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Making unhealthy places: The built environment and non-communicable diseases in Khayelitsha, Cape Town

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ABSTRACT

In this paper, we examine how economic, social and political forces impact on NCDs in Khayelitsha (a predominantly low income area in Cape Town, South Africa) through their shaping of the built environment. The paper draws on literature reviews and ethnographic fieldwork undertaken in Khayelitsha. The three main pathways through which the built environment of the area impacts on NCDs are through a complex food environment in which it is difficult to achieve food security, an environment that is not conducive to safe physical activity, and high levels of depression and stress (linked to, amongst other factors, poverty, crime and fear of crime). All of these factors are at least partially linked to the isolated, segregated and monofunctional nature of Khayelitsha. The paper highlights that in order to effectively address urban health challenges, we need to understand how economic, social and political forces impact on NCDs through the way they shape built environments.

1. Introduction

This paper is concerned with non-communicable diseases (NCDs) in Khayelitsha, a predominantly low income area in Cape Town. In particular, it focuses on how Khayelitsha was shaped by, and continues to be shaped by, economic, social and political forces, and how the resulting built environment impacts on NCDs. Initially, apartheid planning created Khayelitsha in the 1980s as a racially segregated residential area for poor people on the urban periphery. From the 1990s onwards, economic conditions and policies changed, resulting in some changes in the built environment of Khayelitsha, but, on the whole, these shifts have tended to reinforce the area's marginalisation. The built environment of Khayelitsha continues to have a negative impact on the health and wellbeing of residents, resulting in extremely high prevalence of NCDs.

There have been only a few studies that have attempted to examine how economic, social and political forces manifest in built environments that impact negatively on the health of residents. For example, Krieger's (2011, 2012) work suggests that these forces can manifest in various ways and "people literally embody, biologically, their lived experience, in societal and ecologic context, thereby creating population patterns of health and disease" (Krieger, 2011, p. 215). However, there has been relatively little work on NCDs in cities of the global South (Dalal et al., 2011; Ebrahim et al., 2013), and almost nothing of relevance to the relationship between the built environment and NCDs in the global South. Where scholars have examined the urban environment or built environment and health in cities in the global South, they have tended to focus on environmental health issues resulting from inadequate water, sanitation, stormwater drainage, energy supply and shelter, rather than NCDs; a typical example is Sverdlik's (2011) review of health in informal settlements which, of its twenty four and a half pages of text, spends one and a half pages on NCDs. Herrick (2014) notes that the link between health and urban planning is still seldom recognised in the global South.

Our paper adds to and complements the work on how economic, social and political forces can manifest in built environments that impact negatively on the health, specifically NCDs, of residents, through examining how these forces impact on NCDs in Khayelitsha through the shaping of the built environment. The

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paper draws on literature reviews of the relationship between the built environment and NCDs and of the historical context, and on ethnographic fieldwork undertaken in three different neighbourhoods of Khayelitsha. The fieldwork focused on residents' perceptions of how their neighbourhood environments impacted on their health and wellbeing.

First, the various links between built environments and NCDs are discussed. Second, the evolving context of Khayelitsha since its establishment in the 1980s is examined, showing how economic, social and political forces have played, and continue to play, a role in shaping the built environment and NCDs. The key features of Khayelitsha's built environment include: its isolated location as a separate township on the periphery of Cape Town; its origin as a segregated area for largely low-income black Africans; and (despite a few shopping malls, a few major community facilities and some informal economic activity) its largely monofunctional residential nature. The fieldwork method is then briefly introduced, and the findings on the ongoing impact of the built environment in Khayelitsha on residents with regard to NCDs are discussed. Finally, we reflect on the factors underlying the creation of areas like Khayelitsha (which continue to result in the creation of similar areas), and the ongoing challenge this presents for addressing the growing incidence of NCDs in cities in the global South.

