CHALLENGES TO PUBLIC HEALTH IN THE FAVELAS OF METROPOLITAN RIO DE JANEIRO, BRAZIL

Robert E. Snyder, Kathryn L. Lovero, Claudete A.A. Cardoso, Lee W. Riley and Alon Unger

Introduction

This chapter describes the growth and impact on public health of urban informal settlements or “slums” in metropolitan Rio de Janeiro, colloquially known as favelas in Brazil. The favelas of Rio de Janeiro, Brazil are among the most recognizable in the world, from panoramic flyover images shown on television during the 2014 World Cup and 2016 Olympic Games, to their representations in film, not to mention the varied cultural contributions. The concentration of vulnerabilities and the health inequalities faced by favela residents today have historical origins reinforced by ongoing demographic, political, and social forces. We highlight the specific physical, legal, and social characteristics of slum life in this region and their impact on select health problems through a series of case studies compiled from the authors’ experience working in these communities. We also offer a description of the complex tapestry of public health programs and other resources that exist to support Brazilians who live in favelas, such as the Sistema Único de Saúde, a single-payer health system introduced in the 1988 Constitution.

Global public health has been significantly influenced by the rapid and worldwide urbanization of low- and middle-income countries in the second half of the 20th century. Urban centers were often thought to positively influence public health through more readily available healthcare, enhanced access to resources such as food, water, vaccinations, and maternal and newborn care, and economic and educational opportunities. There are also adverse consequences of rapid urbanization on health, particularly in areas characterized by poverty, inadequate infrastructure, overcrowding, the lack of basic services, and the unequal distribution of wealth.

Today, the majority of the world’s population lives in cities, whereas in 1950 only 30% did so. The United Nations (UN) projects that the world’s urban population will grow to nearly 66% by 2050, with roughly 90% of this growth occurring in Africa and Asia (United Nations 2014). As a result, there is a growing focus on identifying and addressing intra-urban disparities in wealth, living conditions, and health outcomes. These differences are most pronounced in informal settlements characterized by urban poverty and marginalization from basic resources, which are more commonly referred to as “slums.” We recognize that terminology describing these communities is complicated and that using the term “slum” or “informal settlement” or describing these communities as “poor” may have negative connotations (Sverdlik 2011). The term “slum” has been used commonly in the
literature and has been formalized through the United Nations to describe human settlements with distinct physical and social characteristics, as outlined below.

Today, the population density of global slum communities is unprecedented in magnitude; nearly 30% of the world’s urban population—more than 880 million people—live in slums (United Nations 2016). They are ubiquitous, known by different terms colloquially all over the world, many of which also have pejorative connotations. Table 18.1 provides a list of some of the names of these communities in different languages, and Figure 18.1 highlights their worldwide distribution (Davis 2007;

<table>
<thead>
<tr>
<th>Language or region</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>French</td>
<td>bidonville, taudis, habitat précaire, quartier irrégulier</td>
</tr>
<tr>
<td>Spanish</td>
<td>asentamiento irregular, barrio marginal, barraca, conventillos, colonia, popular, villa miseria, pueblo joven</td>
</tr>
<tr>
<td>German</td>
<td>Elendsviertel</td>
</tr>
<tr>
<td>Arabic</td>
<td>mudun safi, labbach, brarek, medina achouaia, foundouks, tanake, aashwa’i</td>
</tr>
<tr>
<td>Russian/Eastern European language</td>
<td>trushchobi, kartonsko naselje</td>
</tr>
<tr>
<td>Portuguese</td>
<td>favela, aglomerado subnormal, morro, loteamento, cortiço, comunidade gecekondu</td>
</tr>
<tr>
<td>Turkish</td>
<td>slum, hood, ghetto, squatter camp, shantytown</td>
</tr>
<tr>
<td>South Asian language</td>
<td>chawl, ahata, katra, bustee, katchi abadis, watta, pelli gewal, jhopadpatti</td>
</tr>
<tr>
<td>Kiswahili</td>
<td>mabanda</td>
</tr>
<tr>
<td>Zulu</td>
<td>umjondolo</td>
</tr>
</tbody>
</table>


Figure 18.1  Slum population by region, 2014.
Source: UN-Habitat (2016).
UN-Habitat (2003). Their proliferation in the 21st century represents a fundamental transformation in the physical and social structure of urban life and human health.

In 2003, the UN operationally defined slums as communities characterized by insecure residential status, poor structural quality of housing, overcrowding, and inadequate access to safe water, sanitation, and other infrastructure (UN-Habitat 2003). See Table 18.2 for the detailed UN definition. Many have called attention to the challenges to public health posed by urbanization and slums (Harpham 2009; Riley et al. 2007; Unger and Riley 2007; Vlahov et al. 2011); however, little high-quality data and even fewer high-quality cohorts exist to collect data on the impact of slum life on residents’ health. Figure 18.2 shows the diversity of slum settings on three different continents, illustrating some of the challenges to health services delivery in these communities.

There is limited but consistent evidence suggesting that residents of slums have worse communicable and non-communicable disease health outcomes compared to neighboring non-slum areas in the same cities (Agyei-Mensah and de-Graft Aikins 2010; Banu et al. 2013; Marlow et al. 2015; Neiderud 2015; Sclar and Northridge 2003; Sverdlik 2011; Wallerstein 1999). In the Philippines, it was estimated that 39% of children in the country’s slums between five and nine years old had tuberculosis, twice the national prevalence (Wallerstein 1999). We know little about the impact of living in these communities on health-related behaviors, such as smoking prevalence, vaccine uptake, and

Table 18.2 UN operational definition of slums

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Physical or legal definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate access to safe</td>
<td>Less than 50% of households have water supply with:</td>
</tr>
<tr>
<td>water</td>
<td>• an individual household connection; or</td>
</tr>
<tr>
<td></td>
<td>• access to a public stand pipe;</td>
</tr>
<tr>
<td></td>
<td>• rainwater collection;</td>
</tr>
<tr>
<td></td>
<td>• at least 20L/person/day within an acceptable distance.</td>
</tr>
<tr>
<td>Inadequate sanitation</td>
<td>Less than 50% of households have sanitation with:</td>
</tr>
<tr>
<td></td>
<td>• public sewer;</td>
</tr>
<tr>
<td></td>
<td>• septic tank;</td>
</tr>
<tr>
<td></td>
<td>• pour-flush latrine;</td>
</tr>
<tr>
<td></td>
<td>• ventilated improved pit latrine;</td>
</tr>
<tr>
<td></td>
<td>• disposal system shared by a maximum of two households.</td>
</tr>
<tr>
<td>Poor structural housing</td>
<td>Proportion of households residing on or near:</td>
</tr>
<tr>
<td>quality</td>
<td>• geologically hazardous zones;</td>
</tr>
<tr>
<td></td>
<td>• garbage mountains;</td>
</tr>
<tr>
<td></td>
<td>• high-industrial-pollution areas;</td>
</tr>
<tr>
<td></td>
<td>• other unprotected high-risk zones (e.g. railroads, airports, energy transmission lines).</td>
</tr>
<tr>
<td>Overcrowding</td>
<td>Proportion of households with more than two people per room, or less than 5 m$^2$ per person.</td>
</tr>
<tr>
<td>Insecure residential status</td>
<td>Proportion of households with:</td>
</tr>
<tr>
<td></td>
<td>• formal title or deeds to the land and residence;</td>
</tr>
<tr>
<td></td>
<td>• enforceable agreements or documented proof of a tenure arrangement.</td>
</tr>
</tbody>
</table>

skilled birth assistance, or its long-term and context-specific consequences on obesity, heart disease, and mental illness. Moreover, the formal health sector may only encounter residents after they develop late-stage and costly complications of preventable diseases (Riley et al. 2007), making an accurate assessment of the origins of health inequities difficult. These late encounters can occur for a number of reasons. For example, someone with hypertension would only be identified when he or she had a cardiac event requiring life-saving medical intervention because of poor screening as a result of the limited access to medical care in these communities.

