

# Chapter 8

## Tracing the Diffusion of Infectious Diseases in the Transport Sector

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*“. . . There can be no pause or let-up in the battle against HIV/AIDS. Every truck driver, taxi driver, bus operator, commuter, passenger, pilot, air steward and seafarer can either be part of the problem or become part of the solution. . . . these movements can either continue to widen the spread of HIV/AIDS or become a powerful channel for disseminating the information, knowledge and understanding upon which effective prevention depends. . . .”*

*Abdulah Omar, South African Minister of Transport, 2001*

### Introduction

Despite notable differences in infrastructure and efficiency levels among transport sectors of industrialized and developing nations, technological advancements across different transport modes have contributed greatly to both socioeconomic development and accumulation of wealth. Efficient transport systems enable economies to develop optimal allocation of scarce resources, thereby maximizing wealth while securing the smooth operation of society at-large. In addition to its vital economic role, the transport sector carries indispensable social responsibilities vis-à-vis labor conditions, public health, and consequently, sustainable development.

While human biomass constitutes a sizeable fraction of the matter moved about the earth, most human mobility results from the planned transport of goods and services among different geographic points (EU, 2006). This combined movement has an ultimate impact on the juxtaposition of various species of oftentimes disparate ecosystems. While humans build road networks, tunnels, bridges, ports, railways, ferries, and supersonic planes that form effective means to traverse natural barriers to species spread, they often accelerate and even facilitate disease movement from one area to another. Mass processing and wide distribution networks further allow for the amplification and extensive dissemination of potential human microbes. Particularly in marginalized areas, transport milieux are highly conducive to risk-laden behavioral patterns and are

thus transformed into transmission settings and vectors of disease (Apostolopoulos, n.d.).

In the midst of the 2005-2006 fuel crisis, this chapter captures the transport sector in an era of intense competition and restructuring following the September 11 attacks. Wide geopolitical turmoil and subsequent demographic shifts in volatile regions along with the breakdown of public-health structures and environmental and ecological upheavals have contributed to an upsurge of pre-existing and the advent of emerging and re-emerging infectious diseases. This “anomaly” in the epidemiological transition poses additional threats to both the transport sector and humans, as wide dissemination of infectious pathogens remains an unintended but enormous consequence of transport. Within this context, this chapter places the transport sector firmly within the discourse of epidemiology and demography, and critically reviews its far-reaching role in the diffusion of disease—primarily of sexually transmitted (STIs) and bloodborne (BBIs) infections and secondarily of tuberculosis (TB), Severe Acute Respiratory Syndrome (SARS), avian influenza, and malaria. While all transport modes are reviewed, the chapter places particular emphasis on the trucking and maritime sectors in developing regions and presents new findings on trucking in the United States.

## Transport, Development, and Public Health

### *Transport and Development*

Socioeconomic development and public health represent essential forces of contemporary societies with the power to define human welfare. Within this context, transport functions as an intervening variable with the potential to affect both, by either hampering or accelerating growth that ultimately influences health. The transport sector—which physically moves humans, animals, goods, and services between different geographies—employs millions of workers, generates revenues, and consumes materials and services produced by other economic sectors. Not only does it provide vital links between centers of production and consumption, but the existence of adequate transport infrastructure and the provision of transport services are indispensable for the normal functioning of economic and sociocultural life and to the development of nations. Aggregate data indicate that the transport sector accounts for 5.3% of GDP in low-income and 6.8% in middle-income countries, while it ranges between 8-10% in the industrialized nations of North America and the European Union (EU) (BTS, 2006; EU, 2006).

The transport sector comprises a network of land (road, rail), water (sea, lakes, rivers), and air (civil aviation) modes, with streamlined intermodal connections at riverine-maritime ports and air-road-rail interfaces prevail-

ing by the day (World Bank, 2006). It also includes subsectors that maintain and provide various services, such as forwarding, construction, fuel stations, truck- and bus-stops, border crossings, ports, bus and train terminals, and airports. In the post-WWII era, overall patterns and trends of travel and transport have exhibited marked changes. In the industrialized world, bus and rail travel have either remained relatively stable or have diminished while travel by car and air have increased; whereas, transport by bus and train has increased sharply in developing regions (BTS, 2006). Of EU's domestic land transport, passenger cars account for 81%, buses and coaches 9%, railway modes 7.5%, and powered two-wheelers the rest of total traveled miles (EU, 2006).

### *Transport and Health Risks*

Even though the transport sector has brought about a plethora of positive effects on the socioeconomic spheres of diverse communities, the correlation between the transport of people and goods and the propagation of disease has long been established (Hays, 2000). Health risks within the broad boundaries of transport range from the consequences of increased vehicle emissions (i.e., air pollution, asthma), traffic congestion (i.e., vehicle crashes and injuries, stress and mental health problems), and noise pollution (i.e., auditory disorders) to the ramifications of increased (i.e., inactivity, obesity, CHD) and decreased access to transport (i.e., transport wait time, maternal mortality, obstetric emergencies) (Frumkin, Frank, & Jackson, 2004; Marmot & Wilkinson, 2001).

The rapid geographic distribution of disease and its eventual ramifications of epidemic outbreaks represent some of the worst adverse consequences of transport growth (ILO, 2005). Overall, the transport sector has been linked with a multitude of airborne, foodborne, waterborne, bloodborne, and zoonotic disease risks (i.e., SARS, TB, malaria, avian influenza, STIs/HIV) (CDC, 2006). The inherent occupational risks of the transport sector render its workers as well as the populations they come into contact with particularly vulnerable to acquiring and spreading disease. Thus the dissemination of infectious diseases has far-reaching and complex implications not only for the transport sector but also for all sectors of economy and society. Transport appears to be the most affected economic sector in developing regions and as a result, STI/HIV outbreaks and epidemics have become serious barriers to development (World Bank, 2006).

Transport corridors, stopping places, and terminal points have proven to constitute prime vectors for STIs/HIV and associated risks (CSIR, 2004). These settings bring together transport services and construction and maintenance workers in temporary establishments where the absence of stable social networks is demonstrated with prevalent sexual multipartnering among non-regular partners (ILO, 2003). With about 80-90% of passengers

and freight transported by road in East and Southern Africa, data show that mobility increases not only travelers' own STI/HIV risks but also that of their partners at home and of sexual partners encountered along transport corridors and at transport hubs (ILO, 2005b). Along Polish and Lithuanian borders, 42% of interviewed truckers reported engaging in commercial sex, 33% of whom without condoms (Kulis, Chawla, Koziarkiewicz, & Subata, 2004), and at about the same time, 50-fold HIV increases were recorded after the completion of the Kunming-Nanning highway in China (UNDP, 2001). In South Africa, 22% of transport workers were forecast to die of AIDS within five years while enormous economic impacts were anticipated, while in Thailand, HIV/AIDS related costs to the trucking sector were expected to surpass US\$15 million just in 2000 (FHI, 2002). Despite the fact that railway tracks run along major road corridors in several African nations and Indian provinces, very limited research is available on the potential role of railways in disease spread.