2. The built environment and NCDs

The World Health Organization (WHO) identifies the main NCDs as "cardiovascular diseases, diabetes, cancers and chronic respiratory diseases" (WHO, 2011, p. 1), but there are a range of other NCDs, including mental disorders such as depression and post-traumatic stress disorder (WHO, 2008). NCDs, are growing rapidly in the global South, and it is estimated that by 2020, NCDs may account for 69 per cent of all deaths in the global South (Allender et al., 2008). The four main behavioural risk factors for NCDs are "tobacco use, physical inactivity, harmful use of alcohol and unhealthy diet" (WHO, 2011, p. 1). There are, however, a range of other risk factors; for example, in addition to being NCDs themselves, mental disorders such as depression and anxiety increase the risk of other NCDs (Prince et al., 2007). Although public health discourse tends to focus on lifestyle (and non-communicable diseases are sometimes even referred to as "diseases of lifestyle"), in recent decades there has been increasing recognition that the urban environment and built environment can have a significant (although complex and difficult to quantify) impact on human health (Cummins et al., 2007; Diez Roux, 2003; Macintyre et al., 2002; Perdue et al., 2003; Rao et al., 2007; Vlahov et al., 2007). The health settings approach is also useful for understanding the complex relationships between health and place, as it recognises that health settings – which are "the place or social context in which people engage in daily activities in which environmental, organisational and personal factors interact to affect health and wellbeing" (WHO, 1998, p. 19) – are "themselves important and modifiable determinants of health and wellbeing, both directly and indirectly" (Dooris et al., 2007, p. 328).

The terms "urban environment" and "built environment" are often used interchangeably but should be understood as different things. Vlahov and Galea (2002) subdivide the urban environment into three main components in terms of relevance to health: the social environment, the physical environment, and the provision of health and social services. The physical environment, in turn, can be subdivided into the natural environment – which can be conceptualized as providing ecosystem services, which have a profound impact on human health (Millennium Ecosystem Assessment, 2005; Sala et al., 2009) – and the built environment. A useful definition of the built environment is that it consists of "all buildings, spaces, and products that are created or modified by people" (Rao et al., 2007, p. 1111). Rural areas naturally also have built environments, and these also impact on health (for example, see Merchant et al., 2006), but almost all scholars who write about built environments mean the term to refer to urban built environments. Of course, these different components of the urban environment are closely related to each other: the social environment impacts on the built environment (for example, the physical form of residential areas generally clearly reflects the socio-economic status of residents) and the built environment impacts on the social environment (for example, residents of spatially segregated areas may find it harder to engage with communities and in activities located outside the area in which they live).

Most of the literature of relevance to the relationship between the built environment and NCDs exists in four, largely separate, bodies of work on built environments and physical activity, built environments and food (and a few related pieces of work on alcohol), built environments and mental health, and a body of work on urban planning (which is inherently mainly concerned with the built environment) and health.

These first two bodies of work are partially related in that they start from the premise that obesity increases the risk of developing many NCDs and that obesity occurs more frequently when there is "high energy intake and low energy expenditure" (Hill and Peters, 1998, p. 1371). In this view, therefore, the two main ways that the built environment can impact on obesity are through access to food and the extent to which the built environment is conducive for physical activity. This is the "obesogenic environment thesis" (for example, Hill and Peters, 1998; Lake and Townshend, 2006; Townshend and Lake, 2009). Both the underlying assumptions of what causes obesity and attempts to link the built environment to obesity have been criticized (for example, by Guthman, 2013), but there is growing evidence that the built environment has at least some impact on NCDs, however hard this is to quantify.

The most-studied relationship between the built environment and NCDs is the impact of the built environment on physical activity, for example, whether the layouts and design of streets are conducive to walking and cycling, whether there is a mix of land uses that encourages walking and cycling to a range of local destinations, and whether there are suitable spaces, such as parks and sportsfields for range of outdoor activities. There has been a large body of work on this, mainly in the global North (for example, Handy et al., 2002; McCormack and Shiell, 2011; Saelens et al., 2003).

In terms of food availability, some of the commonly identified ways in which the built environment can impact on obesity, and thus NCDs, is through the nature and location of food outlets (linked to the concept of "food deserts" , which are low-income residential areas in which nutritious foods are hard to access) and the extent of urban agriculture (Alkon et al., 2013; Dixon et al., 2007). In addition, alcohol consumption is linked to NCDs, and the type and location of alcohol outlets are therefore important (Bernstein et al., 2007; Parry et al., 2011).