There is a dearth of data describing these communities. Even when data are available, they are not analyzed to assess intra-urban health disparities (Vlahov et al. 2011). Comparisons of rural and urban disease burdens do not exist, and calculation of disability-adjusted life years (DALYs) has been used sparingly to compare disease within urban areas (Marlow et al. 2015).

**Favelas in Brazil**

Brazil is emblematic of global slum growth. Its slums are colloquially called *favelas*, and provide a telling portrait of the potential impact of living in these communities on the public’s health. Brazil is the largest country in South America, with an area of 3.28 million square miles and a 2015 population of 207.8 million people. In 1950, 36% of Brazilians lived in urban areas (Corburn and Riley 2016; United Nations 2008), which had increased to 80% by 2000, with 31.5% of the country’s urban
population residing in *favelas* in 2007 (IBGE 2007). Although the percentage of the urban population living in *favelas* decreased from 36.7% to 22.3% between 1990 and 2014, the absolute number of people living in such conditions has increased as the country’s population has grown (United Nations 2017).

In 2010, Brazil undertook the first and, to date, only nationwide census of slums in the world. To support this effort, it also developed a standardized definition for these communities, which they called *aglomerados subnormais* or subnormal agglomerates (AGSN). The *Instituto Brasileiro de Geografia e Estatística* or IBGE (Brazilian Institute of Geography and Statistics) defined an AGSN as a community with a minimum of 51 individual dwellings that illegally occupy their land, whose construction was not overseen by regulatory agencies, and that also suffer from a scarcity of public services (e.g. sanitation, electricity, and trash collection). The 2010 Census reported that 11.4 million (5.8%) of Brazil’s approximately 200 million residents live in an urban AGSN. Figure 18.3 shows the ten Brazilian cities with the largest AGSN population in the 2010 Census. However, likely owing to differing definitions of what constitutes these communities, that same year UN-Habitat estimated that 28% of the Brazilian population lived in slums (IBGE 2010; UN-Habitat 2003).

In this chapter, we focus on the metropolitan area of Rio de Janeiro. The *favelas* of the city of Rio de Janeiro are among the most well known in the world. In 1950, the city recognized 58 of these communities, whereas the 2010 Census identified 763. In 1950, 7% of the city’s population lived in *favelas*, compared to 23% in 2010, but the latter survey used official AGSN criteria from the government’s census agency, which might make them more comparable (1.4 million AGSN residents out of 6.3 million total residents) (IBGE 1953, 2010; Snyder et al. 2014). Figure 18.4 shows the growth of these communities relative to the rest of the city of Rio de Janeiro’s urban population.

![Figure 18.3](image-url) Population living in AGSN and non-AGSN communities in Brazil, 2010.

*Map: Guillermo Douglass-Jaimes, PhD, MA.*
A survey by Szwarcwald et al., stratified by income and census tract of residence, found that life expectancy differed by almost 13 years between the wealthiest parts of the city and favelas. Healthy life expectancy for those over 65 years old was almost twice as high in wealthy areas relative to favelas (Szwarcwald et al. 2011). However, an urban health inequality index compiled for the city revealed general improvements in health inequalities from 2002 to 2010, driven by improvements in population health and reductions in mortality rates (Bortz et al. 2015).

Favelas and their residents have made important contributions to Brazilian society and culture. It was in the favelas of Rio that Brazil’s most famous dance style, samba, evolved into its modern form. These communities have also produced some of Brazil’s most famous musicians, artists, and athletes. International attention on the city’s favelas is also growing, with the city’s favelas being featured in films, art installations, and global media, most recently during the 2014 World Cup and 2016 Olympic Games. Moreover, favela tourism has emerged as a tourist attraction, offering visitors the chance to visit these vibrant communities (Figure 18.5). Additionally, there have been public calls and prominent efforts to map and recognize favelas by international organizations such as Google and Amnesty International.

A Brief History of the Favela

The city of Rio de Janeiro was the capital of the Brazilian Republic from its founding in 1889 until the current capital city, Brasília, was built in 1960 (Bueno 2003). There were a number of factors influencing the country’s population dynamics in the late 19th century, including the abolition of slavery in 1888, the continued influx of European immigrants, and the Grande Seca (Great Drought) in the country’s Northeast (Bueno 2003). By the turn of the century, many of the country’s large coastal cities resembled industrial European and North American cities, with the wealthy elite residing outside of the city’s center and the working class being mostly confined to centrally located
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In Rio, these tenements and communities were called *cortiço(s)*, which is translated into English as tenements, or literally as beehives. These communities were the predecessors to today’s *favelas*, having been immortalized in Aluísio Azevedo’s book *O Cortiço*, published for the first time in 1890. *O Cortiço* described the most infamous of these communities, called *Cabeça de Porco* (Pig’s Head). The cortiço was widely considered a locus of poverty, criminal activity, and infectious disease (Abreu 1994; Chalhoub 1996; Valladares 2000). Figure 18.6 shows an image of this community from above, prior to its destruction in 1893.

The Brazilian Portuguese word for slum, *favela*, was coined at the turn of the 20th century and used to describe a community that arose on Providência hill in the city of Rio de Janeiro, also called *Morro da Favela* (translated as Favela Hill). Residents consisted of a mixture of the working class relocating from previously cleared tenements, recently emancipated slaves, and soldiers returning to the city from the War of Canudos in 1897, a civil conflict in Canudos, a city in the northeastern state of Bahia (Queiroz 2011). These soldiers were promised land in exchange for their participation in the campaign, but these promises never materialized. Some referred to the area where they settled as *favela*, originating from their experience of being quartered on a similarly named hill in Bahia with poor soil, steep land, and other inhospitable characteristics; the hill was also host to the Canudos native shrub called the *favela* shrub, *Cnidoscolus quercifolius* (Abreu 1994). The word *favela* subsequently came to generally describe these communities in the 1920s, an era marked by the continued demolition of tenements by the city’s mayor. This had the effect of driving more and more residents to squat on the city’s hills, developing the precursors to Rio’s modern-day *favelas*.
The exodus never stops. Every day their carts pass, full of ragged goods, cans, earthen vessels, cages, archaic chests, and, taking the suburban roads they head into the hills . . . repelled by greatness, by the crushing luxury of their poverty, by the progress that does not permit their place in the heart of the city. The mountain opens its green robe and welcomes the poor.