Populations that are at the highest risk and also the most vulnerable fall under the following categories: (a) operators of transport services; (b) building and maintenance crews; (c) management professionals; (d) customers of transport services; (e) population segments that provide sex services in exchange for survival, safety, or resources; and (f) marginalized populations that the foregoing groups come into contact with. The first three categories, which constitute the core of the transport sector, include operators of buses, taxis, trucks, trains, boats, and airplanes, support personnel (i.e., loaders, vulcanizers, mechanics, and workers in roadside workshops), filling-station employees, infrastructural construction workers, supervisors and foremen, and other auxiliary employees. The last three categories represent those who use transport services or come into contact with transport employees, and include passengers, migrant laborers, itinerant traders, commercial sexworkers (street and brothel workers), reststop workers, lodge owners and attendants, residents of surrounding communities, local brew-sellers, barmaids, and their spouses as well as other sexual partners.

## Risk Vulnerability in the Road Sector of Developing Regions

### *Sub-Saharan Africa and Southeast Asia: Different Settings, Same Scenarios*

#### Political Economy and Epidemiology

Sub-Saharan Africa (SSA), an enormous geographic area with numerous sociocultural differences but at least as many similarities, has been in a constant state of demographic flux in the post colonial era (IOM, 2003). A particularly gendered process by which men follow different routes and

destinations than women, labor migration has been an important driving force in the culture and economy of SSA (Williams, Gouws, Lurie, & Crush, 2002). Interlinked customs and practices, such as patriarchy, gender relations, land tenure, and social customs (Schoepf, 2001) along with debt structural-adjustment policies (Stillwaggon, 2002) have fostered institutionalized circular (internal and crossborder) migration, which in turn has rendered people highly vulnerable and has deeply scarred the continent and its people (Synergy Project, 2002).

Propelled by socioeconomic marginalization, natural disasters and civil-military unrest, population mobility (facilitated by transport) has turned into the foremost factor fuelling HIV and associated epidemics (Apostolopoulos, n.d.). Just as severe malnutrition and multiple bacterial, viral, and parasitic infections have been predominant forces behind the unparalleled HIV epidemic—characterized by high prevalences, rapid spread, and uneven distribution and endemicity—the road sector has also consistently rendered populations highly vulnerable to STIs/HIV, TB, malaria, and other opportunistic infections (Caldwell, Caldwell, Anarfi, Ntozi, Orubuloye, Marck, Cosford, Colombo, & Hollings, 1999). The distribution of labor demand resulting in labor migration and family social structuring (IOM, 2003) has brought about prevalent multipartner sexual mixing and networking (Williams et al., 2002). Consequently, these and other factors have led to the current situation in SSA, which accounts for 60% of all HIV/AIDS cases in the world and the highest adult HIV/AIDS prevalence rates, estimated at 7.4% (UNAIDS, 2006).

Southeast Asia (SEA)<sup>1</sup> constitutes an equally large and diverse geographic area, where large population segments live in areas of pervasive poverty and maldevelopment (ADB, 2006). Equally pervasive is population mobility as internal (rural to urban) migration is gradually increasing with overall movement patterns involving high proportions of temporary migrants, and migration flows including significant numbers of youth and women (Guest, 1999). These “floating” populations, in search mainly of work, are highly vulnerable and oftentimes operate as bridges to the general population similar to other people at-risk (i.e., sexworkers, trafficked women, IDUs). Within such contexts, SEA is a collage of mini-epidemics displaying a considerable variation in scope and intensity. At the end of 2003, although adult HIV prevalences were estimated to be at most 0.9%, 4.1-9.6 million adults and children were living with HIV/AIDS (UNAIDS, 2006). India alone is second to South Africa in terms of the overall number of people living with HIV/AIDS, which was estimated to be about 5.1 million at the end of 2003 (UNAIDS, 2005). Epidemics in this region remain largely concentrated among intravenous drug-users (IDUs), men who have sex with men (MSM), sexworkers

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<sup>1</sup> In this chapter, SEA refers to Pakistan, India, Nepal, Bangladesh, Myanmar, Thailand, Cambodia, Laos, Vietnam, Malaysia, and southern China.

and their clients, and the sexual partners of all these population segments (UNAIDS, 2006).

### Road Construction and Transport Corridors

When roads, bridges, and other land-transport infrastructural works are built, they link low and high HIV prevalence villages and cities (UNDP, 2004). The impact of road construction on STI/HIV spread in a low prevalence area—comparing pre- and post-road construction and infrastructure improvement data—was recorded in the Mandalay-Muse highway that links Mandalay (Myanmar) via Muse (Myanmar) to Yunnan (China) (Hsu, 2001). Surveillance data reveal an overall increase of HIV prevalence among IDUs following the completion of the highway. Similar findings were reported during the highway construction project linking Kuming (Yunnan province, China) to Nanning (Guangxi province, China), as the overall documented HIV cases jumped from 10 to 525 within a three-year period (Kulis et al., 2004). Along the same lines, improvement works on National Highway One and Ho-Chi-Minh National Highway in Vietnam facilitated HIV spikes in Ha Noi and Hai Phong (UNDP, 2002).

Transport corridors in SSA are grouped into four sub-geographical regions. In western Africa, they are mostly vertical corridors connecting ports of higher STI/HIV prevalence countries of the south with land-locked lower-prevalence countries in the Sahel region, or horizontal corridors, connecting the capitals of coastal countries. Most notable are the Abidjan-Lagos, Bamako-Ouagadougou-Tema, Bamako-Ouagadougou-Niamey, Dakar-Bamako, and the Abidjan-Bamako corridors. In eastern Africa, major transport corridors connect land-locked countries to coastal ports in the Indian Ocean and the Red Sea, and they are the Djibouti-Galafi-Addis Ababa, Djibouti-Dewenle-Addis Ababa, Mombasa-Kampala-Kigali-Bujumbura-Goma, Dar es Salaam-Kigali-Bujumbura-Goma, and Dar es Salaam-Lusaka-Lilongwe/Blantyre corridors. The main corridors of central Africa include the Douala-Ndjamena-Bangui, Pointe Noire-Brazzaville-Bangui, and the Matadi-Kinshasa-Bangui. Finally, in southern Africa main corridors include the Durban-Lusaka-Lubumbashi (North-South), Beira-Harare-Lusaka-Lilongwe/Blantyre, Maputo Johannesburg, and Nacala-Lilongwe/Blantyre.

In the SEA region, transport corridors are grouped primarily into the Indian highway system (the largest in the world) and the ASEAN highway network, and secondarily into those crossing Pakistan, Afghanistan, Bangladesh, and Nepal. Within this division, and vital for transport and disease prevention, are the corridors of National Highway Six and Eight (China), National Roads One, Four and Five (Cambodia), Kolkota (India)-Patrapole-Benapole (Bangladesh), AH-01, AH-02, AH-03, and AH-14 (Myanmar), Kolkota-Birganj (Nepal), Peshwar (Pakistan)-Torkhum-Kabul (Afghanistan), and Quetta (Pakistan)-Spin Boldak-Kandahar (Afghanistan) (UNDP, 2004).