A relatively under-explored link between the built environment and NCDs is how the built environment can impact on mental health. Mental disorders such as depression and anxiety are not only NCDs themselves, but also increase the risk of other NCDs (Prince et al., 2007). There is a body of work that suggests that well-maintained areas with legible planning layouts and access to green space seem to be more conducive to good mental health (Evans, 2003; Galea et al., 2005; Sullivan and Chang, 2011). Violence and injuries are important risk factors for mental disorders such as depression, anxiety and post-traumatic stress disorder (Prince et al., 2007; Seedat et al., 2009). Of particular importance, crime and fear of crime can have a significant impact on

mental health (Lorenc et al., 2012). Although there are many social factors that can result in high levels of violence and injuries (for example, see Seedat et al., 2009), the built environment can directly influence levels of crime, and fear of crime, in various ways, for example, through the design of buildings and public spaces (Newman, 1972; Schweitzer et al., 1999). In addition, there is evidence to suggest that spatial segregation and isolation may increase levels of crime (Shihadeh and Flynn, 1996). The built environment can also directly influence the prevalence of injuries, for example, dense informal settlements are particularly at risk of fires and burn injuries (Sverdlik, 2011).

The literature on urban planning and health attempts, in varying ways, to bring together the different bodies of work relating to the relationship between the built environment and health (for example, Smit et al., 2011; Boarnet and Takahashi, 2005; Frank and Kavage, 2008). Over and above direct impacts on the risk factors for NCDs, the built environment can also impact on income. For example, where low-income residential areas are located far from concentrations of employment, the ensuing transportation costs and transportation time can place a high burden on poor households (Srinivasan et al., 2003). Similarly, the uneven distribution of community facilities (such as schools, libraries, clinics, parks and playgrounds) can also result in residents of deprived areas having poorer access to many of the benefits of urban life (Capon and Blakely, 2007; Verter and LaPierre, 2002).

There has been some recognition that interventions in the built environment can impact on NCDs, for example, the NCD Alliance briefing paper "Nutrition, physical activity and NCD prevention" lists one of the three steps to preventing NCDs as: "Create and maintain activity-friendly built and external environments that encourage physical activity and other healthy behaviours" (NCD Alliance, 2011, p. 3). Healthy planning guidelines go further, listing numerous ways in which planners can create healthier urban environments (for example, Barton and Tsourou, 2000). As discussed elsewhere, however, this body of work is largely based on experiences in the global North and are only partially relevant in the global South, where states are usually weaker and levels of poverty and informality are higher (for example, see Smit and Pieterse, 2014).

3. Context of Khayelitsha

Cape Town's levels of inequality are amongst the highest in the world, with a Gini coefficient higher than any other non-South African city (UN-Habitat, 2010). Khayelitsha, located in the south-eastern part of the City of Cape Town municipal area (see Fig. 1), is the largest concentration of poverty in the city: the unemployment rate (expanded definition, which includes discouraged work seekers) is 41.7%, and 54.5% of households in Khayelitsha live in informal dwellings (City of Cape Town, 2013). Just over 10% of the population of Cape Town live in Khayelitsha – 392,000 of Cape Town's 3.7 million residents, according to the 2011 Census (City of Cape Town, 2012, 2013). The Khayelitsha health sub-district has the worst health indicators in Cape Town, as can be seen by comparison with the most recent indicators for Cape Town as a whole and for the Southern sub-district, which has the best health conditions in Cape Town (see Table 1). The mortality rates for stroke, hypertensive disease and diabetes mellitus are particularly high compared to the rest of Cape Town; the mortality rate for hypertensive disease for women in the Khayelitsha sub-district is more than three times the average for Cape Town as a whole (see Table 2).

To understand why Khayelitsha exists as a large, isolated, largely poor dormitory suburb on the periphery of Cape Town, it is necessary to understand the history of segregated residential development in Cape Town, and how Khayelitsha was the latest in a long line of segregated townships for black Africans. Each one was built further and further out from the central city.

