

# Uncovering How Urban Regeneration Programs May Stimulate Leisure-time Walking Among Adults in Deprived Areas: A Realist Review

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## Abstract

Evidence suggests that urban regeneration programs can stimulate leisure-time walking (LTW) in deprived areas. However, underlying pathways remain unclear. This study explored how urban regeneration might stimulate LTW among adults in deprived areas. We conducted a realist review, a theory-driven approach to evidence synthesis that focuses on mechanisms. We searched three electronic databases for peer-reviewed literature that describes how the neighborhood environment or urban regeneration influences LTW among adults in deprived areas. Evidence from 13 qualitative studies was synthesized. All studies indicated that safety problems and poor physical neighborhood design make adults fearful of walking. Seven studies indicated that poor aesthetics makes walking less relaxing and stress releasing. Seven studies indicated that poor infrastructure makes it inconvenient for adults to walk. A limited number of studies indicated that a lack of LTW facilities creates a shortage of settings for walking and that low levels of social capital constrain social support for walking and social interaction while walking. Evidence from this study suggests that urban regeneration might stimulate LTW among adults in deprived

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areas by creating a neighborhood that is less frightening, more relaxing, and more convenient to walk in.

### Keywords

walking, neighborhood, area deprivation, urban regeneration, realist review

Despite the well-known health benefits of physical activity (PA), 34.8% of the European adult population does not meet recommended levels of PA.<sup>1</sup> In areas that are socioeconomically deprived, these numbers are even higher, especially regarding PA in leisure time.<sup>2-4</sup> These area differences in PA can be explained only partly by differences in individual characteristics.<sup>2-4</sup> Ecological models posit that PA is determined by the interaction of an individual with the environment.<sup>5-8</sup> Several reviews have pointed to associations of PA with various neighborhood characteristics, including aesthetics, infrastructure, recreational facilities, and social networks.<sup>9-13</sup> Compared to adults in non-deprived areas, those living in deprived areas generally report poorer neighborhood aesthetics, less recreational facilities, less social support, more safety problems, and lower levels of trust and social cohesion.<sup>2,14-16</sup> These results imply that area differences in adult PA can potentially be explained by poorer neighborhood conditions.

In the past decade, numerous urban regeneration programs have been implemented in deprived areas across Western Europe that aim to improve the socioeconomic position of its residents as well as their living conditions.<sup>17</sup> As such, urban regeneration has the potential to improve PA in deprived areas. Only a few of these programs have been evaluated for their impact on PA, and resulting evidence is conflicting. In 1998, the New Deal for Communities was introduced in the 39 most deprived areas of England with the aim of tackling problems related to health, education, employment, crime, community, housing, and physical environment. At four- and six-year follow-ups, adult PA had not changed in the target areas or in similarly deprived control areas.<sup>18,19</sup> In 2007, the District Approach was introduced in the 40 most deprived districts of the Netherlands with the aim of tackling problems related to employment, education, housing, physical environment, safety, and social interaction. At a three-year follow-up, target areas saw larger improvements in leisure-time walking (LTW) trends among adults than the rest of the country.<sup>20</sup> No changes were observed in trends of leisure-time cycling or sports.

None of these studies have explored *how* urban regeneration is able to influence PA among adults in deprived areas. To guide future urban regeneration programs, various researchers have expressed the need to go beyond measuring mere quantitative changes in PA and try to understand how these changes have been brought about.<sup>21-24</sup> Therefore, the current study aimed to explore the pathways by which urban regeneration programs might influence PA of adults in deprived areas. More specifically, we aimed to explore the pathways by which

urban regeneration might stimulate LTW among adults in deprived areas. We focused on LTW because prior quantitative evaluation studies have identified this to be the only PA outcome that had improved following an urban regeneration program.<sup>18–20</sup>

## Methods

### *Realist Review*

We performed a realist review.<sup>25,26</sup> This theory-driven approach focuses on the inner workings of complex programs like urban regeneration programs. It aims to explore how programs work, for whom, and in what conditions. Three concepts are central to the realist approach: mechanisms, contexts, and outcomes.