(Rio de Janeiro newspaper Correio da Manhã [1907], cited in Abreu 1994)

There are very few available descriptions of the distribution of disease from this era. In the early 20th century, morbidity statistics and epidemiological surveillance data were not routinely collected in many countries, including Brazil. Further, our understanding of infectious disease dynamics was in its infancy; the connection between yellow fever and mosquitoes was only established in 1900. In Brazil, most descriptions related to the risk that disease posed to commercial mariners, such as yellow fever, smallpox, tuberculosis, and leprosy (Havelburg 1898a, 1898b, 1898c). However, the tenement homes were ideal for the spread of communicable disease. Yellow fever often ravaged these communities, killing many members of the working class (Abreu 1994). In 1900, the first reports of a bubonic plague outbreak in the city began to appear in consular dispatches to the United States (Havelburg 1900). One report by the vice-consul, General W.L. Lowrie, subtitled “Sanitary Arrangements,” describes differences in the distribution of this outbreak within the city, highlighting the high incidence of plague among the urban poor, even citing a map that showed that 385 of 426 (90.4%) plague cases occurred in “the rather low-lying business portions of the city, where many large families occupy close quarters in the upper or attic stories of the buildings, secluded from the sunlight and musty with foul air” (Lowrie 1900). Throughout the early 20th century, political decisions such as the Agache Plan in 1930 that classified favelas as “illegal urban structures” maintained that these communities needed to be removed for public health and functional and aesthetic...
reasons. By 1937, the city had formally prohibited construction of new homes in these communities (Faerstein 2013; Prefeitura do Distrito Federal 1930). Despite numerous efforts at prohibition, Rio’s *favelas* continued to grow throughout the 20th century.

Countrywide, between 1940 and 1980, more than 41 million migrants (27% of the country’s rural population) migrated to cities from rural areas, as the country’s population transformed from predominantly rural to urban (Corburn and Riley 2016). Nationwide, cities were unprepared to absorb this population influx. After the 1964 coup d’état and takeover from President João Goulart, the military leadership decreed a more restrictive legislative code, stifling the press as well as most political opposition, while simultaneously committing numerous acts of torture and other human rights violations. The country’s economic policies were also revised to emphasize centrally planned technological improvements in agriculture and industry, which favored large farmers and land speculators in lieu of individuals, forcing even more to relocate to *favelas* (Martine and McGranahan 2010).

In the city of Rio de Janeiro, many *favelas* continued their expansion into the hills, on ever more precarious land. A number of new *favelas* also began to develop in the western part of the city as well as in the cities surrounding the bay of Guanabara, such as Niterói, São Gonçalo, and others neighboring Rio in the *Baixada fluminense* region. *Favelas* offered cheaper and more available housing, in addition to proximity to economic opportunities, as well as improved access to education, food security, and healthcare compared to where people had previously lived. The 1950 Census published a description of two *favelas*’ health problems (Jacarezinho and Morro de São Carlos), describing infant mortality rates of 31.6% and 34% as “alarmingly high” (IBGE 1953). It also published several other diseases’ prevalence, but, without details describing sampling methodology or a comparison population, it is hard to evaluate their accuracy or severity relative to other groups in the region (Table 18.3).

Democratization, Public Health, and Modern-Day *Favelas* in the State of Rio de Janeiro

The country’s inefficient social security system had been augmented the first time Getúlio Vargas served as president (1930–1945), yet this expansion still only included members of the formal economy. There were few guarantees for the working poor, especially residents of the city’s exploding *favela* population, until the late 20th century. The new constitutional guarantees of 1988 were a direct response to the previous military dictatorship’s oppression, as well as the absence of a comprehensive social safety net. This 1988 Constitution and new government sought to assure a number of civil liberties and rights, enshrining access to healthcare as a human right (Fleury 2012). The new

### Table 18.3 1950 Census: slum health

<table>
<thead>
<tr>
<th></th>
<th>Jacarezinho homes</th>
<th>Morro de São Carlos homes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%)</td>
<td>N (%)</td>
</tr>
<tr>
<td>Total number of homes in community</td>
<td>4,109</td>
<td>2,108</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>354 (8.6%)</td>
<td>239 (11.3%)</td>
</tr>
<tr>
<td>Leprosy</td>
<td>8 (0.2%)</td>
<td>6 (0.3%)</td>
</tr>
<tr>
<td>Syphilis</td>
<td>177 (4.3%)</td>
<td>121 (5.7%)</td>
</tr>
<tr>
<td>Cancer</td>
<td>31 (0.8%)</td>
<td>34 (1.6%)</td>
</tr>
</tbody>
</table>

Source: IBGE (1953).

Note: Compiled as part of the 1950 Census in Rio de Janeiro, the first effort to describe the slum-dwelling population in a Brazilian census. One publication produced from these efforts (IBGE 1953) highlighted disease rates in two Rio de Janeiro slums, Jacarezinho and Morro do São Carlos.
public healthcare program that was designed to deliver this healthcare, the *Sistema Único de Saúde* (SUS), was codified into law two years later.

SUS is publicly funded, with a strong focus on primary and preventive care. It is loosely modeled on Cuba’s *Sistema Nacional de Salud*, with primary health centers (*postos de saúde* or *postos*) scattered throughout cities that act as gateways to non-emergency primary and rotating care (i.e. specialists rotate between several health posts), specialized for members of the communities they serve. In many locations, Rio de Janeiro included, these clinics are intentionally placed in low-income areas that were previously without access to healthcare. As a result, they are often in, or border, *favelas*. These clinics are staffed with teams of physicians, nurses, community health workers, and other health professionals (Viana and Poz 1998). Community health workers or *agentes comunitários de saúde* (ACS) are residents of the communities where they work and were introduced system-wide in 1991, having been modeled on a similar and successful initiative implemented in the country’s Northeast.

SUS predominantly serves the country’s poor, with a parallel private healthcare system offering supplementary coverage for those with the financial means to purchase it (Paim et al. 2011). SUS’s teams of health professionals were designed to serve resident populations of roughly 5,000 people per health center or *posto*, with an emphasis on community outreach. Physicians have time explicitly built into their weekly schedules to walk around and engage the community in primary care. Nationwide, by 2010, there were almost 33,000 teams of family healthcare workers, with roughly 236,000 community health workers who were responsible for 98 million people among 85% of Brazilian municipalities (Paim et al. 2011). Today, SUS faces new challenges such as funding shortages, and employees are often paid months late, continuing to work *pro bono* until payment arrives. There are also frequent staffing shortages from clinic closures and absenteeism due to violence in the *favelas*.

Despite efforts by SUS and other governmental and non-governmental organizations to reach urban populations, the rapid growth and marginalization of many informal urban communities pose a significant challenge to the public health of *favela* residents. Table 18.4 highlights some of the adverse health outcomes related to living conditions in these communities. While the vast majority of *favela* residents have electricity, almost 12% of *favela* residents lack access to improved sanitation facilities (World Bank 2017a), increasing their susceptibility to both water- and vector-borne disease. Additionally, *favela* residents have a relatively lower education level, on average, when compared to residents living in other parts of the city. Furthermore, almost 75% of households in Rio de Janeiro’s *favelas* earned less than the minimum wage (Snyder et al. 2014).