The roots of racially-segregated residential areas in Cape Town date back to 1901, when there was an outbreak of bubonic plague in Cape Town, and the Cape Town Council "decided that a location should be built so that Africans could be housed under controlled and sanitary conditions" (Maylam 1990, p. 61). As a result, the

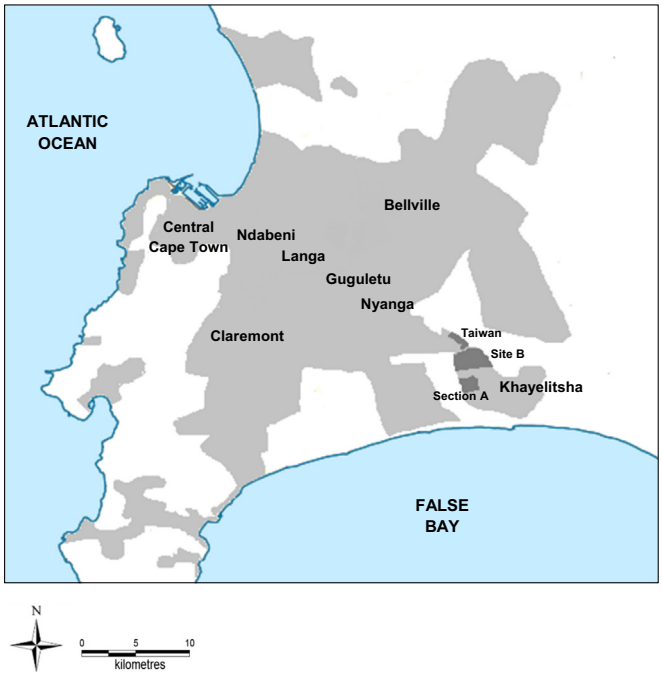

Fig. 1. Cape Town, showing current built-up area and places mentioned in the text. Source: Author

Table 1
Health inequities: average age-standardized mortality rates per 100,000 people for the Khayelitsha and South Peninsula sub-districts and Cape Town 2001–2006. Source: Groenewald et al. (2010).

Indicator	Khayelitsha sub-district	Southern sub-district	Cape Town
Non-communicable disease	844	526	618
HIV/AIDS	229	30	79
Other communicable diseases	321	82	135
Homicide	111	26	58
Traffic accidents	59	13	27
Total	1619	713	956

Table 2
Age-standardized mortality rates per 100,000 for selected NCDs in Khayelitsha and Cape Town 2001–2006.Source: Groenewald et al. (2010), p. 447.

Condition	Khayelitsha health district		Cape Town total	
	Males	Females	Males	Females
Ischaemic heart disease	21.7	22.1	106.8	64.0
Stroke	125.8	131.5	84.3	76.4
Hypertensive disease	81.4	125.8	35.4	40.8
Diabetes mellitus	89.0	122.9	64.0	70.3
Lung cancer	63.2	24.4	59.4	24.8
Chronic obstructive pulmonary disease	60.8	9.5	56.9	22.0

segregated settlement of Ndabeni was established, 7 km east of the city centre, beyond the urban edge of the time (Cook, 1986). As Cape Town expanded, the local government decided to relocate the residents of Ndabeni further away, and in 1922, they were forcibly relocated to the new segregated township of Langa, 5 km SE of Ndabeni (Cook, 1986). In the 1950s, attempts at racial segregation accelerated, with "the construction of vast African townships. According to the apartheid 'ideal' these townships were to be sited as far as possible from white residential areas… Spatial separation was to be reinforced by buffer zones and by natural or other barriers" (Maylam 1990, pp. 69–70). In Cape Town during the 1950s and 1960s, the townships of Nyanga and Guguletu were built according to this approach.[1]

In March 1983, it was announced that black Africans "legally resident in Metropolitan Cape Town would be housed in Khayelitsha", a new town to be established beyond the urban edge (Cook, 1986, p. 57). Core houses were built for residents who had legal permission to be in Cape Town and serviced sites were provided for "illegal" residents to build shacks on.