*Mechanisms* describe how a program produces its outcome(s). In urban regeneration programs, special interest should be given to social mechanisms, which refer to the choices and capacities that a program offers to its recipients.<sup>25</sup> For example, Hedström and Ylikoski distinguish three connected types of social mechanisms: (1) mechanisms by which social structures and cultures shape individuals' desires, beliefs, and opportunities; (2) mechanisms that link these desires, beliefs, and opportunities to individuals' choices and actions; and (3) mechanisms by which these actions and interactions generate intended and unintended social outcomes.<sup>27</sup> Social mechanisms can thus help us understand how urban regeneration might shape individuals' beliefs and opportunities and how these beliefs and opportunities might stimulate them to engage in LTW.

Whether and how these mechanisms are enacted upon depends on the *context* in which they are activated.<sup>25,26</sup> Contextual factors may reside at the infrastructural, institutional, interpersonal, or individual level. Thus, contextual factors may range from broad conditions into which the program is introduced (such as geographical location or existing social structures) to the personal characteristics of its recipients (such as age or gender).

Each program has an underlying theory of how the program is assumed to work and what outcomes are expected from it. The realist approach identifies this program theory and systematically gathers evidence to test and refine this theory.

### *Articulating the Initial Program Theory*

Following the guidelines of Pawson and colleagues,<sup>26</sup> we first articulated an initial program theory that describes how urban regeneration programs may be expected to stimulate LTW in deprived areas. The initial program theory was presented as a set of CMO configurations, which each reflect the relationship between the context (C), mechanism (M), and outcome of interest (O). To develop the initial theory, we performed an exploratory search of the

peer-reviewed literature to identify frameworks and theories that postulate how the neighborhood environment might influence PA. We did not specifically search for frameworks and theories that are focused on urban regeneration and LTW in deprived areas; to our knowledge, these are currently not available. Because of our focus on neighborhood environment, we excluded psychosocial theories that focus exclusively on the individual person. The search was not exhaustive, as we only meant to identify the key ideas set out in the literature.

### *Searching for Evidence*

After having articulated the initial program theory, we searched the peer-reviewed literature for evidence to test and refine our initial program theory. In April 2014, three databases were searched for articles published in English or Dutch after 1990: two multidisciplinary databases (Google Scholar, Web of Science) and one health-specific database (PubMed). Search terms included various combinations of synonyms for “neighborhood,” “deprivation,” and “walking.” In addition, we searched for articles that cited or were cited by the articles that were eligible for inclusion. The first author performed the search, consulting intensively with the last author.

### *Appraising the Evidence*

In close collaboration with the last author, the first author systematically selected articles that were eligible for testing and refining the initial program theory. Following the realist principles, articles were included or excluded based not on their study design but on their ability to provide evidence for theory testing (relevance) and the methodological credibility of this evidence (rigor).<sup>26</sup>

Abstracts were screened using three criteria: the study had to be focused on (1) the relation of the neighborhood environment or urban regeneration with general walking, LTW, general PA, or health; (2) adults or the elderly; and (3) deprived areas or comparisons between deprived and non-deprived areas. Full-text articles of all eligible abstracts were screened using three additional criteria: results of the study had to (4) refer to general walking or LTW; (5) provide evidence on mechanisms; and (6) be sorted by type of area in case the study focused on both deprived and non-deprived areas. In line with criterion (5), we excluded full-text articles that solely speculated on possible mechanisms in the introduction or discussion section, without presenting original evidence on possible mechanisms.

To aid in assessing the rigor of the evidence, we enlisted the characteristics of each of the studies (e.g., aim, design, study population, study site) and identified limitations that might affect the rigor of the evidence to be extracted from each study.

## *Extracting and Synthesizing the Evidence*

After appraising the evidence, we extracted and synthesized the evidence from the articles, using the framework approach of Ritchie and Spencer.<sup>28</sup> First, we indexed the evidence in the article. We did so by flagging evidence on the mechanisms by which the neighborhood environment or urban regeneration influenced general walking or LTW. We also flagged evidence on personal factors that influenced whether these mechanisms were activated. We did not flag evidence on general PA, health, types of walking other than LTW, types of PA other than walking, adolescents, children, or non-deprived areas. Flagging was guided by our program theory, but we were also alert for unanticipated mechanisms and contextual factors.