Truckers, Sexual Networks, and Bridging<sup>2</sup>

Truckers, who were implicated in the early geographic spread of HIV in SSA and later in SEA, are considered as regional core groups<sup>3</sup> in STI/HIV infection and transmission (Apostolopoulos, n.d.). Since 1983, when the Pasteur Institute identified HIV as the AIDS virus<sup>4</sup>, numerous studies have tried to delineate how long-haul truckers have contributed to HIV spread in these regions. Findings from an exhaustive review, reported herein, cover 24 SSA nations—Benin, Burkina Faso, Cameroon, Congo, Ethiopia, Ghana, Guinea, Ivory Coast, Kenya, Lesotho, Malawi, Mali, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, South Africa, Swaziland, Tanzania, Togo, Zambia, and Zimbabwe—and 10 in SEA—Bangladesh, Cambodia, China, India, Myanmar, Nepal, Pakistan, Philippines, Thailand, and Vietnam.

Millions of truckers<sup>5</sup>, their assistants, and their social and risk contacts have attracted extensive epidemiological attention and have been linked to STI/HIV transmission, while their mobility patterns have influenced the overall epidemiology of these diseases (Laukamm-Josten, Mwizarubi, Outwater, Mwaijonga, Valadez, Nyamwaya, Swai, Saidel, & Nyamuryekungé, 2000; Orubuloye, Caldwell, Caldwell, & Santow, 2001; Rao, Pilli, Rao, & Chalam, 1999). Although the “trucking hypothesis” (which suggests that truckers who frequent sexworkers on their routes across the Trans-Africa highway have spread the HIV-1 virus) lacks empirical support to single-handedly establish the magnitude of the epidemic in SSA (Hunt, 1996), it does however, corroborate the fact that when truckers travel, not only do they carry their genetic makeup, accumulated immunologic experience, and disease pathogens and vectors, but also their culture and capacity to introduce diseases into new regions (Apostolopoulos, n.d.). In fact, according to several studies, in 2001, 56% of long-haul truckers in the Kwa-Zulu/Natal midlands tested HIV positive (Ramjee & Gouws, 2002), while between 50 and 87% of Indian truckers were found to engage in risky sexual behaviors at “dhabas” (roadside hotels) (AVERT, 2006).

Truckers engage in vigorous sexual cultures around hotspots<sup>6</sup>, the transient residents of which include poor, oftentimes young women from the rural

<sup>2</sup>When there is sexual mixing between high (core groups) and low (general population) STI-prevalence groups, these people serve as bridge populations.

<sup>3</sup>Core groups are defined as “small proportions of persons with an STI who are frequently infected with and transmit the disease, and who sustain the endemic and epidemic transmission of STIs” (Thomas & Tucker, 1996).

<sup>4</sup>While since 1959 scientists isolated what is believed to be the earliest known case of AIDS, suggesting that all AIDS viruses share a common African ancestor within the past 40-50 years, the term AIDS was not used until 1982.

<sup>5</sup>Eight million truckers and their assistants traverse the Indian subcontinent alone (IOM, 2005).

<sup>6</sup>Hotspots include, among others, trading centers, border posts/crossings, roadside settlements, squatter camps, truck depots, and other stops along truck routes that serve as homes to merchants, bar/restaurant owners and workers, young men who service the trucks, and sexworkers.

hinterlands (Synergy Project, 2002). Prevention experts believe that truck drivers play a major role in HIV spread in both SSA and SEA by importing HIV/STIs across borders and into rural communities and to people who were previously uninfected, thereby functioning as potent bridge populations (ILO, 2005). While there is extensive heterogeneity in work patterns and sexual cultures of truckers between countries, regions, and continents based on country size, religion, and culture, among others, risk behavioral patterns of trucking populations remain closely similar (Apostolopoulos, n.d.).

There are drivers who return home every one to two weeks, while others no more than once a year (Gibney, Saquib, & Metzger, 2003; Synergy Project, 2002). Long periods of separation from spouses and other regular sex partners give reason to drivers to engage in casual or transactional sex. In India, truckers engage consistently with large numbers of non-regular and usually commercial sex partners; in fact, they can have anywhere from 40-400 sex partners a year, depending on how much time and money they have on their hands (Synergy Project, 2002). In several predominantly Muslim SSA countries, quasi-polygamous patterns have been noted among truckers who have “serial” wives along their routes (Synergy Project, 2002), while others have “road wives” with whom they stay when traveling in certain directions (ILO, 2005). Commercial sexworkers are only part of the far-reaching sexual networks that exist at trucking-related hotspots. Both men and women who live and work around these settlements often have other regular sexual partners (in addition to their husbands and wives), while some trucker wives, who are left behind for months at a time, have other sexual partners of their own. Moreover, truckers frequently offer rides in exchange for sexual favors to itinerant market women traveling with their goods. Truck routes, therefore, operate as transmission settings that facilitate the travel of HIV from high- to low-prevalence areas along with trucks (Apostolopoulos, n.d.).

While heterosexual partnerships appear to be most prevalent, male truckers have also reported homosexual encounters on the road (Manjunath, Thappa, & Jaisankar, 2002). Truckers from Lahore, Pakistan who identify as Pathans (an ethnic group that accepts homosexuality) engage in regular sex transactions with other men (Agha, 2000). Nearly 50% of Pakistani, 25% of Brazilian, and 5-25% of Indian truckers report having had both oral and anal sex with other men but with erratic condom use (Synergy Project, 2002). It is worth noting here that most such homosexual transactions occur between drivers and crews—with clearly defined power differentials between operators and their assistants. In SSA, there is limited substance abuse involved in either homosexual or heterosexual transactions of truckers, while in SEA (India and Mekong region<sup>7</sup>), IDU has been recorded in both types of interactions (USAIDS, 2003; Zofeen, 2003a,b).

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<sup>7</sup>The Mekong region derives its name from the river that runs through it and includes Myanmar, Thailand, Laos, Cambodia, Vietnam, and China’s Yunan province.

In addition to truckers, several other commercial vehicle drivers and road transport populations are at high risk for STI/HIV infection. These populations include bus and taxi drivers as well as commuters using public-transportation (taxis, buses, and trains) predominantly in the Kwa-Zulu/Natal, Gauteng, and Northern provinces in South Africa (Parker, Oyosi, Kelly & Fox, 2002), intra-city commercial bus drivers and motor-park attendants in Lagos, Nigeria (Ekanem, Afolabi, Nuga, & Adebajo, 2005), taxi drivers in Addis Ababa, Ethiopia (Taravella, 2005), commercial taxi and bus drivers in Ibadan, Nigeria (Akintola, 2001), motorcycle taxi drivers in Vietnam (FHI, 2006), and taxicab and tricycle drivers in the Philippines (Morisky, Nguyen, Ang, & Tiglao, 2005).

