnosis and access to HIV care, 2) the impact of mobility on adherence to antiretroviral treatment and maintenance in HIV care, and 3) the increasingly recognized barrier that travel to HIV treatment centers poses for many people living with HIV, particularly in rural or resource-limited settings. We will highlight the strengths and limitations to the current body of literature and provide insight into the complexity of the relationship between HIV care and geographic mobility.

WHAT IS A “MOBILE” POPULATION? A BRIEF AND INCOMPLETE HISTORY OF MIGRATION THEORY

E.G. Ravenstein’s 1885 paper, “The Laws of Migration” represents a starting point for migration theory in the English literature. By comparing census data from the United Kingdom collected in 1871 to 1881, Ravenstein proposed seven “laws.” The paper maintains that economic motivations drive all migration, but is limited by the lack of detail provided by the census data examined. Nevertheless, it highlights some of the issues that make mobility difficult to define today, including variations in patterns of mobility: local migrants (within a city), short-journey migrants (to a bordering county), migration by stages, long-journey migrants, and temporary migrants. Ravenstein asserted that the majority of migrants only travel a short distance, and noted differences in migration patterns by gender. He observed that women migrate more frequently than men but stay within the country, whereas men are more likely to leave their birth kingdom.³ He later expanded on his work to include data from over twenty countries that supported his earlier laws.⁴

Almost a century later, Everett S. Lee took up Ravenstein’s mantle and defined mobility broadly as “a permanent or semi-permanent change of residence,” intentionally avoiding limitations based upon the distance of or motivation for the move, or the need to cross international borders. He excluded temporary moves, repeated travel to a single destination, and the movements of migrants who have no long-term residence. Lee defined four important factors that affect migration: those associated with the area of origin, those associated with the area of destination, intervening obstacles, and personal factors.⁵ From Ravenstein’s laws and Lee’s framework come the frequently discussed “push” and “pull” factors thought to govern the act of migration. “Push” factors are those that lead people to leave unfavorable conditions in one place, and “pull” factors are favorable conditions that attract migrants to a destination.

Zelinsky then added a temporal element to migration theory, asserting that, over time and with modernization, personal mobility increases. He also included “circulation” as “short-term, repetitive, or cyclical” movements that represent mobility but without the declared intention of a lasting change in residence.⁶ This concept has evolved into what many call “circular migration,” a pattern of recurrent migration to and from a specific destination.^{7, 8}

Zelinsky also noted that distance is not necessarily a constant and that a functional approach to space, to account for the time or cost of travel, may be more accurate.⁶

In the following decades, both Massey and colleagues and Kearney offered up reviews of migration theory.^{9, 10} Both emphasize the different, and often divergent, conclusions that can be drawn based on individual migration theories and the need for an empiric approach. Kearney also describes the difficulty in finding the appropriate unit of analysis for the study of migration, and promotes a combined “articulation theory” which uses the household as a unit of analysis but examines its interactions with both capitalist and non-capitalist modes of production.¹⁰

The work above, along with that of many others, provides a theoretical framework to guide the examination of mobility as a complex behavioral, social, political, and economic phenomenon. It becomes clear that there are multiple axes of mobility, some of which are summarized in Table 1. Considering this overwhelming complexity, the lack of a unifying definition for a “mobile” population or individual is unsurprising. For the purposes of this review, we will use the United Nations (UN) definition, which defines mobile people broadly as those “who move from one place to another temporarily, seasonally, or permanently for a host of voluntary and/or involuntary reasons.” Migrants, by extension, are mobile people who “take up residence or who remain for an extended stay in a foreign country.”¹¹ The UN also specifically recognizes that refugees and asylum seekers may be an important subgroup with regards to risk for HIV/AIDS and other health-related issues.¹¹

CURRENT ESTIMATES OF THE PREVALENCE OF GEOGRAPHIC MOBILITY

International Migration

The UN Department of Economic and Social Affairs estimates the number of international migrants, defined as the number of people living in a country or area other than that in which they were born, to be 214 million in 2010.¹²

International migration is not evenly distributed; approximately 10% of the population of more developed regions are international migrants, whereas 1.3% of the population of less developed regions are international migrants.¹² Data presented in the 2009 Human Development Report from the United Nations Development Programme (UNDP) shows that, among international migrants, approximately one third moved from a developing country to a developed country; the remainder moved within developing countries or within developed countries. The UNDP report argues that geographic mobility leads to global gains in human development.¹³