Khayelitsha was specifically planned to be remote and isolated. Cook (1986, p. 64) noted at the time that "the 2100 ha site selected for the town lies well beyond the main built-up area and is 39 km from central Cape Town. The dune land, with low lying areas subject to seasonal flooding, is not regarded as highly desirable". In addition, it was specifically intended as a solely residential area: "No sites have been set aside within Khayelitsha for industrial purposes. … The satellite nature of the town is further highlighted by official encouragement given to the local bus company to provide essential links to work and the nearest shopping centre in Mitchell's Plain" (Cook, 1986, p. 62).

Since South Africa's transition to democracy in the early 1990s, there have been many changes in South African townships such as Khayelitsha, including "a large amount of informal commercial and industrial activity, expanded shopping centre life and intensified differentiation between rich and poor neighbourhoods" (Freund, 2010, p. 292). A large-scale urban renewal programme has been implemented in Khayelitsha, with much investment in infrastructure and facilities (Donaldson et al., 2013; Ngxiza, 2012). One of the most tangible changes has been the rapid growth of informal settlements, resulting in Khayelitsha becoming a mix of formal and informal housing, with the majority of households living in informal dwellings (City of Cape Town, 2013).

At the city scale, social and economic changes have tended to reinforce the marginalisation of areas such as Khayelitsha. South African cities have increasingly come to resemble other aspirant world class cities in the global South (Murray, 2004). Crankshaw (2012, p. 857) suggests that "the emerging post-Fordist spatial order of Cape Town" can be characterized by increased division "between racially-mixed middle-class neighbourhoods, on one hand, and black working-class neighbourhoods characterized by high levels of unemployment, on the other". Similarly, de Swardt et al., (2005, pp. 101–102) note that the residents of Khayelitsha "are simultaneously thoroughly dependent on the city's economy and deeply marginalized within it… jobs are still scarce and the majority of livelihoods are still eked out in the informal and survival sectors. Most of the inhabitants live in poverty, and are thoroughly incorporated into an urbanized and monetized economy within which they have a marginal status".

[1] For more on the complex history of Cape Town, and racial terminology, see Wilkinson (2000).

4. Research method

In addition to literature reviews of the theoretical framework and context, fieldwork was undertaken to examine the extent to which residents see the built environment impacting on NCDs and other forms of illness in three areas within Khayelitsha: the oldest formal part of Khayelitsha (Section A), a site and service area which has generally been upgraded with formal dwellings (Site B), and an informal settlement known as Taiwan (for more details, see Smit et al., 2014). In each of the three areas, "body map" workshops were organised with 10 participants each. A well-known research method in medical anthropology, body mapping is a technique that allows for the exploration of people's knowledge about their bodies, health and social environments, unhindered by possible biases or assumptions present in researchers (Cornwall, 1992). Over the course of five days, participants gradually worked on tracing the outlines of their body, drawing the organs inside as they knew them, and then annotating these drawings to represent different aspects of their health and wellbeing (for example, adding "scars to the skin" and "scars under the skin"). Participants were also asked to draw their life histories onto the maps: where they were born, what that area looked like, when and how they moved to Cape Town, the area they reside in now, and so on. Colour codes were used to express people's emotions about their living environments (for example, red for danger). Fig. 2 shows examples of body maps, drawn by a woman and man from the Taiwan settlement. These representations of the body and their socio-economic environments were then used to guide group discussions, interviews and probes into issues of health and wellbeing, and how these are affected by their living environments (for more information on the body mapping technique, see for example Mendelson and Almeleh, 2004). All discussions were recorded and transcribed.