### *Latin-American Truck Routes as Transmission Settings*

#### Demography and Epidemiology

Latin America, with Mesoamerica and South America as its two regions<sup>8</sup>, is a diverse geographical entity with profound internal differences—demographic and epidemiological in nature, which are most visible in population mobility and disease risk. Civil-military strife, extreme poverty, and socioeconomic inequalities in Mesoamerica have produced constant crossborder movement within the region and towards the U.S. These sociodemographic factors along with larger economic imperatives—all deeply embedded in regional historical developments—have created caravans of refugees and other displaced populations, transport workers, sexworkers, merchants, truckers, sailors and portworkers, and other laborers (Population Council, 2006). In Mesoamerican migrant milieux, where institutional corruption, human trafficking, deportation, violence, and sex (transactional, survival, or non-consensual) are abundant, populations are highly vulnerable to disease (Bronfman, Leyva, & Negroni, 2002). On the other hand, South America with larger countries and enormous natural resources represents mostly internal, occupation-based mobility rather than crossborder movement.

With over 2.1 million HIV cases in Latin America and the Caribbean basin combined, the STI/HIV epidemiology in Latin America is equally diverse across different geographies and demographics (UNAIDS, 2006). In South America, STIs/HIV are especially concentrated among IDUs and MSM—in fact, sex between men represents the predominant mode of transmission in Bolivia, Chile, Colombia, Ecuador, and Peru. While as South American nations with the highest HIV rates, HIV prevalences in Argentina and Brazil range around .5-.6%, infection levels among IDUs reach 60% in urban Brazilian centers and surpass 24% in some cases among MSM in Argentina (Fernandez, Kelly, Stevenson, Sitzler, Hurtado, Valdez, Vallejo, Somlai,

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<sup>8</sup>Mesoamerica stretches from Mexico to Panama while South America spans from Colombia to Chile and Argentina.

Amirkanian, Benotsch, Brown, & Opgennorth, 2005). In Mesoamerica where HIV is transmitted predominantly via sex, IDU plays a lesser role, but HIV prevalence among female sexworkers ranges from about 1% in Nicaragua, 2% in Panama, 4% in El Salvador and 5% in Guatemala, to over 10% in Honduras (UNAIDS, 2006). Because developmental deficiencies in Mesoamerica frequently compel large numbers of people to migrate, which further fuels the epidemic, HIV is found mainly among marginalized populations. Recent surveillance data indicate that although sex between men is hidden, it is a powerful factor in the newly-emerging epidemics of Belize, Costa Rica, El Salvador, Nicaragua, and Panama (UNAIDS, 2006).

#### Population Mobility, Truckers, and Disease

Epidemiological data indicate that within this volatile region characterized by constant movement, especially in Mesoamerica<sup>9</sup> some of the highest STI/HIV rates originate in areas where large populations on the move, with diverse origins, occupations and lengths of stay, converge. The most significant of these high-risk mobile populations are truckers, traders, sexworkers, employees of international organizations, and significant numbers of sailors who pass through such areas (Bronfman et al., 2002). A few examples of locations where they converge include Panama City's port, Mexico-Guatemala border towns, the Atlantic coast of Honduras, and Belize.

The foregoing begs the following questions: What are the conditions of transport corridors in Mesoamerica that render mobile populations vulnerable to STIs/HIV and associated diseases? Why are transport workers and their sexual partners particularly susceptible to these diseases, as compared to other professional groups? Part of the explanation lies in the fact that the broad risk environment includes transport corridors, nodes, and hubs as well as bars, brothels, and other related operations. Further, transport in Mesoamerica connects areas of high- and low-HIV prevalence, while busy transport routes, nodal points, and border crossings are associated with factors of transmission and higher than average prevalence (Bronfman et al., 2002; Bronfman, Negroni, & Kendall, 2002). Finally, transport workers experience elevated insecurity, have limited access to health services, and are vulnerable to harassment and extortion (often with police complicity) (Bronfman et al., 2002). Transport workers are not the only ones at risk; individuals who provide various services along transport corridors are also highly vulnerable to disease.

Transport, as a predominally male sector, is also associated with peculiar notions of *machismo* (that is deeply embedded within Latin male culture), which often includes sexual relations on the road. Mesoamerican truckers have a reputation of being independent, aggressive, womanizing, macho men who consume large quantities of alcohol and engage in frequent sexual transactions with

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<sup>9</sup>Four of the six highest HIV prevalence countries in the region—Belize, Honduras, Panama, and Guatemala—are located in Mesoamerica (USAID 2006).

multiple women on the road—which corroborates the prevalent “macho myth” (Bronfman et al., 2002). Extant studies corroborate the critical role of truckers in HIV spread in the region, especially through bridging and extensive sexual mixing among diverse, usually marginalized populations (Apostolopoulos, n.d.; Bronfman et al., 2002; Passador, Guirao, Pinto, et al., 1998).

The most comprehensive regional study was conducted at 11 transit stations (including crossborder stops, border ports, and seaports) in southern Mexico, Belize, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama. Research results reveal that truckers (also referred to as land sailors) exhibit bisexual practices that do not contradict culturally defined machismo, drug use, practices involving casual and transactional sex, low condom-use, and frequent use of brothels, nightclubs, and other highway pickup places (Bronfman et al., 2002; Schifter, 2001). In some transit stations, reports indicate that over 60% of migrant women have forced sexual intercourse at some point of their travel.

In South America, the highest-risk transport workers operate along a highway corridor that connects Brazil, Paraguay, and Argentina. Argentinian truckers are known to engage in unsafe sexual practices with sexworkers, teenagers, and sometimes children, as young girls in the poorest northern regions often exchange unprotected sex for material resources (CDC, 2003). Brazilian truckers, on the other hand, who drive longer distances, are particularly vulnerable to risks due to their long waits at checkpoints to clear customs, which gives them time and opportunity for risky encounters (Population Council, 2006) and due to their extensive drug use (Silva, Greve, Yonamine, & Leyton, 2003). According to data collected in several Brazilian towns bordering Bolivia, Colombia, Peru, Argentina, Uruguay, and Paraguay as well as in the town of Santos, truckers form complex and risky sexual networks with multiple partners on the road (Lacerda, Gravato, McFarland, Rutherford, Iskrant, Stall, & Hearst, 1997; Lippman, Pulerwitz, Reingold, Chinaglia, Ogura, Hubbard, van Dam, & Diaz, 2004). In addition to truckers, three-wheeled motorcycle taxi-drivers, used heavily in public transport in Peru, play an important role in the spread of bacterial STIs (Paris, Gotuzzo, Goyzueta, Aramburu, Caceres, Crawford, Castellano, Vermund, & Hook, 2001). Motorcycle operators at a northeastern Amazon city were found to use the services of sexworkers and have other casual sex partners of both genders during their trips. In fact, findings reported high gonorrhea and chlamydia incidences along with low condom use.