Second, we collected all extracted evidence in a document and sorted it by type of mechanism. We grouped and labeled recurrent patterns of evidence and regularly discussed patterns with the research team. Inter-rater disagreements were resolved by discussions between the first and last author. Data extraction and analysis were iterative, meaning that when new patterns emerged, data sources were checked again for additional evidence.

Finally, we appraised the quality of the CMO configurations included in our final program theory. CMOs were classified into two groups: well-supported CMOs (when more than half of the studies provided supporting evidence of reasonable quality) and less well-supported CMOs (when less than half of the studies provided such evidence).

## **Results**

### *Initial Program Theory*

Figure 1 displays our initial program theory and describes how urban regeneration programs may be expected to stimulate LTW in the context of area deprivation. The outline of our theory was based on conceptual frameworks developed by Kremers and colleagues<sup>29</sup> and Ogilvie and colleagues.<sup>30</sup> Based on these frameworks, we posited that urban regeneration programs change various environmental characteristics in deprived areas, which in turn activate a wide range of cognitive processes (i.e., mechanisms) that stimulate LTW among adults. Whether these mechanisms are activated may depend on personal factors, such as age and gender.

More specific ideas on what environmental changes may activate what mechanisms were derived from two reviews of theories on how the physical<sup>31</sup> and social<sup>32</sup> environment may influence leisure-time PA. Five potential pathways were identified. Each pathway is described and explained below, using CMO configurations.

1. Urban regeneration in deprived areas (C) that increase the amount of LTW facilities, such as parks and trails, may increase the amount of settings where

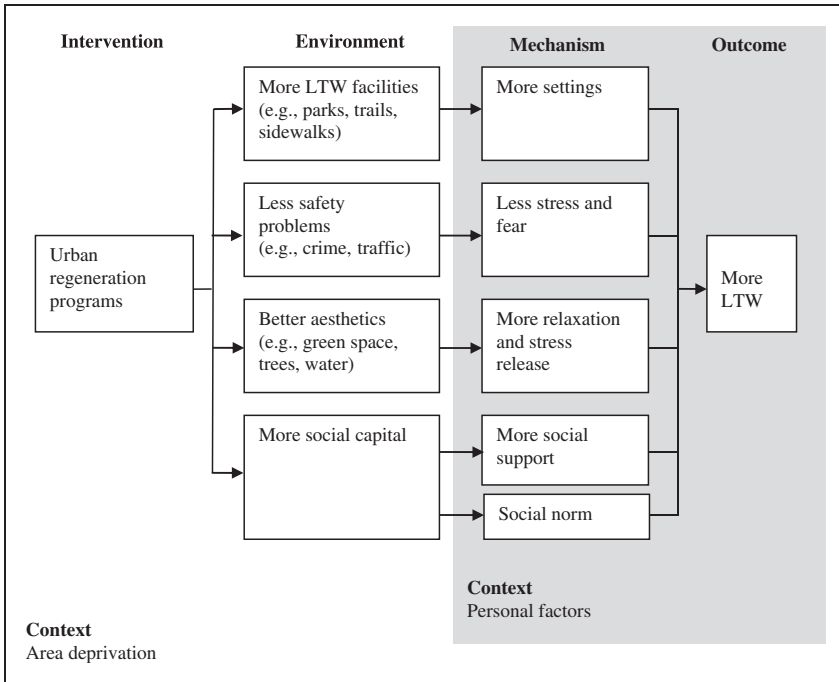


Figure 1. Initial program theory.

walking is the predominant behavior (M), which may in turn stimulate LTW (O).

According to Barker’s behavior setting theory, behavior settings are regions of the physical environment that are associated with recurring patterns of organized social activities.<sup>31</sup> These settings therefore promote or even demand a predominant type of behavior. For example, a trail promotes walking, as cars are not allowed there. Increasing the amount of settings where walking is the predominant behavior may therefore stimulate LTW.

2. Urban regeneration in deprived areas (C) that reduce safety problems, such as crime and heavy traffic, may reduce levels of stress and fear among adults (M), which may in turn stimulate LTW (O).