Participants varied in age from 18 to people in their 60s. Because the workshops took five days, none of the participants were currently in long-term employment, but there were a number of participants who occasionally found short-term employment. Some participants were not detailed about their employment

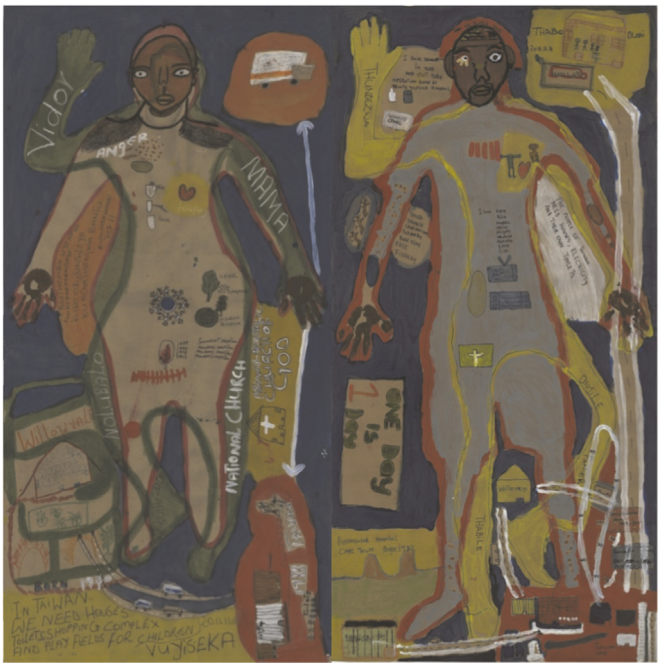

Fig. 2. Examples of body maps drawn by participants in the Taiwan settlement. (For interpretation of the references to colour in this figure, the reader is referred to the web version of this article.)

history, but we estimate that up to about 20% of the participants had some history of short-term employment. In addition, some of these participants had previous experiences of being in long-term employment.

We recruited people who lived within particular neighbourhoods. All participants were isiXhosa-speaking black Africans who were South African citizens, but we attempted to get a balance of males/females and age groups. The three workshops had similar mixes of people, but differed mainly in terms of socio-economic status, with participants from the Taiwan settlement being significantly poorer than those from the other two areas.

5. Fieldwork findings

Our fieldwork investigated residents' perceptions of how their environment impacted on NCDs and other forms of illness. The fieldwork confirmed that residents felt that the built environment had a large, and multi-faceted, impact on their health.

The first thing to note is that conditions vary considerably between the three areas. In Section A, people have formal houses with running water, flush toilets and electricity, and the streets are well maintained. Site B was a serviced site area where people originally lived in shacks on serviced plots, but these generally have been upgraded to formal houses over time. In Taiwan, people lived in shacks with access only to communal taps and toilets, and many houses did not have electricity connections.

The fact that Khayelitsha is an isolated, segregated, mainly residential area with restricted access to economic opportunities impacts on NCDs is a variety of ways. The three main ways in which the built environment of Khayelitsha has a negative impact on NCDs (food, physical activity and depression/stress) are discussed below.

5.1. Food

Although Khayelitsha was initially planned and built with limited provision for formal retail facilities, a network of small informal shops (known as *spaza* shops) soon emerged. In the past decade, a number of shopping malls, which include supermarkets, have been established in Khayelitsha. This has resulted in a complex food environment, typical of "food deserts" in African cities: "poor, often informal, urban neighbourhoods characterized by high food insecurity and low dietary diversity, with multiple market and non-market food sources but variable household access to food" (Battersby and Crush, 2014, p. 143). The net result is that for most households, getting sufficient, and healthy, food to eat is a constant struggle.

Respondents said that they generally do their major (weekly or monthly) grocery shopping at one of the local malls or at a larger one in the nearby township of Mitchells Plain. Larger shopping rounds usually consist of canned food, flour, rice and sometimes meat. Several participants in the Taiwan area said that they do their shopping at the Site B Mall – they travel there by train, and then they take a taxi back (at a cost of R4).[2] For residents who shop at the much closer Thembani Shopping Centre, it is a 25 min walk (but as another respondent added, "For an elderly person it can even take an hour and a half"). For smaller, ad hoc food purchases, or weekly fruit and vegetable shopping, residents use the local *spaza* shops or the enormous number of informal retailers selling fresh fruit and vegetables. One respondent from Site A described the reasoning behind this: "for small things… you can't go to Pick 'n Pay [a large supermarket chain], pay R6.50, just for a pint of milk. It's R16 for a taxi [to get to the mall]".