Since the end of the 1970s, most *favelas* in Rio have had electricity services, although often through illegal access to the electrical grid via homemade connections called *gatos*. In 2010, only 70% of *favela* households in Rio de Janeiro had single-meter access to electricity (i.e. non-*gato*) (Snyder et al. 2014). In the 1980s, these communities began to obtain access to municipal water and sewage disposal services (Zaluar and Alvito 1998). A series of *favela*-upgrading programs, such as *Favela Bairro* and *Minha Casa Minha Vida*, aimed to improve the quality of life in these communities (Faerstein 2013). Coupled with conditional cash-transfer programs—of which *Bolsa Família* was the most influential—the upgrading programs contributed to a burgeoning Brazilian middle class, and have lifted more than 23 million people out of poverty since 2003 (Aquino et al. 2009). This has also contributed to the broad diversity of economic, social, and demographic characteristics we see in the *favelas* today. For example, in many of the region’s slums, residents living at the top of the hills, furthest from the formal roads, have the worst access to government services and are also poorer than those near the bottom of these hills (Snyder et al. 2014).

Informal tenancy affects *favela* residents’ continuity of care under SUS. By 2014, more than 20,000 families had already been evicted from informal areas in Rio de Janeiro in preparation for the World Cup and Olympics, the largest wave of evictions in the city’s history (ANCOP 2017). In spite of the country’s recent economic gains, many *favela* residents also continue to live in
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overcrowded conditions. In Rio de Janeiro’s favelas, there were an average of 42,991 residents per square kilometer, compared to 26,372 residents per square kilometer elsewhere in the city (Snyder et al. 2014). Such crowded conditions can contribute to increased transmission of tuberculosis and other respiratory diseases, as well as a relatively greater frequency of exposure to vectors such as mosquitoes and rats that transmit important pathogens such as dengue virus, Zika virus, and leptospira.

Violence and crime have also evolved into major problems in Brazil. As the favelas are home to a number of drug traffickers and sometimes violent militias (milícias), interpersonal violence and the corresponding police response, such as the Unidade de Polícia Pacificadora (UPP) or Pacifying Police Units, make accessing healthcare unsafe and at times impossible. Health posts are forced to close during violent confrontations or when access into the community is blocked by violence (Loewenberg 2005; Zaluar and Conceição 2007).

Major surveys in 1994 and 2004 showed that Rio de Janeiro had the third-highest homicide rate in Brazil (Waiselfisz 2007). According to the 2010 Global Burden of Disease report, the number of years of life lost (YLL) caused by interpersonal violence in Brazil increased from the rank of fifth in 1990 to first place in 2010 (Murray et al. 2013). This increase in violence is closely linked to the international drug trade, principally cocaine (da Silva 2010).

In part owing to concerns about gangs and milícias in the favelas, and in part owing to the Olympic Games and World Cup being hosted in Rio de Janeiro, the UPP program was developed and implemented by the city’s government (Cano 2012). This community-outreach police program began in 2008 and sought to bring police closer to some favela communities by installing police stations

Table 18.4 Characteristics of slums and adverse health outcomes

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Physical or legal outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate access to safe water</td>
<td>• Contaminated water sources.</td>
</tr>
<tr>
<td></td>
<td>• Water scarcity.</td>
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<tr>
<td>Inadequate sanitation</td>
<td>• Increased rat density in living quarters.</td>
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<tr>
<td></td>
<td>• Open or broken sewers.</td>
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<tr>
<td></td>
<td>• Suboptimal schools.</td>
</tr>
<tr>
<td></td>
<td>• Inadequate/inappropriate healthcare services.</td>
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<tr>
<td>Poor structural quality of housing</td>
<td>• Land and mud slides.</td>
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<tr>
<td></td>
<td>• Flooding.</td>
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<tr>
<td></td>
<td>• Fire.</td>
</tr>
<tr>
<td></td>
<td>• Vertical, multi-story housing.</td>
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<tr>
<td></td>
<td>• Residence in or near dumps.</td>
</tr>
<tr>
<td>Overcrowding</td>
<td>• Enhanced opportunity for disease transmission.</td>
</tr>
<tr>
<td>Insecure residential status</td>
<td>• Eviction.</td>
</tr>
<tr>
<td></td>
<td>• Exposure to toxic/chemical waste and pollution.</td>
</tr>
<tr>
<td></td>
<td>• Diarrheal diseases, cholera, typhoid, hepatitis A.</td>
</tr>
<tr>
<td></td>
<td>• Scabies, bacterial skin infections, acute glomerulonephritis.</td>
</tr>
<tr>
<td></td>
<td>• Typhus, leptospirosis, diarrheal diseases, cholera, malaria, dengue, hookworm, hepatitis A, chronic respiratory diseases, stunting.</td>
</tr>
<tr>
<td></td>
<td>• Under-utilization of services and maternal health complications, vaccine-preventable diseases, perinatal diseases, rheumatic heart disease, suicide.</td>
</tr>
<tr>
<td></td>
<td>• Poor access to education.</td>
</tr>
<tr>
<td></td>
<td>• Drug-resistant infections, poorly controlled hypertension, diabetes, and other chronic illnesses.</td>
</tr>
<tr>
<td></td>
<td>• Unintentional injuries.</td>
</tr>
<tr>
<td></td>
<td>• Leptospirosis, diarrheal diseases, cholera, malaria, dengue, Zika, chikingunya, hepatitis A.</td>
</tr>
<tr>
<td></td>
<td>• Drowning.</td>
</tr>
<tr>
<td></td>
<td>• Falling injuries.</td>
</tr>
<tr>
<td></td>
<td>• Burn injuries.</td>
</tr>
<tr>
<td></td>
<td>• Tuberculosis and other respiratory diseases, meningitis, scabies, skin infections, bacterial pharyngitis, rheumatic heart disease.</td>
</tr>
<tr>
<td></td>
<td>• Poor access to healthcare services.</td>
</tr>
<tr>
<td></td>
<td>• Acute poisoning, respiratory diseases, cancer.</td>
</tr>
<tr>
<td></td>
<td>• Intentional injuries, STDs, unwanted pregnancy, substance abuse-related diseases.</td>
</tr>
</tbody>
</table>

Source: Adapted from Unger and Riley (2007).
with police forces that were explicitly trained in community outreach. By 2012, the city’s official data for murders called *letalidade violenta*, a composite indicator consisting of the sum of intentional homicides, deaths by police, death after robbery, and assault followed by death, had fallen from a 2008 high of 2,877 to 1,557 in Rio de Janeiro and 729 to 480 in Grande Niterói (Niterói, Maricá, Itaipuçu, and São Gonçalo) (ISP 2017). However, by 2016 the indicator had again crept up to 1,909 in Rio and 678 in Niterói. Differential rates inside and outside of *favelas* do not exist, nor do publicly available geocoded addresses for each incident to facilitate independent geographical assessments of the burden of violence.