In the United States (U.S.), the percentage of the total population represented by international migrants has risen from 9.1% in 1990 to 13.5% in 2010, and there are an estimated 42.8 million international migrants.¹² Estimates of how many of these migrants are undocumented/unauthorized vary widely, but a recent report from the Pew Hispanic Research Center shows that the annual flow of unauthorized immigrants has decreased since mid-decade, and the total number of unauthorized immigrants was estimated at 11.1 million in March, 2009.¹⁴

Internal Migration

Not surprisingly, the scale of internal migration within a country is much greater than international migration. The UNDP estimates that globally, almost 740 million people are internal migrants, over three times the number of international migrants.¹³

Mobility within the U.S. is estimated by the Current Population Survey, a monthly survey of approximately 50,000 households conducted by the Bureau of the Census for the Bureau of Labor Statistics. In the most recent report, 12% of the U.S. population reported living at a different residence in March, 2009 than their residence one year prior. However, rates of mobility by this measure vary dramatically by employment status (Figure 1) and race or ethnicity (Figure 2). People of color, particularly those self-identifying as Hispanic or black, are 1.5 to 2 times more mobile than the general population. Of note, the above estimates are *not* estimates of mobile populations by the UN definition,¹ as the Current Population survey does not capture temporary or seasonal mobility. In general, estimates of mobility that encompass the entire population covered by the UN definition are rare, and thus, estimates of global “mobility”, as opposed to migration, do not exist.

GEOGRAPHIC MOBILITY, ACCESS TO, AND MAINTENANCE IN HIV CARE

Early in the course of the HIV epidemic, governments, public health workers, and researchers argued that migration contributed to the spread of the HIV epidemic.^{15–19} The link between mobility and risk for HIV infection is well established,^{18, 20–26} and the strengths and limitations of these data were recently reviewed by Deane and colleagues.²⁷ In 2001, the UN Programme on HIV/AIDS (UNAIDS) attempted to move the debate away from attempts to detain the HIV epidemic by preventing migration. UNAIDS argued that human mobility is highly prevalent, beneficial under many circumstances, and protected by the 1998 *International Guidelines on HIV/AIDS and Human Rights*.²⁸ The 2001 report highlighted the obstacles that geographically mobile populations face in accessing HIV care once infected.¹ A review of the existing literature reveals that the interaction between mobility and access to HIV care can be beneficial or detrimental.

Potential Negative Impact of Mobility on Access to HIV Care

In the short term, migrants may be at risk for delays in HIV diagnosis and entry into HIV care because of lack of medical insurance, language barriers, and fear of deportation if undocumented.

Investigators in Northern California found that immigrants were more likely than U.S.-born patients to be diagnosed with lower CD4+ cell counts, a measure of severe immunodeficiency, and opportunistic infections. These findings imply that immigrants were receiving their HIV diagnosis at a more advanced disease state than non-immigrants. In interviews conducted within the same study, lack of knowledge regarding HIV risk, social stigma surrounding HIV testing and diagnosis, and the need for secrecy were all found to contribute to immigrants' delay in seeking HIV diagnosis and care.²⁹ A published review of the role of international migration on the Japanese epidemic cites several studies with similar findings showing that immigrants to Japan are diagnosed and seek HIV treatment at more advanced disease stages than non-immigrants.³⁰ As multiple studies link delays in initiation of HIV care and treatment to increased mortality,^{31–33} mobile populations' delay in HIV diagnosis and care-seeking could impact their overall survival.

Moves towards Access to HIV Care or Caregivers

Once diagnosed, people living with HIV may move to seek support from caregivers or family members, access better HIV care, or escape stigma.

Two studies, one in Thailand and one in South Africa, examined changes in residence after HIV diagnosis and their relationship to mortality prior to widespread availability of ART in these regions. The South African study found that HIV+ people were more likely to move shortly prior to death, and concluded that people living with HIV were returning home due to their need for end-of-life care.³⁴ The Thai study conducted a similar analysis, but also

collected data from patients' families and key informants which supported the conclusion that people with advanced HIV disease were seeking family support and care.³⁵ Though both these studies linked moves to mortality, moves prior to death may be less necessary in the future as access to ART increases and mortality from HIV declines.

Two investigations using data from the U.S. HIV Cost and Services Utilization Study found that people living with HIV were more likely to change permanent residence than those without HIV, and two times more likely to change state of residence. The results of this survey differed from the South African and Thai studies in that most respondents indicated they were not moving back home. The most common reasons for moving included the desire to be near caregivers, to be in a community with shared needs and interests, to obtain care from a physician specializing in HIV care, and to avoid discrimination.^{36, 37} This type of mobility, in search of improved care or more favorable circumstances to receive care, could positively impact HIV treatment outcomes by expanding social support and access to services.