### *Eastern European and Central Asian Corridors: The Multiplier Effect*

#### Soviet Union Collapse and STI/HIV Explosion

Eastern Europe (EE) and Central Asia (CA) constitute diverse areas with notable sociocultural, economic, and topographic differences and extend from the Baltics and Ukraine in Eastern Europe to the central Asian states

of Kazakhstan, Kyrgyzstan, and Tajikistan. The collapse of the Soviet Union, followed by an abrupt free-market transition, eliminated most social-safety mechanisms for millions of people, and fostered economic instability, unemployment upsurge, and westbound migration (ILO, 2005). As in SSA and SEA, circular migration became the driving force behind sex multipartnering and networking, as many migrant settings began to operate as sexual marketplaces rendering migrants vulnerable to sexual exploitation and numerous subsequent risks (Van Liemt, 2004). Sexwork and trafficking of women in particular continue to place migrants and their contacts in transit, destination, and home settings in highly risky situations (Limanowska, 2005).

The sexual and parenteral STI/HIV spread in EE/CA is believed to be getting out of control with a ninefold increase in HIV-positive cases since 1995 and 210,000 new infections recorded in 2005 alone (UNAIDS, 2006). The regional HIV epicenter—Belarus, Moldova, Russia, and Ukraine—continues to worsen with ripple effects felt by ever-larger segments of society, beyond IDUs and sexworkers. While the other EE/CA countries still have concentrated epidemics, they are rapidly expanding due to a high presence of HIV enabling factors (UNAIDS, 2006). In a recent speech, Peter Piot, UNAIDS Executive Director, stressed that while macrostructural antecedents drive HIV in the region (fueling both IDU and risky sex), it is crossborder migration that continues to shape both the patterns and distribution of HIV/STIs in the region (UNAIDS, 2005).

#### Truckers in the Baltics and STI/HIV Risk

In Central Asia, several key transport corridors link broader regions and countries in the area that play an important role in disease spread by connecting high- and low-prevalence regions (Brushett & Osika, 2005). The northern corridor links Afghanistan to Russia through Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan, while the south corridor links the Caucasus countries of Armenia, Azerbaijan, and Georgia via the Batumi/Poti-Baku and Batumi/Poti-Yerevan corridors (Brushett & Osika, 2005). Because drug and human trafficking prevail in the region, these corridors represent an area of special interest to public health specialists.

The Baltics—comprised of Poland, Latvia, Estonia, and Lithuania—stand at the crossroads of the main east-west and north-south transport corridors that link Former Soviet Union (FSU) and European Union (EU) countries. Baltic nations also neighbor Russia, Kaliningrad (Russian territory), Ukraine, Moldova and Belarus, where public-health conditions are rapidly deteriorating and STI/HIV rates are rapidly soaring (Benotsch, Somlai, Pinkerton, et al., 2004). In Russia and Ukraine alone, sexworker numbers are skyrocketing, condom use in the sex industry continues to be erratic, huge spikes are reported in syphilis alone, and IDU is on the upsurge (UNAIDS, 2006). Within this environment, Polish, Belarussian, Russian, Ukrainian, Moldovan,

and Lithuanian truckers who cross the borders of these nations engage in regular casual sex on the road with random partners. Revealing data denote that over 60% of these truckers practice unprotected sex, even though they are aware of STI/HIV transmission risks (Kulis et al., 2004). Such findings denote that as transport networks of these regions improve and get integrated in the global market, so will the disease risks increase for transport workers at road transport relay-points, reststops, restaurants, vehicle repair-stations, and other locales where risk networks converge (Apostolopoulos, n.d.).

## Disease Risks Along U.S. Trucking Routes

### *U.S. Truckers: Myths and Risks*

Although the majority of industrialized nations rely mainly on railways for freight transport, in the U.S. the trucking sector constitutes the skeleton of the economy. Trucking comprises a sizeable part of the highway-services sector, which has over 55,000 facilities (4,500 of which are truckstops) and employs nearly 12 million truckers and 10 million other professionals (NATSO, 2005). From a health standpoint, truckstops<sup>10</sup> represent the most significant physical settings for truckers due to their policies, resources, and built environment characteristics with the potential to critically affect health (Apostolopoulos, Sönmez, & Kronenfeld, n.d.).

Popular culture has perpetuated the aura of “myth, danger, mystery, adventure, and manhood” for U.S. truckers, and has linked trucking to sexworkers and drugs, homosexual encounters at “pickle parks”<sup>11</sup>, thieves and muggers, and highly sexualized conversations on Citizens Band (CB) radio (Ouellet, 1994)—further reinforcing the urban-cowboy legend. Truckers operate under stringent work conditions filled with stress and loneliness and in danger of traffic safety hazards (Solomon, Doucette, Garland, & McGinn, 2004). The vulnerability of truckers is further exacerbated by frequent relationship and physical-health problems as well as involvement in substance misuse and notorious gambling (Overdrive, 2002). Despite epidemiological links between a syphilis outbreak along a highway in the eastern U.S. and truckers, sexworkers, and drug use (Cook, Royce, Thomas, & Hanusa, 1999), little research has been carried out on truckers’ risk interactions, their sexual mixing and drug use practices, or their elevated risks for disease acquisition and potential role in diffusion.

<sup>10</sup> Besides truckstops, trucking contexts and settings also include terminals, warehouses, and highway rest areas.

<sup>11</sup> Pickle parks are wooded, semi-public areas behind highway rest stops, known among truckers for incidents of homosexual activity.

## *Trucker Networks, Substance Use, and Disease Risk*

### Risk Milieux and Multimodal Populations

Trucking milieux are polymorphous settings with inextricable topographical, cultural, and psychosocial properties (Apostolopoulos, Sonmez, Kronenfeld, & Yang, 2006). Such contexts comprise interlinked entities with distinct sexual and drug cultures associated with spatial and temporal factors, types of risk exchanges and populations, and their position within broader risk geography (Apostolopoulos et al., 2006b). They mainly include truckstops and highway rest areas, various off-highway establishments that cater to truckers, highway adult bookstores, bars and nightclubs, striptease clubs, and mostly illegal brothels (Apostolopoulos et al., 2006b). Most risk exchanges unfold at truckstops (particularly those located in depressed urban areas), rest areas (more so when they are heavily wooded and have public toilets with stalls), and low-end motels (often close to adult clubs, sex stores, and bars, which do double duty as brothels). Since the late 1990s, truckers and truckchasers<sup>12</sup> have been exploiting the Internet to “hook up” in cyberspace and to arrange in-person meetings anywhere in the country. Thus, sexual encounters that might not have been feasible before are easier than ever to arrange.