Owing to continued gang activity, and also in part owing to some of the abuses perpetrated by the police in these communities, the police have had a difficult time gaining the confidence of residents. A 2007 survey of several communities in Rio de Janeiro found that more than 60% of residents indicated that they “did not trust” the police (Zaluar and Conceição 2007). From 2005 to 2016 there were 5,905 police killings in the city of Rio de Janeiro. In 2014, police killings represented 15.4% of the year’s total homicides (ISP 2017). From 2010 to 2013, 99.5% of the city’s police homicide victims were men, 79% were black, and 75% were between 15 and 29 years old. Between 2011 and 2015, there was only one instance of a police officer being charged with a crime (Amnesty International 2015).

**Case Studies in Slum Health from Niterói, Rio de Janeiro State**

This section reviews select case studies from the authors’ public health work in *favelas* in order to further illustrate challenges to public health in these communities. All cases and details were collected from our experience in community-based public health research and clinical programs in *favelas* surrounding the city of Niterói, which is located across the Guanabara bay from Rio de Janeiro. Many...
of Niterói’s residents commute across the bay to Rio de Janeiro for work, and it is internationally renowned for its architecture, particularly the Contemporary Art Museum or MAC (Museu de Arte Contemporânea) designed by Oscar Niemeyer. In 2010, it had roughly 0.5 million residents, with the seventh-highest human development index (HDI) of 5,565 Brazilian cities, yet in 2010 more than 16% of the city’s population lived in favelas (IBGE 2010). In 2010, the municipal area encompassed 129.3 square kilometers, and there were 78 AGSN in the city (IBGE 2010). Figure 18.7 shows the extent of AGSN communities and the coverage of the Programa Médico de Família in Niterói (PMF-Niterói) in 2010.

Although small, Niterói played an important role in the development of Brazil’s modern public health system and its role in serving the urban poor. Prior to SUS, in the early 1980s, city officials from Niterói worked closely with Cuban public health officials to develop the PMF. Figure 18.8 illustrates the close relationship between Cuban officials and PMF-Niterói; Fidel Castro toured the city in 1999 to inaugurate a health post with then mayor Jorge Roberto Silveira. This program went on to serve as a model for SUS. In 2014, despite the program’s consistent under-financing, PMF supported 35 health posts, ten different kinds of polyclinics for appointments with specialists, and several different hospitals, including 24-hour emergency psychiatric and maternity hospitals.

Figure 18.8 Fidel Castro’s framed and preserved signature on the wall of a health post in Niterói, Brazil after his 1999 tour of the country.

Photo: R.E. Snyder, 2016.
Case 1: Maria and Prenatal Care

Maria is a 19-year-old woman living in a favela outside of Niterói’s city center. She works for a wealthy couple in the neighborhood of Icaraí, performing multiple tasks including cleaning, cooking, and caring for the family’s young children as a traditional doméstica. She completed nine years of school and comes from a family of six children. One day, Maria discovers that she is pregnant using a rapid home test when her period was four weeks late. She is the eldest daughter, and still lives with her parents, also being the first of her generation to become pregnant. Her aunt encourages her to go to the community health post, located near the base of Morro do Palácio. She has been relatively healthy and has infrequently attended the clinic since her childhood. She was last seen at the health post more than five years ago.

After confirming her pregnancy test at the health post, the community health workers (CHWs) enroll her in the prenatal program. SUS has an explicit emphasis on mothers and children, with CHWs carefully following all pregnant women until birth, ensuring attendance at all prenatal visits.
and guiding their care free of charge. Despite this, Maria unexpectedly misses one of her appointments because of a bout of diarrhea. After calling her and learning of her illness, the CHW heads to Maria’s house to perform a home prenatal visit and also ensure she remains hydrated in spite of her diarrhea. A few months later, Maria begins to show more overt signs of pregnancy. While her employers are understanding, she can no longer continue her work as a *doméstica* because it requires her to be physically active, and she loses her job and income.

After Maria’s child is born, the CHW visits her within a few days of her discharge from the hospital to begin well-child visits and ensure the child attends the clinic to receive all of her vaccinations. Before discharge, Maria is given a vaccination card, which she is asked to bring to every checkup with her newborn. The health post also organizes “vaccine days,” for which it generates press via traditional means (television, radio, fliers) as well as via word of mouth from health workers, and one such advertisement is seen in Figure 18.9.

**Discussion**

Free access to health posts and careful tracking of prenatal visits at the local level helped to ensure that Maria received care despite having lost her job as a *doméstica*. She faces challenges trying to find a new job and is exposed to other health problems such as diarrhea, possibly as a result of unsafe water. Although there are funding shortfalls that result in closures of health posts or occasional vaccine shortages at some health posts in Niterói, the CHWs were still able to follow Maria and enroll her child in services.

In many parts of the world, coverage of basic health services, including vaccination, continues to be less than adequate among the urban poor. For instance, in parts of India, only 43% of the urban poor aged 12–23 months were fully immunized in 2002 (Agarwal et al. 2005; APHRRC 2002; Fry et al. 2002). Vaccine coverage is closely related to low levels of maternal education, the presence and distance to health services, and the child’s mother’s land tenure status. Healthcare access may sometimes be validated with residency cards, which only come with a formal land title and government-issued identification. Specific to Brazil, until the late 1980s, vaccination rates for many major vaccines remained under 70%, far below what was required to achieve herd immunity (Domingues et al. 2012). However, in part owing to SUS’s explicit focus on maternal and child health and the free provision of vaccines, vaccination rates have risen, and in 2007 they were nearly universal for measles (100%), tetanus, diphtheria, and pertussis (98.2%) among children aged 12–23 months (Victora et al. 2016). The national vaccine calendar in Figure 18.10 highlights which vaccines are provided via SUS. These programs emphasizing local preventative care have been so successful that a survey of 27 Brazilian capitals in 2007–2008 actually reported slightly higher vaccination coverage among residents of low-income areas (81.2–86.2%) than among wealthier areas (77.2%) (Barata et al. 2012). Direct supervision of the vaccination schedule by CHWs in lower-income areas of Brazil contributes to the higher vaccination coverage compared to wealthier areas, which do not have community health posts and CHWs. Additionally, up-to-date vaccination cards are required to remain eligible for federal income assistance (e.g. *Bolsa Família*), further bolstering vaccine coverage in lower-income areas.