Investigators in British Columbia documented an increase in permanent migration of people living with HIV to Vancouver when antiretroviral therapy became available there in the early 1990s. The migration was attributed to desire for the increased access to specialized health care services in the urban center, particularly HIV care and support services. They documented that those with access to HIV care at the time of their diagnosis were less likely to move after diagnosis.^{38, 39} The same group went on to examine determinants of geographic mobility in a population-based HIV/AIDS drug treatment program, and found that permanent migration, defined as a change in postal code, was low: 3% of people in the cohort changed residence over the 27-month observation period. Mobility was associated with living in a smaller community, being heterosexual, acquiring HIV through intravenous drug use, and the absence of AIDS at the time of HIV diagnosis.⁴⁰

Finally, two surveys of care utilization in the United Kingdom showed that migrants and asylum seekers were more likely than non-migrants to access HIV support services, but not clinical HIV care.^{41, 42} Bringing together the above findings, mobile populations, particularly international migrants, may be at risk for delays in HIV diagnosis or entry into HIV care.^{34, 35} Once diagnosed, people living with HIV may become mobile, particularly within the same country, in order to access better HIV care, receive needed support from caregivers, or escape stigma.³⁶⁻⁴⁰

GEOGRAPHIC MOBILITY AND ADHERENCE TO ANTIRETROVIRAL THERAPY

Mobility also has a potential impact on adherence to antiretroviral treatment for HIV. In populations with access to antiretroviral medication, poor adherence to antiretroviral therapy (ART) remains a primary barrier to treatment success, and a strong predictor of disease progression and mortality.⁴³⁻⁴⁵ The dominant hypothesis found in the literature is that mobility could negatively impact antiretroviral adherence, leading to poor treatment outcomes.

This adverse impact on adherence could be caused by mobility-induced interruptions in medication supply, increased difficulty in taking medications in settings with less privacy because of fears of disclosure of HIV status, disruptions in daily schedule, conflicting demands on the mobile individual's time, and loss of social support if this support was found at home.^{30, 46-48}

An alternate hypothesis is that mobility might have a positive impact on adherence to ART if people living with HIV were moving into locations where HIV care or caregivers were more readily available or social supports were improved. It is important to note that different types of mobility may have differential impacts on adherence. Figure 3 presents a theoretical framework for the varying impacts of mobility on adherence and, therefore, on the outcomes of antiretroviral therapy, and the following sections review current literature regarding mobility and antiretroviral treatment outcomes. To account for the diversity of definitions of mobility in the literature, and the likelihood that different patterns of mobility will have differential effects on HIV treatment outcomes, the literature review is divided by mobility patterns.

Interactions between Permanent Migration and Adherence to Anti-retroviral Therapy

The Canadian investigators cited above also determined the impact of migration on antiretroviral adherence in British Columbia using the cumulative number of changes of residential address as a time-dependent measure of mobility, and pharmacy refill data to measure adherence. This study showed that individuals who migrated three or more times were 1.79 times more likely to be classified as non-adherent (95% CI: 1.44, 2.21; nonadherence defined as <95% ART coverage by pharmacy refill data), when compared to those with no migration. Similar associations were seen for those individuals moving once or twice during the observation period.⁴⁹ This study raises additional questions as it did not allow for determination of reasons for non-adherence. Were medications not refilled because of difficulty transferring prescriptions, difficulty accessing care in a new location, or other mobility-induced barriers? Or was the mobility a symptom of some other barrier to adherence such as substance abuse or mental illness?

In a qualitative study on barriers to antiretroviral adherence among people living with HIV in Botswana, Weiser and colleagues interviewed 109 patients and 60 providers. They found that, in addition to financial constraints, forgetfulness, and running out of medications, 13% of patients identified travel or migration as a reason for missed doses of medications. Fifty-four percent of patient participants reported frequent travel or migration, and many patients had to travel great distances for HIV treatment.⁴⁷