People who lived in shacks without access to electricity had to strategise about how to keep perishable food fresh. They either had to buy electricity (illegally) from neighbours or ask neighbours with electricity and refrigerators to store food for them. Often, however, this led to conflict. For example, participants spoke of going to fetch their food from the neighbour's refrigerator, only to find it had been eaten. Others spoke about having to store their food in buckets, which would attract "rats as large as cats" as one of the participants described it. The rodents would bite through the buckets and eat the food.

In addition to the problems of having to travel long distances to undertake their major shopping (often at a substantial cost), and problems with the storage of perishable foods, many participants mentioned that money was often tight and that they sometimes ran out of food and had no money to buy more.

Khayelitsha was planned as a residential dormitory township, and no provision was made for urban agriculture. Although there are some community vegetable gardens in the area, only a few houses have vegetable patches, and none of the participants mentioned using such gardens for their food supply. This is similar to the findings of de Swardt et al. (2005) who found that only 3 per cent of households in Khayelitsha had home food gardens.

Given the difficulties listed above, it is not surprising that eating healthily was not a priority for most residents. Although a few respondents with specific health issues, such as high blood pressure or heart problems, were very conscious of eating what they regarded as healthy foods, probably more typical, especially of the younger generation, was the young man who wrote on his body map: "I eat a lot of junk food and I drink a lot of alcohol to socialise. That's how I live". Similarly, one young woman said: "I eat lots of junk as well. … Lots of sweets. Lots of oily stuff".

5.2. Physical activity

There are considerable differences between the various parts of Khayelitsha. The physical environment of the formal part of Khayelitsha seems, at first sight, to be fairly conducive to outdoor physical activity. There are a number of sports facilities and parks in the more formal areas, although it should be noted that these areas generally are less well supplied with community neighbourhood parks than is the case with more affluent areas in Cape Town (Willemse, 2013). With a few exceptions, however, the facilities that are available in Khayelitsha are badly maintained, and considered dangerous to use by residents. Some of the young men from Section A talked about a local park that they cannot use anymore because "the thugs have vandalised it all; there used to be things that children could play on, but not anymore". In addition, *tik* (methamphetamine) smokers frequent such playgrounds, so mothers cannot let even their older children go there unsupervised.

Informal areas such as Taiwan have no parks or playgrounds at all. The density of the settlement is so high that there are no clear and clean spaces for children to play close to their houses. One participant who ran an informal crèche described how she and the children "usually just play here in between these dirty streets". Another respondent described how young boys would venture a little further away from the area, to go and play on the stretch of grass between the settlement and the freeway, risking their lives whenever a soccer ball gets kicked near the road. While boys are generally allowed to play on their own, we were told more than once that "girls have to play nearer to the house" because "they get taken away and raped".

Residents see physical activity as important. In all three areas, people spoke about "taking walks" for exercise. However, use of

[2] R4 is equivalent to about US$ 0.30. The median household income in Khayelitsha is about R1600 (about US$ 130) per month (City of Cape Town, 2013).

streets and other public spaces for walking is greatly constrained by fear of crime and violence. People do not go out at night, they plan their walking routes to avoid public open spaces, and they avoid residential areas other than where they live and stick to walking along main roads. One of the women in the Taiwan settlement said that "on big roads… we won't get robbed". Another woman from the Taiwan area described taking an hour long walk to attend her church: "It's not safe to go there because sometimes when we are walking these kids [young people] will apprehend us… if you have whatever little money with you they can even snatch that from you, even if it's just R10, they will take it."

The reasons why Khayelitsha is not conducive for walking and many other forms of outdoor activity are complex. At one level, major roads and public spaces such as parks have not been planned to be safe, as houses do not front on to these spaces, many areas lack street lighting and the multitude of through-routes in most of Khayelitsha means that community surveillance is difficult. Potential criminals therefore have many potential hideaways and multiple escape routes. In addition, Khayelithsa's isolation is also a major constraint to walking and cycling, as Cape Town's major facilities and shopping centres can only be reached by car or public transport, so the range of destinations residents can walk or cycle to is severely limited.