**Case 2: Joana and HIV Care**

Joana is 26 years old, and her family includes some of the community’s founders, who worked at a sardine factory in the old city. She was diagnosed with HIV after her first daughter passed away from the disease almost ten years earlier. While all women entering prenatal care in Brazil are tested for HIV, Joana’s first pregnancy was before SUS had been established in her community, and she did not receive prenatal care or testing. Joana’s mother had left the family when she was 14, and her father
was an alcoholic absentee. Needing to make ends meet to feed her and her three younger siblings, and without parental support to stay in school, Joana dropped out when she was 15 to start working. Almost one year before her first pregnancy, with regular employment hard to find, Joana turned to prostitution. When she discovered she was pregnant with her first child, the baby’s father was not supportive and Joana was unsure how she would otherwise afford to care for the child. This made it difficult for her and her new partner to accept her pregnancy, deterring her from seeking prenatal care, and leading to the loss of her child. After her diagnosis, Joana began visiting a clinic that specialized in HIV care. She also began highly active antiretroviral therapy (HAART), which she was able to obtain from a reference center, while the team at the local health post followed her to ensure

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<table>
<thead>
<tr>
<th>Target Group</th>
<th>Age</th>
<th>BCG</th>
<th>Hep-B</th>
<th>TDP, Hib-B, Hep-B, Polio</th>
<th>Pneumo 10v</th>
<th>Rotavirus</th>
<th>Mening-C</th>
<th>Yellow Fever</th>
<th>Hep-A**</th>
<th>MMR***</th>
<th>HPV</th>
<th>dTpa****</th>
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<tr>
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<td>2 mos.</td>
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</tr>
<tr>
<td>3 mos.</td>
<td></td>
<td>2 dose</td>
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<td>6 mos.</td>
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<td>9 mos.</td>
<td></td>
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<td>15 mos.</td>
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<td>1 booster (with TDP)</td>
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<td>1 booster (with TDP)</td>
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<td>2 booster (with TDP)</td>
<td>2 booster (with TDP)</td>
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<tr>
<td>9 years</td>
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<td>1 dose</td>
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<td>Adolescent</td>
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<td>3 doses²</td>
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<td>3 doses²</td>
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<tr>
<td>Adult</td>
<td>20-39 years</td>
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<td>1 dose</td>
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<tr>
<td>Elderly</td>
<td>60 years and up</td>
<td>3 doses²</td>
<td>3 doses²</td>
<td>3 doses²</td>
<td>3 doses²</td>
<td>3 doses²</td>
<td>3 doses²</td>
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<td>3 doses²</td>
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<tr>
<td>Pregnancy</td>
<td></td>
<td>1 dose</td>
<td>1 dose</td>
<td>1 dose</td>
<td>1 dose</td>
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<td>1 dose</td>
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</tbody>
</table>

* Figure 18.10  Brazilian national immunization calendar (2017).


** Notes:**

- TDP = Tetanus, diphtheria, and pertussis.
- * Administer one dose of the Pneumococcal 10V conjugate vaccine and the Meningitis C conjugate vaccine in children between two and four years old, who have not received the booster, or who have missed a previous vaccine.
- ** Administer one dose of the hepatitis A vaccine in children, between two and four years old, who have missed a previous vaccine.
- *** The “quad-vaccine” consists of the second dose of MMR vaccine plus the varicella vaccine. Children between two and four years who have not received any dose of the vaccine with varicella can receive one dose.
- **** Pregnant women who do not have the opportunity to be vaccinated during pregnancy have one dose of Tdap administered postpartum, as soon as possible. Tdap can also be offered by health professionals who work in maternity wards and neonatal units (conventional ICUs and kangaroo ICUs), attending recently born children and children up to one year old.
- † Verify the vaccination status of the individual.

Translated from Portuguese by R.E. Snyder.
HAART adherence. Community health workers from a nearby health post also conducted home visits to make contact and respond to any of her questions or concerns. Joana recently gave birth to another child, after completing all prenatal visits at the HIV referral center she was attending for her ongoing HIV care. Joana and her daughter, Ana Laura, were visited by community health workers during their first week home. The community health workers helped Joana with any issues she had when administering Ana Laura’s preventative antiretroviral treatment, and scheduled Ana Laura’s first appointment with physicians at the pediatric HIV referral center. They also gave her free infant formula provided by the Brazilian government for the first six months of her daughter’s life. When Ana Laura was five months old, Joana received notice that Ana Laura’s second viral load test collected at four months of age was undetectable, indicating that Ana Laura was not infected with HIV.

**Discussion**

The national policy for HIV care in Brazil has been internationally recognized for its success and is considered a global model for HIV treatment (Nunn et al. 2009). Beginning in the 1980s, Brazil began to implement several successful national campaigns that promoted HIV education and prevention. In the 1990s, Brazil instituted a number of innovative measures to treat those infected with HIV, and in 1996, despite the World Bank’s suggestions, it began providing free and universal access to HAART for HIV-positive individuals (Nunn et al. 2009). In recent years, HIV testing services have become more decentralized in an effort to improve the quality of service coverage. Rapid point-of-care tests have been introduced at primary healthcare units, also called health posts, and self-testing kits were made available at pharmacies and self-testing centers in 2015. After an initial diagnosis of HIV, patients are referred to specialized centers for HIV care (centros de referência), while health post staff continue to ensure medication adherence (Brazilian Ministry of Health 2015; Ministério da Saúde 2014). It is important to highlight HIV-infected individuals’ ability to remain anonymous, as they also have the opportunity to visit reference centers outside their community to obtain their medications instead of at their community’s health post.

As in other parts of the world, there was a dramatic change in the HIV epidemic after free and universal access to triple antiretroviral treatment in 1996 (Candiani et al. 2007; Cardoso et al. 2012; Marins et al. 2003). In addition to improving the health of HIV-infected individuals, vertical infection rates decreased from 25% to 1–2% in exposed children owing to the use of HAART and other measures intended to prevent mother-to-child transmission, such as promoting the use of formula instead of breastfeeding in HIV-positive mothers. Brazil has made reasonable progress towards the 90–90–90 targets set out by UNAIDS: by 2020, for 90% of people with HIV to know their status, 90% of those diagnosed to be on antiretroviral therapy, and 90% of these to have undetectable viral loads. Brazil achieved 83% of diagnoses in 2014, with 87% on antiretroviral therapy (UNAIDS 2016a), and possesses an expanding capacity to evaluate viral loads in its HIV-positive population (Candiani et al. 2007; Cardoso et al. 2012; Marins et al. 2003). Figure 18.11 shows one of the advertisements used to highlight the rights of Brazilians to obtain testing for HIV and other sexually transmitted diseases.

Despite this progress, Brazil still faces many challenges in combating HIV. In 2015, more than 830,000 people were living with HIV (a population prevalence of 0.4%), with roughly 15,000 HIV-related deaths reported in the same year, an increase since the mid-1980s (Barreto et al. 2011; Ministério da Saúde 2016a; UNAIDS 2016c). Although HIV prevalence in the general population is relatively low, it is higher in vulnerable populations, such as men who have sex with men (10.5%), female sex workers (4.9%), and injection drug users (5.9%) (Ministério da Saúde 2014; UNAIDS 2014). As in Joana’s story, many aspects of living in favelas contribute to an elevated risk of HIV infection: a lack of social support, lower education levels, limited employment opportunities, and a greater frequency of sex work. The country also needs to improve its early diagnosis and treatment
systems for the disease (Ramos et al. 2013). However, given the relative strength of the Brazilian HIV program and structure of SUS (e.g. CHWs provide local care and can seek and recapture those who have stopped treatment), as in Joana’s case, the country has had success in treating existing HIV infections, as well as reducing the incidence of new infections and vertical transmission of the disease (UNAIDS 2016b).