According to Evan and Cohen’s environmental stress theory, chronic exposure to environmental stressors, such as the threat of violence and crime, can lead to feelings of fatigue and diminished control over one’s routines.<sup>31</sup> To cope with this, people may try to minimize their exposure to environmental stressors by

avoiding places where they are highly prevalent.<sup>33</sup> For example, they may refrain from walking through a poorly lit park. Hence, a reduction in these environmental stressors may promote LTW.

3. Urban regeneration in deprived areas (C) that improve neighborhood aesthetics may promote relaxation and stress release (M), which may in turn stimulate LTW (O).

According to Kaplan's restorative environments theory, restorative environments have the capacity to reduce stress and promote relaxation.<sup>31</sup> Restorative environments are characterized by a high prevalence of natural features, such as water and vegetation. These features create a sense of novelty and an experience of "getting away" from daily routines. This attracts people to these types of settings. Hence, an increase in these settings may stimulate people to walk in these settings.

4. Urban regeneration in deprived areas (C) that increase the amount of social capital may create more social support (M), which may in turn stimulate LTW (O).

Social capital refers to the shared resources that allow people to act together.<sup>32</sup> According to Berkman and Kawachi, social capital may influence health behaviors such as LTW through the psychosocial process of social support.<sup>32</sup> Neighbors who trust each other are more likely to provide help and support in time of need, for example, by providing money for new walking shoes. Therefore, an increase in social capital may stimulate LTW.

5. Urban regeneration in deprived areas (C) that increase the amount of social capital may reinforce positive social norms (M), which may in turn stimulate LTW (O).

According to Berkman and Kawachi, social capital may not only increase levels of social support but may also reinforce positive social norms for health behaviors such as LTW.<sup>32</sup> In cohesive communities, where residents know and trust each other, people may be more likely to adopt healthy norms of behavior like LTW because of higher levels of peer pressure or encouragement. Therefore, an increase in social capital may stimulate LTW.

## *Evidence*

A total of 13 qualitative articles were included to test and refine our initial program theory (Table 1). Although we also identified numerous quantitative studies on the relation of the neighborhood environment or urban regeneration

**Table 1.** Characteristics of Included Articles.

#	Authors, year	Design	Context	Aim
34	Annear et al. <sup>34</sup>	<ul style="list-style-type: none"> <li>• Case study</li> <li>• Interviews</li> <li>• Qualitative</li> </ul>	<ul style="list-style-type: none"> <li>• Christchurch, New Zealand</li> <li>• 1 deprived suburban area;</li> <li>• 1 non-deprived suburban area</li> <li>• 63 elderly adults (65–91 years old)</li> </ul>	How does area deprivation affect leisure-time physical activity among older adults?
35	Burgoyne et al. <sup>35</sup>	<ul style="list-style-type: none"> <li>• Case study/evaluation</li> <li>• Focus groups</li> <li>• Qualitative</li> </ul>	<ul style="list-style-type: none"> <li>• Countryside, Ireland</li> <li>• 2 deprived areas</li> <li>• 53 adults (18–60 years old)</li> </ul>	How does the neighborhood environment affect walking? What was the impact of the Sli-na-Slaiste walking route?
36	Burgoyne et al. <sup>36</sup>	<ul style="list-style-type: none"> <li>• Case study</li> <li>• Focus groups; interviews</li> <li>• Qualitative</li> </ul>	<ul style="list-style-type: none"> <li>• Cork, Ireland</li> <li>• 2 adjacent deprived areas</li> <li>• 80 adults</li> </ul>	What are determinants of engaging in physical activity?
37	Coulson et al. <sup>37</sup>	<ul style="list-style-type: none"> <li>• Case study/evaluation</li> <li>• Focus groups before, after, and during the intervention</li> <li>• Qualitative</li> </ul>	<ul style="list-style-type: none"> <li>• Bristol, England</li> <li>• 1 deprived area</li> <li>• 36 adults</li> </ul>	How has home zone remodeling and construction of the renewal of an existing cycle-walkway in a deprived area affected quality of life and physical activity?
38	Day <sup>38</sup>	<ul style="list-style-type: none"> <li>• Case study</li> <li>• Focus groups; interviews</li> <li>• Qualitative</li> </ul>	<ul style="list-style-type: none"> <li>• Glasgow, Scotland</li> <li>• 1 highly deprived urban area;</li> <li>• 1 medium deprived suburban area; and</li> <li>• 1 non-deprived coastal area</li> <li>• 45 retired elderly adults (62–90 years old)</li> </ul>	How does the local outdoor neighborhood environment affect older people's health?