A cross-sectional study of predictors of loss to follow-up among 34,835 patients in the French Hospital Database on HIV, a network of 62 French University Hospitals, found that migrants were at increased risk for loss to follow-up.⁵⁰ This finding is complicated by the use of a surrogate marker for migrant status, those responding positively to a question about “stays outside France for more than six months since 1978,” which also asks the respondent to specify location of stay. This variable has been shown to provide an approximation of migrant status in other studies.⁵¹ In this study, among patients diagnosed within the year, 13% reported a stay in sub-Saharan Africa of over 6 months, and 7% in other foreign non-European Union countries. Compared with those who did not report a stay outside of France, patients reporting stays in sub-Saharan Africa had an odds ratio for loss to follow up of 1.3 (95% CI: 1.0, 1.7) and for those reporting stays in other EU member states the OR was 2.6 (95% CI: 1.4, 4.8).⁵⁰ Though these findings imply that migrants have higher degrees of loss to follow up, the lack of data regarding when the migration took place in relationship to the loss to follow up makes it difficult to determine whether permanent migration or circular migration was the issue.

Impact of Circular Migration on Adherence to Anti-retroviral Therapy

Few data exist on the impact of circular migration, defined by Zelinsky originally as “short-term, repetitive, or cyclical” movements that represent mobility but without the declared intention of a lasting change in residence,⁶ on HIV treatment outcomes. Many HIV+

individuals travel regularly for work or family obligations, while keeping their permanent residence constant. Circular migration is frequently implicated in the spread of HIV, and has been cited as a challenge in addressing at-risk populations,⁸ 52–54 but the effect of circular migration on adherence to antiretroviral therapy is not well described.

It may be that individuals in the French Hospital Database on HIV study described above fit the definition of circular migrants, as a subset clearly maintained residence in France while occasionally spending over 6 months in a different country, but the data did not permit close examination of migration patterns. Similarly, the Weiser study combined migration and frequent travel, so the impact of circular migration alone is more difficult to assess.

Sellier and colleagues conducted a cross-sectional observational study of antiretroviral adherence in 61 HIV-infected people from sub-Saharan Africa living in Paris who had returned from travel to their country of origin within the last 12 months. Self-reported adherence decreased significantly during the participants' travel, with 26% frequently missing doses in Paris compared to 49% frequently missing doses in sub-Saharan Africa ($p=0.015$). Some of the common reasons for missed doses while traveling were being busy, fear of social stigma, and lack of a confidential place to store medications. The authors report that the duration of the visit and knowledge of HIV infection status among destination household members also appeared to affect adherence.⁴⁶

AN ADDITIONAL ASPECT OF MOBILITY – DISTANCE FROM CLINIC

Though not included in traditional concepts of “mobility”, travel to access medical care can become a significant source of mobility for people living with HIV. Some data demonstrate that difficulty finding money for or time for transportation to and from clinic is a barrier to effective ART. Particularly where dedicated HIV care clinics are scarce, people living with HIV may travel hours or even days to receive medical care.

The cost of this mobility, both in terms of payment for transportation and in hours which could be dedicated to other tasks, is usually borne by the HIV+ patient and their family. Studies in Africa have shown that distance from clinic and difficulty paying for transportation is linked to poor ART adherence and loss to follow up.⁴⁷ 55–57

Several qualitative studies have shown that people living with HIV in Uganda cite distance from clinic and the transportation costs of travel to clinic as a reason for poor ART adherence.⁵⁵ 56 Another investigation, also from Uganda, showed that though the rate of perfect adherence to ART decreased as distance from clinic increased, the adherence rates for those living <20km and >20km from clinic did not differ.⁵⁸

Distance from clinic has also been implicated as a reason for loss to follow up or delay in seeing HIV care. In an analysis of predictors of loss to follow up in a large program ($n=46,400$) in Western Kenya, those who spent over an hour traveling to clinic did not have higher rates of loss to follow up than those spending less than an hour.⁵⁹ In a Ugandan study, the most common reasons cited by patients for not returning to clinic were: lack of transportation (50%) and distance to clinic (42%). Sixty-three percent of those who were “lost to follow up” were alive, and, of those interviewed, 83% of the survivors had transferred care to a new clinic, implying that the barrier of distance was being overcome by transfer of care to a closer treatment center.⁶⁰ In Cameroon, retention in care was shown to be associated with having good access to care, defined as living within 40km of the clinic site or within 80km if living on a main road.⁵⁷

In non-resource-limited settings, the impact of distance from clinic may differ. In Kansas City, distance between residence and clinic was not found to be associated with missed

clinic visits,⁶¹ and travel to a clinic in the Southern United States was not found to be associated with delay in HIV care initiation in one study.⁶² In two separate analyses of distance traveled to services in England, where 80% of people living with HIV reside within 5 km of an HIV care center, people from more affluent areas were more likely to travel for HIV care than those from deprived areas, implying that travel for care was a choice.^{63, 64}