5.3. Depression and stress

Fear of crime is pervasive in Khayelitsha and is a major source of depression and stress, which is potentially a risk factor for NCDs. For example, one respondent said that she used to walk at night, but "[n]ow I prefer to stay in my house at all times, with the door and burglar gate locked. I trust no one". The narrow winding streets of Taiwan and Site B were singled out as being particularly dangerous. The situation is particularly bad in informal areas such as Taiwan, where the narrow, sandy lanes do not allow police cars to pass through, and police have generally been found not to patrol on foot in the informal sections (Khayelitsha Commission of Inquiry, 2014). One woman who lived in the formal part of Khayelitsha said that she is scared to go to the informal and site-and-service areas of Khayelitsha: "There are lots of informal shacks, it is all informal housing, no streets, just small narrow paths with lots of corners, and that is where you get attacked, or robbed, or worse".

These fears are not irrational - police statistics show that the Khayelitsha police district has very high crime rates (for example, Provincial Government of the Western Cape, 2006), and this is borne out by the high homicide rate reflected in Table 1. Although it is difficult to quantify, it is likely that the isolation and segregation of Khayelitsha has contributed to the high levels of crime in the area. Inappropriate street layouts and lack of street lighting in many areas exacerbate the problem (Brunn and Wilson, 2013).

In addition to violence and crime, depression and stress among participants in all three areas were also clearly influenced by socio-economic factors such as poverty and unemployment, bad living conditions, and, especially in Taiwan, people's sense of inability to create for themselves a life and living environment that they would consider healthy, safe and dignified. One of the very many examples is that of a man in Section A, who explained that "poverty makes me sad. Because here in the community, most of the people are unemployed". Similarly, a woman in Taiwan told us: "generally not having money, that stresses me".

Stress was also directly influenced by people's housing and living environment. This was especially noticeable in the dense informal settlement of Taiwan. As many in that area pointed out: "it is not good living here" , or "this is not a good place". In addition, residents in the Taiwan settlement were also plagued by fear of fire, as fires often sweep through the shack settlements.

Whereas people in the formal housing area of Khayelitsha at least felt more protected from crime and violence when they were inside their houses, inhabitants of Taiwan described not being safe even inside their houses. One man said that he was usually awake at night to listen out for gunfights, as the bullets would make their way through the walls of the shack and he would need to take cover under his bed. One woman said she would get scared when she heard "guns! When they are fighting outside!". One young man described it as follows: "What makes me angry in Taiwan is that people are fighting and some are shooting one another… you will always be hearing gunshots outside".

Another source of stress for many were the numerous shebeens (informal drinking establishments). Khayelitsha's shebeens gave rise to feelings of powerlessness among those who live close by, who are fearful of fighting outside the shebeens, and cannot sleep until the noise in the shebeens dies down, often only early in the mornings. In addition, some mothers were worried about the effect of shebeens on their children.

6. Conclusion

The example of Khayelitsha demonstrates how economic, social and political forces can result in the establishment of an isolated and segregated residential area of largely poor households with limited access to economic opportunities, limited opportunities for safe physical activity and healthy food options, and high levels of depression and stress. The net result is that the environment of Khayelitsha is not conducive to good health or healthy lifestyles, and the area has the worst health conditions (including NCDs) in Cape Town. Changes over the past two decades have resulted in more public and private investment in areas such as Khayelitsha (community facilities, shopping malls), but at the same time have widened income divides and decreased the possibility of formal employment, thus reinforcing the marginalisation of residents.

Khayelitsha is more than a historical curiosity. Many new segregated low-income housing developments are being planned and implemented in Cape Town and elsewhere in the global South. For example, Delft South, a large new housing area in Cape Town is also poorly located and isolated, with limited local economic opportunities, and with high travel costs for those who wish to travel out of the area (Development Action Group, 2007).

Tackling NCDs clearly requires both lifestyle interventions and interventions in the urban environment. However, as the case of Khayelitsha demonstrates, it is important to recognise the pervasiveness of the economic, social and political forces underpinning built environments such as these. Although Cape Town is an extreme example of inequity and exclusion, and how this can negatively impact on health, the same broad patterns and trends can be found in most cities. Understanding these patterns and trends is an important first step in tackling urban health challenges.

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