The trucker typology of “highway cowboys,” “old hands,” “Christian truckers,” and “old-married men” (Stratford, Ellerbrock, Akins, & Hall, 2000) was expanded on by ethnographies of truckers’ multimodal risk networks (Apostolopoulos et al., 2006a). Findings reveal the existence of key players in these risk networks, best described as involved in supplying, consuming, or in some way facilitating risks: (1) *risk consumers* are truckers who are straight, gay, bisexual, or straight-identified MSM and who purchase and use illegal substances and sexual services; (2) *risk suppliers* provide or peddle illicit substances and sexual services and include female sexworkers<sup>13</sup>, truckchasers and male sexworkers, and drug suppliers; (3) *intermediaries* facilitate transactions between consumers and suppliers and include pimps, polishers<sup>14</sup>, lumpers<sup>15</sup>, drug runners, and Internet webmasters and chatroom moderators who help to create virtual fora to bring together truckers and MSM;

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<sup>12</sup>Truckchasers are men (gay, bisexual, or straight-identified MSM) who cruise for truckers in physical locations (i.e., rest areas, truckstops, bars, adult bookstores) and in cyberspace (i.e., Internet websites, chatrooms) with the intention to have sexual encounters.

<sup>13</sup>Sexworkers in trucking milieux are often called “lot lizards” (because they move from truck to truck in the parking lot and knock on doors of truck cabs to get truckers’ attention) or CB prostitutes.

<sup>14</sup>Predominantly male transient/homeless persons, who buff and polish chrome details of trucks at or near truckstops.

<sup>15</sup>People who load or unload trucks and sometimes hitch rides with truckers for certain periods.

(4) *peripheral players* perform various tasks within the risk continuum and include female patrons of businesses that cater to truckers, “floating” migrant workers<sup>16</sup>, hitchhikers, and other contacts at road settings; (5) *industry members* who serve various roles and include employees of trucking and shipping companies, truckstops, rest areas, and other highway settings; and (6) *relationship partners*.

#### Sex and Drug Transactions on the Road

Empirical and anecdotal sources corroborate truckers’ extensive sexual transactions with sexworkers and other women along U.S. highways and across the southern border in Mexican brothels (Hollister, 1999; Ouellet, 1994; Valdez, 2003). Sexual exchanges unfold primarily at truckstops where sex is solicited via CB-radio communication, via pimps and drug runners who provide women and drugs as “package deals,” or by knocks on truck doors by women themselves and the actual sex takes place mostly in the cabs of trucks parked in the “party row”<sup>17</sup>, at nearby motels, or in nearby wooded areas. Condom use is at best inconsistent, mainly due to truckers’ incomplete understanding of potential risks and sexworkers’ need for income expressed in the desire to have as many encounters as possible by going from one truck cab to the next. Research findings corroborate that truckers’ risk-laden sexual encounters along their routes are often combined with substances that are used to relax or party during downtimes (alcohol, crack, cocaine, marijuana) or to stay awake during long drives (methamphetamines, speed) (Apostolopoulos et al., 2006a; Stratford et al., 2000). Various drugs are easily available around truckstops and other trucking settings<sup>18</sup> and are frequently exchanged between truckers and sexworkers either as payment for sex or to use together during their encounters.

Most female sexworkers interviewed at truckstops were victims of various traumatic experiences (i.e., abuse, violence), homeless, addicted to drugs, and at great risk for STIs/HIV. Many women indicated that they came from socioeconomically depressed and densely populated urban areas, where they engaged in sex with members of other core groups (drug suppliers, pimps), thereby corroborating STI endemicity in these populations at risk (Apostolopoulos et al., 2006a,b). Life around truckstops further increases sexworkers’ risks for physical, emotional, and sexual abuse as well as disease and social stigmatization. Nevertheless, many of these sexworkers remain at

<sup>16</sup> Usually transient and seasonal laborers who hustle around truckstops as they move to new jobs as they become available.

<sup>17</sup> Because trucks are parked in rows at truckstops, the last and least visible row is known as “party row” and is used by truckers who invite sexworkers into their cabs or others to use drugs or drink with them.

<sup>18</sup> Interviewed polishers and lumpers claim that 80-90% of truckers they interact with regularly use drugs.

truckstops because they feel safer than on the street, they assume that truckers have more money and can offer other resources such as rides, and some have repeat customers who are truckers. Sexworkers at truckstops are important members of truckers' risk networks and significantly influence the dissemination of STIs via truckers who bridge high- and low-STI prevalence groups and settings (Apostolopoulos et al., 2006a,b).

While truckers' heterosexual mixing is established, homosexual encounters have remained below the societal radar, primarily as a result of the hyper-masculine and mostly homophobic nature of the trucking subculture. Sexual contacts between truckers and truckchasers often follow diverse cruising strategies and are characterized by carefully scripted interactions that depend on nonverbal communication and shared, but usually unarticulated, meanings<sup>19</sup> (Apostolopoulos et al., 2006a,b). Ethnographic research has revealed that truckchasers are often attracted to truckers who project a masculine image and represent the epitome of manhood as they perceive it (Apostolopoulos et al., 2006a,b). Homosexual encounters between truckers and truckchasers frequently occur in semipublic spaces such as highway rest-area bathrooms or stalls in adult bookstores (Apostolopoulos et al., 2006a,b). As revealed in interviews with truckchasers, safe-sex practices are often selective and defined by partners' "healthy appearance" and whether insertive or receptive sex is performed—which is closely related to perceptions of HIV/STI risks (Apostolopoulos et al., 2006a,b).

## Maritime Sector and HIV in Developing Regions

Millions of waterborne-transport workers handle over 90% of trade and a significant segment of travelers in seas, rivers and lakes around the world (EU, 2006). By default of their profession, sailors, mariners, seafarers, fishermen, motor-boat operators, workers on inland waterways, crew members, and port, harbor and dock workers, as well as boat passengers are highly vulnerable to HIV/STIs (WHO, 2004). Limited research<sup>20</sup> has been done on the potential role of these highly mobile populations—that remain away from home for protracted periods of time—as transmission pathways into the general population. The role of this population is even more critical in poverty-stricken areas where fishing and water transportation comprise survival activities for local communities (Wickramatillake, 1998).

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<sup>19</sup> Initial contact ranges from truckchasers loitering in toilets at highway rest areas and tapping the brake-lights of their parked cars to various types of suggestive body language to get truckers' attention.

<sup>20</sup> Empirical studies have focused on Thailand, Myanmar, Vietnam, Cambodia, Laos, Ghana, Brazil, and Kiribati.

Waterborne crews face occupational (e.g., exposure to noxious agents, toxic or dangerous cargo, severe weather and climatic changes), health (e.g., injuries, depression, substance abuse, STIs), and psychosocial risks (e.g., separation and alienation from family and home, stress associated with shipboard living) on a regular basis (Wickramatillake, 1998; UNAIDS, 2005). Within such risk-filled environments, alcohol abuse, contact with sexworkers, poor knowledge of STIs, and unsafe sexual practices comprise key factors that contribute to elevated risks for STIs/HIV and disproportionately high infection rates (Binghay, 2005). As a result, waterborne workers oftentimes become STI transmitters into their own communities, particularly in small areas where locals are isolated, less mobile, and maintain an undeveloped commercial sex sector (WHO, 2004). One example is of the Mekong region, where it is estimated that 22% of seafarers are HIV infected (ILO, 2005).