Case 3: Jonas and Tuberculosis Treatment

Jonas, 29, is very proud of the house that he helped build, where he lives with his wife and three children, who are one, three, and five years old. Even though it only has one bedroom and a small window in the entryway, he worked for several years and saved money to purchase building materials to improve his home. Earlier in the year, he developed a fever accompanied by sweating and chills. Several times, he found himself coughing up blood, and he also noticed that he lost more than 20 pounds in one month. However, he didn’t seek medical attention at the health facility next to his residence because he worked selling snacks on the train; missing one day would result in his family missing dinner. Three weeks after Jonas began to feel ill, two of his children also developed fevers and coughs. Jonas’s wife took all three of their children to the health post, where the children were diagnosed with pulmonary tuberculosis (TB). The contact tracing team from the health post investigated the potential index case and subsequently diagnosed Jonas with pulmonary TB as well. The mother was spared. In the middle of their six-month antibiotic courses, Jonas and his family

Figure 18.11 A poster encouraging individuals to complete AIDS and syphilis testing during prenatal care. It reads “Get tested for AIDS and syphilis during prenatal care. It is your and your baby’s right.”
were forced to relocate to a different *favela*, as the land where their house had been built had been reclaimed by the government after being deemed “environmentally unstable.” Even though Jonas’s family had been receiving directly observed treatment (DOT), and healthcare workers still called them daily after their first missed appointment, the family had trouble finding the time or money to take the longer trip to the old clinic from their new home, and for one month they were inconsistently treated. During that time, the youngest child’s condition worsened, and the doctors found that her TB had evolved into disseminated miliary TB. This new diagnosis meant that the child now had to complete an additional three months of treatment, as well as additional screening to rule out drug resistance. Fortunately at the end of the year the entire family was cured of TB.

**Discussion**

TB has deep social roots and is more common in resource-deprived populations. Adverse social conditions, such as high-density housing and poorly ventilated residences, promote the disease’s spread. It is transmitted through contact with respiratory droplets containing the TB bacillus after being coughed up by an infected individual. Owing to the increased risk of acquiring TB while living with an infected person, it is recommended that all household contacts of TB cases be tested for TB as well. In Brazil, minimum TB treatment length is six months, so adherence can be challenging. In the present case, adverse social conditions contributed to poor adherence and, in turn, a worse clinical outcome in Jonas’s child.

Current Brazilian recommendations for TB control were codified in 2011. This treatment scheme decentralizes TB control to the primary health network by expanding access to health services via SUS (Ministério da Saúde 2011). Such policies, coupled with the free treatment and directly observed therapy, yields a remarkably high cure rate when treatment is properly administered (Durovni 2013). Additionally, a recent analysis of the effectiveness of DOT showed that this DOT was actually more effective among residents of Rio’s *favelas* compared to when DOT was used in non-*favela* areas (Snyder et al. 2016). The pattern of disease in these communities highlights a new phenomenon in TB burden. As observed elsewhere, men have a higher TB burden than women in *favelas*, and the TB burden is higher in *favelas* than in non-*favela* areas in Rio. There is even evidence that some of Rio’s prisons serve as reservoirs for community transmission of TB (Sacchi et al. 2015), with TB prevalence ranging from 4.6% to 8.6% during a 2004 survey (Sánchez et al. 2007). This same survey conducted in three separate prisons found that 25.6%, 48.9%, and 61.8% of inmates self-reported living in *favelas* prior to entry.

**Case 4: Michele and Zika Infection**

Michele is 17 years old and recently gave birth to her second child. She attended prenatal care (six visits) at the primary health post in the community where she lives and underwent one ultrasound at 14 weeks gestational age that was normal. Michele did not repeat her ultrasound because it was too hard to make another appointment in the overburdened public health network. While the area where Michele lives has open sewers and there are lots of mosquitoes in and around her home, Michele, like most Brazilians, doesn’t use a mosquito net, as the most dangerous mosquitoes (*Aedes spp.*) that cause dengue and Zika bite during the day. Michele didn’t notice a rash or any other unusual symptoms during her pregnancy, such as fever, headache, joint or muscle pain, or red eyes. However, it seemed as though almost every other person in her neighborhood had some combination of rash and fever while Michele was pregnant. Michele’s baby was born at term with severe microcephaly (a head circumference of 25 centimeters, in the 1st percentile). Physicians also detected obvious alterations to her child’s hip structure that were suggestive of congenital infection by Zika virus (ZIKV). Her local health post referred her for care at the nearby hospital. This care includes...
specialists in neurology, infectious diseases, ophthalmology, otorhinolaryngology, and follow-up with others in her multi-professional team, which also includes physical, occupational, and speech therapists. At her first appointment with the treatment team, she was overwhelmed with information about her baby’s disease, and felt confused and hopeless about her baby’s future. The physicians reassured her that they would help her child succeed. Unfortunately, she has missed almost all of the consultations since her initial postnatal care in the hospital because there were frequent shootouts in her neighborhood and she was afraid to leave the house with her newborn child. However, the health team stayed in touch with Michele, and continued to schedule appointments in the hope that she could eventually attend. In addition, women in a WhatsApp messaging group called Super Mães Especiais—super special moms—help her stay up to date with medical information, keep in touch with the clinical team, and collaborate with a network of mothers in similar situations.

Discussion

In early 2015, the first case of ZIKV infection was identified in Northeast Brazil (Zanluca et al. 2015). In November of the same year, in the same region, there was also an increase in the number of cases of microcephaly among newborns from mothers infected with ZIKV during their pregnancy (Costa et al. 2016; Oliveira Melo et al. 2016). This epidemic peak of microcephaly in newborns occurred roughly nine months after the epidemic peak of ZIKV infection in February and March of the previous year (Ministério da Saúde 2016b). There is substantial evidence linking ZIKV to microcephaly and other diseases of the nervous system (França et al. 2016; Mlakar et al. 2016; Sarno et al. 2016), as well as eye damage, hearing loss, and joint disease (Ventura, Maia, Bravo-Filho, et al. 2016; Ventura, Maia, Ventura, et al. 2016). One of the greatest challenges in the diagnosis of congenital ZIKV infection is the fact that 80% of infected pregnant women are asymptomatic, which makes it difficult to identify those exposed to the virus during the prenatal period. Testing recommendations from the US Centers for Disease Control and Prevention have been in constant evolution since the introduction of the epidemic, as our understanding of the epidemiology of the disease has evolved in conjunction with our understanding of available diagnostic assays.

Our understanding of the long-term consequences of intrauterine exposure to ZIKV is still evolving, and what little we know about the negative consequences of the disease is likely only the tip of the iceberg. Evolving diagnostic criteria and poor surveillance for microcephaly in Brazil hindered diagnoses and epidemiological evaluations of longitudinal trends in ZIKV infection and resulting birth defects (Victora et al. 2016). Monitoring children exposed to the virus in long-term cohorts is critical to understanding the natural history of the disease (Costa et al. 2016; Oliveira Melo et al. 2016). In Brazil, follow-up of suspected or confirmed congenital ZIKV infection consists of regular pediatric, neurological, ophthalmological, auditory, and orthopedic evaluations until a ZIKV-exposed child’s third birthday (Ministério da Saúde 2017).