*(continued)*



**Table 1. (continued)**

#	Authors, year	Design	Context	Aim
39	Gidlow and Ellis <sup>39</sup>	<ul style="list-style-type: none"> <li>• Case study</li> <li>• Focus groups</li> <li>• Qualitative</li> </ul>	<ul style="list-style-type: none"> <li>• North Staffordshire, England</li> <li>• 1 deprived urban area</li> <li>• 35 adults (mean age 48); 23 young people (12–15 years old)</li> </ul>	How do people perceive their local green space and what are barriers for use?
40	Grant et al. <sup>40</sup>	<ul style="list-style-type: none"> <li>• Case study</li> <li>• Focus groups; interviews; observations</li> <li>• Qualitative</li> </ul>	<ul style="list-style-type: none"> <li>• Ottawa, Canada</li> <li>• 1 deprived urban area; 1 deprived suburban area; 1 non-deprived urban area; 1 deprived suburban area</li> <li>• 75 elderly adults (65+ years old); 19 neighborhood key informants</li> </ul>	How do urban form and area SES affect walking among older adults?
41	Griffin et al. <sup>41</sup>	<ul style="list-style-type: none"> <li>• Case study</li> <li>• Focus groups</li> <li>• Qualitative</li> </ul>	<ul style="list-style-type: none"> <li>• South Carolina, United States</li> <li>• 1 deprived suburban area; 1 non-deprived suburban area</li> <li>• 27 African American adults (age unknown)</li> </ul>	How does safety and other environmental factors influence physical activity among African American residents of low-income, high-crime areas?
42	Kamphuis et al. <sup>42</sup>	<ul style="list-style-type: none"> <li>• Case study</li> <li>• Focus groups</li> <li>• Qualitative</li> </ul>	<ul style="list-style-type: none"> <li>• Eindhoven, the Netherlands</li> <li>• 1 group of high educated individuals in non-deprived areas; 1 group of low educated individuals in deprived areas</li> <li>• 38 adults (29–81 years old)</li> </ul>	How do perceptions of the neighborhood environment influence physical activity and fruit and vegetable consumption across socioeconomic groups?
43	Parry et al. <sup>43</sup>	<ul style="list-style-type: none"> <li>• Case study</li> <li>• Focus groups</li> <li>• Qualitative</li> </ul>	<ul style="list-style-type: none"> <li>• Birmingham and the Black Country, England</li> <li>• 3 highly deprived areas targeted by the area-based initiative New Deal</li> </ul>	How do residents of disadvantaged communities believe where they live influences their health?

(continued)

Table 1. (continued)

#	Authors, year	Design	Context	Aim
44	Trayers et al. <sup>44</sup>	<ul style="list-style-type: none"> <li>• Case study/evaluation</li> <li>• Focus groups before the intervention</li> <li>• Qualitative</li> </ul>	<p>for Communities</p> <ul style="list-style-type: none"> <li>• Young adults (16–20 years old); older adults (60+ years old); numbers unknown</li> <li>• Bristol, England</li> <li>• 1 deprived area</li> <li>• 10 local residents;</li> <li>• 9 primary school pupils (9–10 years old);</li> <li>• 10 college students and tutors; 3 local planners</li> </ul>	<p>What health and physical activity benefits do diverse groups of stakeholders perceive from the proposed home zone remodeling and new cycle-walkway?</p>
45	Wilson et al. <sup>45</sup>	<ul style="list-style-type: none"> <li>• Case study</li> <li>• Focus groups</li> <li>• Qualitative</li> </ul>	<ul style="list-style-type: none"> <li>• South Carolina, United States</li> <li>• 2 low income and high crime areas</li> <li>• 52 African American adults (18–65 years old)</li> </ul>	<p>How do African American adults perceive that neighborhood walking can be promoted using the 5 social marketing principles of product, price, place, promotion, and positioning?</p>
46	Yen et al. <sup>46</sup>	<ul style="list-style-type: none"> <li>• Case study</li> <li>• Focus groups</li> <li>• Qualitative</li> </ul>	<ul style="list-style-type: none"> <li>• Salinas, United States</li> <li>• 1 highly deprived area;</li> <li>• 1 medium deprived area;</li> <li>• 1 non-deprived area</li> <li>• 52 women with at least one child under 18 living at home (age unknown); most Latinos</li> </ul>	<p>How do women perceive their neighborhood to promote or hinder diet, physical activity, and smoking?</p>