### *Seafarers in the Pacific and Southeast Asia*

In the Micronesian island-state of Kiribati, high chlamydia prevalences were recorded among both trainee and experienced seafarers, while 85% of the syphilis cases were among experienced seafarers (WHO, 2004). There are parallels between the chlamydia prevalences among seafarers in Kiribati and truckers (10.2%) in China's Anhui province (WHO, 2001). The endemicity of chlamydia is of concern because most seafarers have regular female partners in Kiribati with whom they do not use condoms. It is likely that there is a significant rate of chlamydia transmission from seafarers to their partners who are at higher risk for STIs than the general population, as was the case with HIV infection in the same community. Moreover, despite a low .3% HIV seroprevalence, the STI picture suggests that seafarers are also vulnerable to the acquisition and rapid spread of HIV infection—supported by the fact that the high HSV-2 prevalence found reflects high levels of sexual activity by seafarers. In contrast, prevalence of nonviral STIs was lower than expected with no cases of gonorrhoea, and only nine cases of diagnosed syphilis. Low HIV rates can be explained by the low prevalence of bacterial STIs and low drug use (1.4%). Because these surveys did not test for chlamydia, gonorrhoea, or trichomoniasis in the general population, it is unclear if the risk behaviors are occurring in Kiribati at-large. Nevertheless, other studies (Synergy Project, 2002) suggest that itinerant men who have left behind wives and/or steady girlfriends demonstrate low condom use associated with increased STI/HIV transmission to their partners and the general community<sup>21</sup>.

Epidemiological data from Vietnam corroborate analogous patterns. Factors influencing risk behaviors of seafarers in Haiphong (major city in

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<sup>21</sup> A low acceptance of condoms was recorded in the study among seafarers for all sexual partners.

northern Vietnam) suggest that the “seafaring lifestyle” strongly determines conceptions of sexuality (Trang, 2002). Seafarers consider contacts with sexworkers or irregular partners a natural part of their occupation while their safe-sex practices (namely condom use) with sexworkers remain inconsistent and their knowledge of STIs/HIV remains unclear—which in turn lead to misconceptions regarding transmission routes. Similar behavioral patterns were also recorded in the HIV hotspot of Haiphong, among both fishermen and passenger-boat crewmembers (Trang, 2002). Irrespective of age or marital status, many fishermen in May Chai (docking area of fishing boats) and Binh dock visit sexworkers (with erratic condom-use patterns, despite easy access) even though they are not far from their wives as they live and work in the same town. In addition to frequenting sexworkers, many fishermen also have extramarital affairs along fishing routes, despite social disapproval, and share the view that condoms are not needed with mistresses because such relationships are based on love.

Fishing patterns, peer influences, sex industry, condom accessibility, and drug use play critical roles in fishermen’s STI/HIV vulnerability in Kien Giang province, Vietnam (CARE, 2002). Because fishing involves heavy physical labor and keeps fishermen away from their homes for over three weeks each month, the men do not see their spouses for extended periods. As a result, during the week-long break when their boats are docked and fishermen get their pay, they engage in entertainment activities that often include commercial sex—readily available wherever the boats dock, and especially at popular karaoke bars in Haiphong and Cat Ba. Conversely, in the central region of Vietnam, there is some level of social pressure on fishermen to remain loyal to their wives, which deters the men from keeping mistresses but not from frequenting sexworkers. It is important to note that in this region condoms are also easily available (regardless of their regular use) and drug use is low among crews of fishing boats even though they are commonly used by locals.

Similar patterns were recorded in Thailand among fishermen working in commercial fishing trawlers (Entz, Prachuabmoh, van Griensven, & Soskolne, 2001). As with Vietnamese seafarers, Thai men also work under harsh conditions, staying out at sea for prolonged periods, thus remaining distant from their wives and families, with limited access to health care. When docked at ports, fishermen demonstrate risky sexual behaviors accompanied by excessive alcohol consumption—not surprisingly, 30% reported having had a current STI. Although STI/HIV rates have declined in Thailand per se due to aggressive government efforts, prevalences are rapidly increasing in the countries of origin of fishermen and boat crews (Entz et al., 2001).

### *Seaport Workers in Western Africa and South America*

Empirical works in Western Africa and South America indicate no major differences in patterns of risk behaviors among those working in the water as opposed to those who work by the water. Around the ports and harbors of

Ghana, women involved in informal economic activities (i.e., selling food), practice opportunistic transactional sex to supplement their income. Their clients include sailors, truckers, freight forwarders, various port employees, dock workers, and other food sellers and hawkers of various goods. Another HIV risk factor for the dockworkers is that many share occupation-protective items, such as gloves, boots, and helmets, and any accidents involving blood are opportunities for easy transmission (Okello & Ighure, 2004). Similarly, increased HIV rates of 7% have been recorded among sexworkers at Brazilian ports, whose clients are mainly dockworkers, sailors, and truckers (Hearst, Lacerda, Gravato, Hudes, & Stall, 1999; Lacerda, Stall, Gravato, Tellini, Hudes, & Hearst, 1996; Trevisol & da Silva, 2005).

## Air Transport and Disease

Approximately 60 million of the total 1.1 billion annual passengers of commercial airliners travel to developing areas of the world (EU, 2006). The enormous volume and speed of air travel along with the environment of the aircraft cabin facilitate the dissemination of infections that are endemic in developing regions to disparate geographic areas<sup>22</sup>. Both cargo and passenger aircrafts can become vectors of disease by transporting humans, mosquitoes, other insects, animals, and various animal products that, in turn, can transmit disease (DeHart, 2003).

Among infectious diseases that are easily transmittable via air travel, most important include avian influenza, TB, SARS, malaria, and west Nile fever (Mangili & Gendreau, 2005). Immediate transmission between passengers has occurred with TB and influenza, while vectors for yellow fever, malaria, and dengue have also been identified on aircrafts (Schuchat, 2005). Since 1946, a number of outbreaks of serious infectious diseases have been recorded aboard commercial airlines, with smallpox, SARS, influenza, TB, measles, and food poisoning among the most important ones (Herck, Castelli, Zuckerman, et al., 2004). Some of these diseases (i.e., influenza, SARS) are capable of causing even pandemics leading to high rates of morbidity and mortality, due to their ease of transmissibility among people, severity of the illness they cause, low level of immunity among populations, and ease and speed with which they travel (Toovey, Jamieson & Holloway, 2004).

Higher-risk populations of freight and passenger airplanes include pilots, flight attendants, cargo and cleaning personnel, other airplane and airport personnel, and passengers. As with truckers, rail conductors or mariners, the vulnerability of air-travel personnel to disease is intimately linked to the characteristics and environment of their occupational lifestyles. As road-transport

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<sup>22</sup> Today it takes less than 24 hours to travel to almost anywhere around the world—a period that is shorter than the incubation period for most communicable diseases.

workers oftentimes have “road wives” and rail workers have “rail wives” with whom they stay and have sex when traveling certain routes, in a similar fashion, it is quite possible for airline pilots and crews to have similar arrangements with regular sexual partners in different cities (Apostolopoulos, n.d.). As with the road sector, hotspots for airline employees are locations away from home in which they stay for a day or longer.