To date, there is no specific drug treatment for ZIKV infection, and intensive clinical follow-up of children exposed to the virus during the intrauterine period is the only known way to remediate the developmental impacts of congenital infection (Bogoch et al. 2016). Favela residents like Michele are not only more susceptible to mosquito-borne disease as a result of inadequate sanitation and higher frequency of mosquito bites, but they also can face difficulties in accessing follow-up care owing to ongoing violence in their communities, the cost of taking time off work, or paying for transport to the clinic.

Recent funding shortfalls, and gang activity displaced from the city of Rio de Janeiro to Niterói by the UPP program in Rio de Janeiro forced the suspension of some vector control activities in favelas in Niterói. Notably, prior to UPP actions in Rio de Janeiro, Niterói and much of the Baixada Fluminense region were relatively safe and gang-free. Violence in Niterói’s favelas prohibited vector activity.
Figure 18.12  These images, compiled from communities in the Rio de Janeiro metropolitan area, highlight the substandard municipal services in these communities that make them ideal for the spread of vector-borne disease, especially those spread by the *Aedes aegypti* mosquito.

control from implementing mosquito control measures in these communities, many of which have open drainage and sewers that are optimal for mosquito breeding. Figure 18.12 illustrates some of the infrastructure problems in these communities that contribute to the proliferation of mosquitoes.

The Future of Health in Brazil’s Favelas

Brazil’s and Rio de Janeiro’s favelas demonstrate how the unchecked growth of these communities, coupled with a century of explicit government exclusionary policies, can have adverse impacts on health. Rio de Janeiro’s long history of inequalities underscores the pervasiveness of the problem. There is no magic legislative bullet to counteract the disparate demographic and economic forces that led to favelas and the adverse health outcomes that we see today. However, Brazil’s integrated community-based health system provides a model for other countries seeking to offer some health-care options to their slum populations, as well as a well-structured opportunity for Brazil to continue to make investments and significant advances in population health.

In recent years, SUS has helped to reduce health inequalities related to diseases like HIV, tuberculosis, the Zika virus, and vaccine-preventable diseases. Yet challenges remain in the prevention and treatment of diseases in Brazil’s favelas that cannot be overcome solely with healthcare reform and improvements in funding and staffing in SUS. SUS has fallen short when trying to address issues like mosquito-borne disease and diabetes. Some aspects of the health system have been shifted to react to children affected by the Zika virus, yet these investments must be sustained, and additional investments must be made to prevent the proliferation of the conditions that led to the vector’s spread. Additionally, structural problems such as violence, poor nutrition, lack of health literacy, and economic pressures are omnipresent counterweights to any improvements made via SUS.

Despite Brazil’s upward mobility at the beginning of the 21st century, as demonstrated by its recent classification as an upper-middle-income economy country by the World Bank, the economy has slowed in recent years. Major political figures and the ruling parties they represent have been crippled by falling global oil prices, massive corruption scandals, and global austerity. Dilma Rousseff, the first female president of Brazil, was removed from office by impeachment in August of 2016, ending 13 years of rule by the left-of-center Workers Party (Partido dos Trabalhadores). The state of Rio de Janeiro is bankrupt and is months behind in payments to many state employees, including healthcare personnel in primary health posts. In 2016, the federal government, led by Michel Temer and the right-leaning Brazilian Democratic Movement Party, passed a federal and constitutionally mandated spending cap for the next 20 years. These freezes will result in absolute decreases in health and educational expenditures over time and are a dramatic turn from the more socially progressive policies enacted at the beginning of the 21st century in Brazil. Residents of favelas and other vulnerable groups will be among the first to suffer from these policies (Watts 2016). The UN special rapporteur on extreme poverty and human rights in 2016, Philip Alston, decried its potential impact: “If this amendment is adopted it will place Brazil in a socially retrogressive category all of its own.”

As three of the case studies above have illustrated, promoting gender equity and addressing women’s health will be essential to improving health outcomes in favelas. In recent years, the country has succeeded in reducing the fertility rate below replacement level—to 1.9—since the 1960s (Gorney 2011), and also offers birth control pills via SUS at no cost. In 2006, Brazil introduced the Maria da Penha law. The law, named after a woman who in 1983 was left paralyzed by her husband after being a victim of domestic violence, increased criminal penalties for those committing domestic abuse, established special courts for prosecuting domestic violence, and required authorities to establish 24-hour shelters for victims (Brasil 2006).

However, important gender-related issues remain. Abortion is still illegal, except in cases of rape or when the pregnancy threatens the woman’s life. Despite passage of the Maria da Penha law, domestic violence remains a major problem nationwide. In 2013, the female homicide rate was
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4.8 per 100,000, fifth out of 83 countries ranked. While homicide rates in the country dipped at the beginning of the 21st century, they have begun to creep up recently, especially among minority women (Waiselfisz 2015). In another Brazilian city, Salvador, researchers identified a higher burden of hypertension among women than men in the same favela, as well as a greater disparity in the difference in rates of obesity between women inside and outside of the favela (Snyder et al. 2017a). This underscores the complexity of disparities inside these communities and the potential that differences in gender roles can have on health outcomes. Traditional gender roles in many of these communities have men performing manual labor and engaged in jobs that require physical activity, such as manual construction or street vending, whereas women are more often tasked with jobs related to child care and home care (even, for example, if it is preparing food for the men to sell as street vendors).

The role of the communities themselves in responding to the threats facing them should not be understated. There are a plethora of examples describing residents of favelas organizing themselves in the absence of formal state programs and to supplement already existing programs. In Niterói, there is a logistical, social, and psychological support group for women raising children with congenital Zika syndrome, organized through WhatsApp, which they named Super Mães Especiais (Lovero and Cardoso 2017). Also in Niterói, researchers worked with residents of a community to produce a diabetes-prevention-themed music video called O Dia de Dona Maria Manuela (see www.youtube.com/watch?v=p80BNySqxk). It was made available on YouTube under the same name for any Portuguese-speaker to access (Snyder et al. 2017b).

Unfortunately, there are times when a community’s organization and response are not enough to overcome the scale of these generational inequities. Explicit efforts must be undertaken by scientists and civil employees to collect high-quality health data, while also training residents of these communities to analyze them. Furthermore, available data on criminal indices must be made at small-scale geographical resolution, so that aggregate values can be calculated for these communities and compared with those around them to design targeted violence-reduction programs. Researchers and health officials should be encouraged to include geographical analyses of their data, not only promoting a better understanding of community health, but also enhancing our ability to evaluate the effects of interventions. These efforts must be coupled with simultaneous work by geographers, to develop standardized definitions for these communities, while delineating their geographical boundaries, such as those undertaken in the 2010 Brazilian Census.

The health of these communities depends not only on the healthcare system that serves their residents, but on a collaborative effort across government, academics, economists, educators, other professionals, and most importantly the residents themselves to address the underlying conditions that promote poor health in this population. Without efforts to improve housing, promote clean water, install proper sewage systems, ensure access to education, and increase employment in these communities, the health inequalities that exist between favela residents and their urban counterparts will not be addressed.

References
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Snyder, R.E., Oliveira, L.R., Ribeiro, C., and Corrêa, M.R. 2017b. Differences in the prevalence of non-communicable disease between slum dwellers and the general population in a large urban area in Brazil. *Tropical Medicine and Infectious Disease*, 1381.