with LTW in deprived areas, they were not eligible for inclusion because none of them assessed the mechanisms underlying these associations. Publication dates ranged from 2006 to 2013. Studies were performed in New Zealand (n=1), Canada (n=1), United States (n=3), the Netherlands (n=1), Scotland (n=1), Ireland (n=2), and England (n=4). Study populations included older adults (n=4), younger adults (n=3), adults (n=6), Latino female mothers (n=1), African American adults (n=2), key neighborhood informants (n=1), and planners (n=1). Four studies included multiple study populations. Studies either explored associations of the neighborhood environment with walking, PA, or health (n=10), or explored the (potential) impact of a specific area-based PA intervention (n=3).

Below, we present the evidence regarding the mechanisms through which urban regeneration programs might influence LTW in deprived areas. First, we discuss the evidence relevant to each of the mechanisms described in our initial program theory. Next, we will discuss the evidence for two mechanisms not identified in our initial program theory.

**More settings.** Two studies indicated that adults in deprived areas refrained from walking because their neighborhoods did not provide enough settings for walking, such as sidewalks, trails, or local parks.<sup>41,45</sup>

**Less fear and stress.** All 13 studies indicated that adults in deprived areas refrained from walking because their neighborhoods made them fearful of walking.<sup>34-46</sup> Adults were fearful, scared, afraid, unsafe, intimidated, concerned, and uncomfortable because of the following safety and design problems:

First, nine studies mentioned that *crime and antisocial behavior* created fear.<sup>34-36,38,39,41-43,46</sup> Specific problems mentioned included burglary, vandalism, assault, drug dealing, drunken people, unfriendly neighbors, and especially youth gangs. Interestingly, while some adults requested more police presence to deal with some of these problems and therefore make them feel safer, others described how high police presence indicated high levels of crime and antisocial behavior and therefore created fear.<sup>34</sup>

Second, seven studies indicated that *lack of lighting* created fear.<sup>35-37,39,41,43,45,46</sup> Adults mentioned that they did not walk at night because that is when youth gangs and other unreliable people were perceived to be most active.<sup>35,39,42,46</sup> Adults also mentioned that poorly lit areas caused fear.<sup>36,39,41,43,45</sup> However, increased lighting may not be the solution to fear: one woman mentioned fearfulness even in lighted areas.<sup>45</sup> Moreover, an evaluation study revealed that despite the installment of adequate lighting, adults still avoided walking on the renewed cycle-walkway.<sup>37</sup>

Third, four studies described how *dense areas of trees and isolation* caused fear.<sup>37,39,44,45</sup> *Dense areas of trees* caused fear because potential offenders were less visible for walkers. Adults mentioned that they were fearful of walking on a

local cycle-walkway because the overgrowing trees provided a potential hiding place for offenders.<sup>37</sup> This issue was also mentioned by adults in another study when asked why they avoided walking in the nearby park.<sup>39</sup> *Isolation* caused fear because it made walkers less visible for bystanders. Adults mentioned that they were fearful of walking on a local cycle-walkway because of its isolated location, and they relished the prospect that more users would give the route a busier and safer feel.<sup>37,44</sup> In another study, adults mentioned the desire for an open view of surroundings, so they could keep an eye on their children and other people could keep an eye on them.<sup>45</sup>

Fourth, four studies indicated that *traffic* imposed fear.<sup>34,35,38,40</sup> All four studies mentioned that a high volume of motorized vehicles induced fear. Older adults suggested that having a sidewalk might relieve some of this fear, although they also mentioned that the presence of cyclists and skateboarders on these sidewalks and on trails induced fear.<sup>40</sup> In one study, adults mentioned that high traffic volume might actually reduce stress because it increases visibility and thereby reduces opportunities for crime or antisocial behavior.<sup>35</sup>

Fifth, four studies mentioned that the presence of *stray dogs* caused fear.<sup>34,35,41,45</sup> Stray dogs made adults feel nervous, afraid, and intimidated, keeping them from walking certain routes.