CONCLUSION

This review highlights the strengths and limitations of the existing literature on mobility and HIV. Many studies have documented the increased risk for HIV infection incurred by mobile populations, and migrants/mobile populations are now listed among the UN's vulnerable or "most-at-risk" populations. Fewer studies have assessed the impact of mobility on HIV+ populations, but those that have show that mobility may have both positive and negative effects on HIV care. Geographic mobility, particularly international migration, may lead to delays in HIV diagnosis or care-seeking behavior, adversely impacting HIV treatment outcomes. Mobility may also interfere with adherence to life-saving antiretroviral therapy. However, it may also lead to greater access to HIV care, as some individuals move towards HIV services and support systems, or away from stigma.

However, the existing literature is limited by varying definitions of mobility and the inherent oversimplification necessary to apply a quantitative measure of mobility. The various axes of mobility described in Table 1 are not considered in most of the investigations, and the complexity of the mobility "phenotype" may inhibit comparison across studies. This is exemplified by the lumping of migration and travel to clinic,⁴⁷ and the lack of exploration of individual-level drivers of mobility and its impact on ART adherence in most studies to date.^{46, 49, 50} Despite these limitations, the investigations reviewed above shed light on the positive and negative impacts of mobility on HIV care and demonstrate that further investigations are essential to define the phenomenon and target interventions to these at-risk populations.

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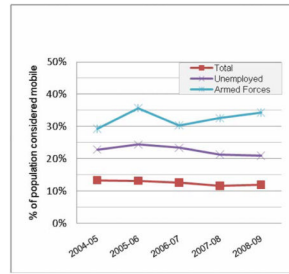


Figure 1. Mobility estimates by employment status from the U.S. Current Population Survey, 2004-2009

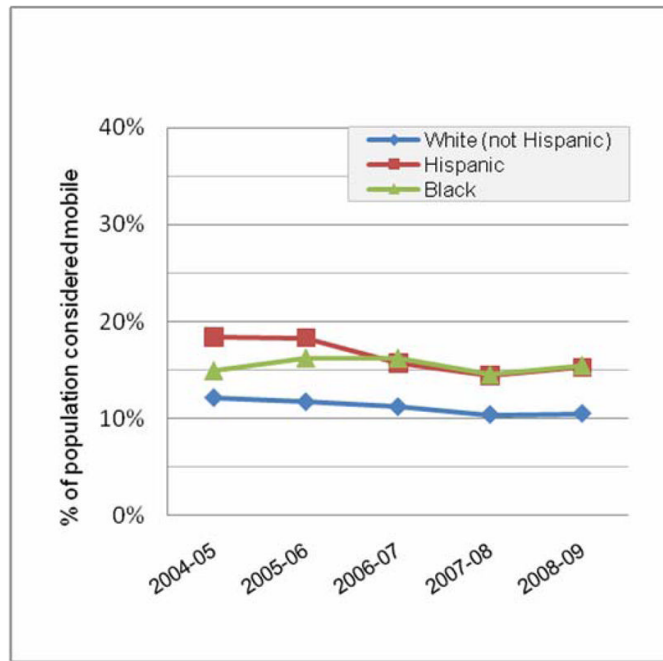


Figure 2. Mobility estimates by race/ethnicity from the U.S. Current Population Survey, 2004–2009



Figure 3.
Theoretical framework for the interaction between geographic mobility and HIV treatment outcomes.

Table 1

Axes which can be used to define and measure mobile populations. References are for migration theory literature discussing each potential division of “mobility”.

Axis	Potential divisions
unit	<ul style="list-style-type: none"> • Individual^{3, 4} • Family¹⁰ • Group/population¹⁰
pattern	<ul style="list-style-type: none"> • permanent migration^{3, 4} • circular migration⁶ • transience⁶ • nomadism⁶
distance	<ul style="list-style-type: none"> • geographic: miles, kilometers, etc...^{3, 4} • socioeconomic: difference in status between origin and destination⁵ • functional: time, cost or effort expended in the move⁶ • civic: crossing city, state, country, continental boundaries^{3, 4}
motivation	<ul style="list-style-type: none"> • push or pull factors affecting the move⁵ • forced or voluntary movement¹¹
local factors	<ul style="list-style-type: none"> • characteristics of the person, origin or destination that impact the move⁵
frequency	<ul style="list-style-type: none"> • in the case of circular migration or multiple permanent migrations⁶
duration	<ul style="list-style-type: none"> • days, months, years