## Surveillance and Interventions

Since the dawn of the HIV epidemic, the health ramifications of the transport sector have been treated as “collateral damage” associated with its many developmental benefits. But the elevated burden of the epidemic for humans and economies, particularly of developing regions, has given new emphasis to the acute need to develop and implement effective mitigation strategies. This is particularly imperative for those socioeconomically marginalized regions where STI/HIV rates have reached epidemic proportions not only among core risk populations but also among other vulnerable segments of the general population.

This overview has elaborated on how intertwined sociostructural, demographic, psychosocial, behavioral, and biological factors render transport populations vulnerable to disease risks. Road transport personnel (more so than rail or shipping) experience the longest and most serious border delays caused by bureaucratic inefficiencies or infrastructural problems that clog transport arteries and border crossings (ILO, 2005). The most notorious delays are experienced at Beitbridge (Zimbabwe-South Africa), Chirundu (Zambia-Zimbabwe), and Komatiapoort/Machipanda (Mozambique-other country) border crossings where truckers can be stuck for as long as several weeks. Consequently, hazards abound within these contexts, in which transport workers have frequent and easily-bought sexual contact with sexworkers along highways and border crossings and also maintain “road wives” with who they engage in risky sexual encounters.

As a result of its unique characteristics, the transport sector plays a critical role not only in the spread of STIs/HIV but also potentially in tackling disease spread (ILO, 2005). Just as its workforce is vulnerable to high risks for STI/HIV infection, it can also play a critical role in influencing the trend of such epidemics by serving as a social vector in disease transmission. This bidirectional relationship that the transport sector has with the STI/HIV epidemic can be instrumental in efforts to combat the epidemic and limit its impact. While prophylaxis, care, and treatment constitute the framework of interventions, the development of robust surveillance systems is fundamental to intervention strategies. Measures need to include comprehensive tracking of: (a) mobility patterns of transport workers; (b) HIV/STI knowledge, attitudes and behaviors of high-risk transport populations; (c) points and types of contact between transport populations and other high-risk core groups; (d) disease spikes and

outbreaks within transport groups and the general population; and (e) potential risk-practices of people living with HIV/AIDS (PLWHA) and their relationships. It is also imperative to establish an early-warning rapid-response system (EWRRS) for the identification of stressors and to focus on their root causes in order to ultimately reduce disease vulnerability (UNDP, 2004).

For greater effectiveness, general prophylactic strategies must go beyond initiatives to reduce the risk of sexual transmission to broader harm-reduction initiatives for IDUs. This includes education for high-risk groups, empowerment strategies for women that include legal and social protection, and condom provision. Care requirements for PLWHA and those infected with other STIs/BBIs, TB, and associated diseases need to be broadened to include social support to caregivers, families, and children. Although recently treatment has become increasingly more viable due to reduced prices for anti-retroviral drugs (ARVs), it still remains constrained due to deficiencies in voluntary counseling and testing (VCT), health-system capacity, and the social structures necessary to make treatment effective.

Within this context and as the necessary backbone of all interventions, prevention measures should include multisectoral approaches that involve the intermodal transport sector, health-care sector, the military, local and national governments, international development and health agencies, and NGOs in an equal partnership to draft and implement measures (Apostolopoulos, n.d.). Based on ongoing international experience, there are several successful interventions and others with the potential to provide beneficial outcomes (Brushett & Osika, 2005; CSRI, 2004; ILO, 2005; Synergy Project, 2002). A few such indicative points, of what interventions applicable to intermodal transport networks must include, are summarized below:

- Coordinated efforts along land transport corridors (truckers, rail workers), seaports and inland waterways (seamen, harbor workers);
- Modal integration to increase logistic chain efficiency and effectiveness to reduce transport time and cost, and liberalization of transport and terminal operations;
- Governmental harmonization of border procedures and formalities, with extensive input from social partners for cooperation in the fight against HIV/AIDS;
- Improved synergy and commitment between the military and a wide range of stakeholders of transport and health care sectors;
- Interface between transport-sectoral activities and communities where transport operations may inadvertently contribute to higher risks of exposure;
- Transport observatories designed to increase efficiencies at border crossings, reduce transit times, and contribute to smoother flow of traffic;
- Regional institutional capacity building to ensure sustainable implementation of preventions; and
- Improvements for travel documentation with more comprehensive information to facilitate faster border crossings.

In addition to the foregoing, four important considerations—societal, community, institutional, and individual—must be addressed when designing transport interventions (Synergy Project, 2002). Societal considerations include macrosocial and political arrangements, resources, and power differences reflecting social inequalities. Community considerations include laws, policies and operating procedures as well as relationships between people and sectors that are formally or informally connected to transmission settings. Institutional considerations refer to individual living and working conditions, resources and opportunities, and the recognition of individual, structural, and super-structural factors. Finally, individual considerations involve how infrastructure and the broad environment is experienced and acted upon by individuals.

## Concluding Remarks

Transport-sector workers, particularly those of developing regions, face disproportionate risks of contracting and transmitting STIs/BBIs, including HIV, compared to workers in other sectors. As a result of their frequent mobility, extended periods away from home and occupational environment, transport populations develop their own road cultures and form their own socioeconomic bonds with those they interact with on the road (Apostolopoulos, n.d.; Synergy Project, 2002). To recapitulate, a few grim statistics put the picture of the sector in better focus: HIV prevalence rates have reached 15% in Abidjan, Ivory Coast—one of the main stops along a major Western African transport corridor; 22% of South Africa's transport workers was estimated to perish from AIDS by 2005; it is estimated that the number of truckers contracting HIV in India increases at the rate of 1,000 per week; and HIV prevalences among waterborne-sector staff in the Mekong region have increased at alarming rates (ILO, 2005; UNAIDS, 2005).

It was not until the late 1990s when comprehensive studies were commissioned to delineate the role of transport in HIV/STI diffusion in developing regions in search for solutions. International agencies such as the ILO, IOM, UNAIDS, UNDP, World Bank, and WHO and NGOs such as CARE, FHI, and PSI have consistently worked to foster the development of public policy that would use the intermodal transport sector as an entry point to reduce vulnerability to STIs/HIV and associated diseases. These efforts have employed synergistic approaches among transport, health, and development agencies with hitherto encouraging outcomes in reducing disease susceptibility for transport populations. In these programs, high-risk populations such as truckers, sexworkers, trawlermen, road-construction crews, floating migrants, itinerant traders, motel employees, taxi and motorcycle rickshaw drivers were targeted, among others.

In closing, in a constantly moving and rapidly integrating world, the international community needs to pay appropriate attention to ticking bombs of fast-expanding epidemics in China, Russia, the Ukraine, India, and the Mekong region—in order to avert the disaster of Sub-Saharan Africa.

Because these regions, in their effort to integrate into the world system of production and consumption, deal with millions of marginalized populations as well as increasing poverty and IDU rates, their transport sectors, which are anticipated to grow further, will only have adverse effects on their already generalized epidemics (Apostolopoulos, n.d.).

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