Sixth, two studies mentioned that *uneven surfaces* created a fear of getting hurt.<sup>38,45</sup> Older adults mentioned how road works and poorly maintained paving could trip them or upset their balance and how potholes and gratings could catch their walking sticks.<sup>38</sup> As a result, they were unable to walk around in their neighborhoods.

A few studies indicated that certain groups of people were more affected by the abovementioned problems than others and hence more likely to restrict their walking. Two studies mentioned that *women* were more fearful of crime, antisocial behavior, and dogs than were men.<sup>41,45</sup> One study mentioned that *adults with children* were especially fearful of traffic.<sup>35</sup> Two studies indicated that *adults who walked alone* were generally more fearful than those who walked with others.<sup>37,45</sup>

**More relaxation and stress release.** Eight studies indicated that adults in deprived areas did not walk around their neighborhoods because it did not offer relaxation and enjoyment.<sup>34–38,41,42,45</sup> Adults mentioned that they were generally more motivated to walk in nature<sup>35,36,42,45</sup> and in areas with nice architecture,<sup>38</sup> because it offered them relaxation and made walking more enjoyable and interesting. However, in deprived areas, several features compromised the relaxation and enjoyment offered by nature and architecture, thereby keeping adults from walking. First, current settings for walking were *neglected* and filled with litter, graffiti, glass, dog excrement, and rubbish.<sup>34–38,41</sup> This created an unattractive, unclean, and unappealing environment that kept adults from walking. Second, local open green spaces did not attract people's attention because they were *dull to look at* and hence did not stimulate walking.<sup>38,42</sup> Third, few people walked on

a new walking route, because its *location* near the road and estates clashed with people's desire for fresh air and experience of the countryside.<sup>35</sup>

**More social support.** Six studies indicated that adults' decision to walk in deprived areas was influenced by the amount of social support—especially emotional support—offered by significant others.<sup>34–36,38,41,45</sup> In all studies, having someone to walk with was mentioned as providing various types of emotional support, including motivation, stimulation, and enjoyment. *Women* tended to value social support more than did men.<sup>35,36,41,45</sup>

However, only limited evidence suggested that urban regeneration may stimulate LTW by creating more social capital, as pre-existing levels of social support in deprived areas appeared to be sufficiently high. Most adults mentioned that they often walked with friends, family, or neighbors and that this motivated them to walk.<sup>35,36,38,41,45</sup> In only two studies, some adults mentioned that they did not have anyone to walk with and that this was a barrier for walking.<sup>34,45</sup> Yet, some other adults reported that they preferred to walk alone, because they did not want to be slowed down or depend on others.<sup>36,45</sup>

As opposed to our theory, none of the studies mentioned instrumental support to be important for walking. This may have to do with the fact that walking is much cheaper than other types of PA, such as sports.<sup>36</sup>

**More convenience.** Seven studies indicated that adults in deprived areas refrained from walking because existing LTW facilities were inconvenient to reach.<sup>34,37,38,40,41,44,45</sup> Several infrastructural problems were mentioned as the cause of inconvenience. First, existing settings were located *too far away* from home.<sup>34,40,41,45</sup> This was especially inconvenient for older adults, who were unable to drive or walk there.<sup>34</sup> Second, existing settings *lacked connectivity*.<sup>37,44</sup> For example, adults mentioned that they did not walk on a renewed cycle-walkway because it represented a place to nowhere. Third, existing settings *lacked benches*.<sup>38,40</sup> Older adults mentioned that they needed frequent places to sit and rest along the route to be able to walk longer distances. Some benches were available, but they were often vandalized.

**More social interaction.** Two studies indicated that adults in deprived areas did not walk around their neighborhoods because of few opportunities for social interaction while walking.<sup>38,45</sup> The possibility of running into familiar people was highly valued<sup>38</sup> and said to make walking fun.<sup>45</sup> Deprived areas did not facilitate impromptu social interaction, hence demotivating adults to walk.<sup>38</sup>

### **Refined Program Theory**

We used the evidence derived from the 13 studies to refine our initial program theory (figure 2). The refined program theory posits that there are three

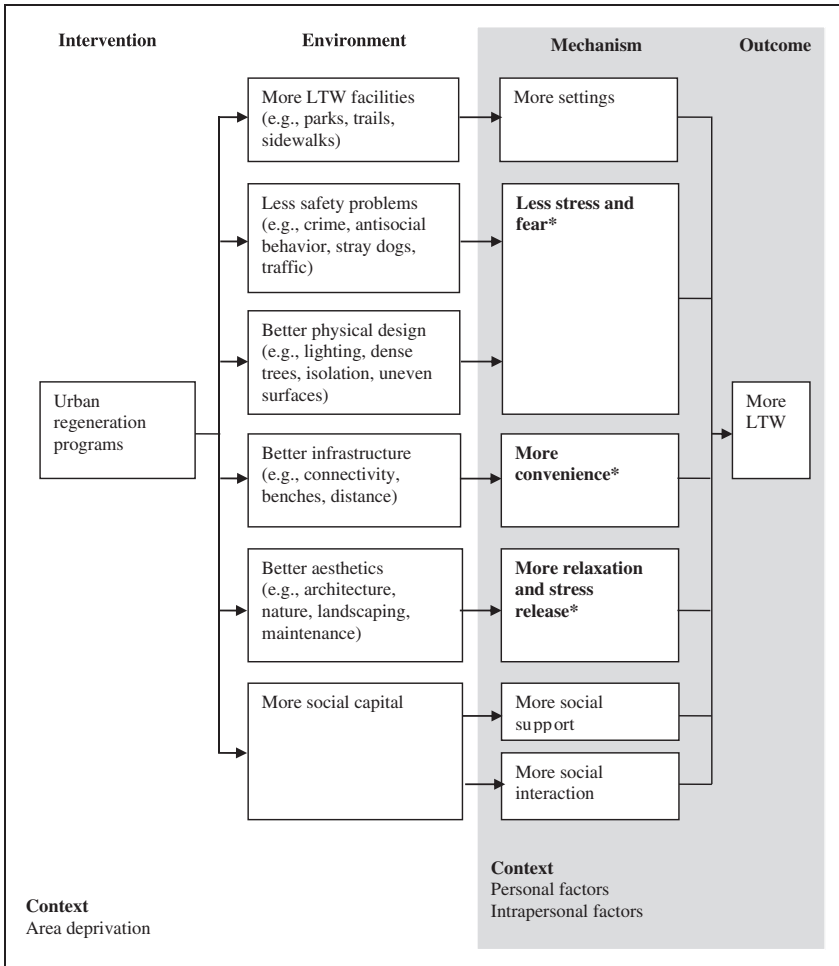


Figure 2. Refined program theory, with most supported pathways in bold and with an asterisk.

well-supported pathways by which urban regeneration programs might stimulate LTW among adults in deprived areas. In figure 2, these pathways are marked with an asterisk. Pathways were considered well supported if the majority of included studies provided supporting evidence of reasonable quality. Well-supported pathways are the following:

- Urban regeneration in deprived areas (C) that reduce safety problems and improve the physical neighborhood design may reduce adults' fear to walk around the neighborhood (M), which may in turn stimulate LTW (O).

- Urban regeneration in deprived areas (C) that improve the neighborhood infrastructure may create a more convenient neighborhood to walk in (M), which may in turn stimulate LTW (O).
- Urban regeneration in deprived areas (C) that improve neighborhood aesthetics may promote relaxation and stress release offered by the neighborhood environment while walking (M), which may in turn stimulate LTW (O).

The refined program theory posits three less well-supported pathways by which urban regeneration programs may stimulate LTW among adults in the context of area deprivation:

- Urban regeneration in deprived areas (C) that increase the amount of LTW facilities may increase the amount of settings where walking is the predominant behavior (M), which may in turn stimulate LTW (O).
- Urban regeneration in deprived areas (C) that increase the amount of social capital may increase the amount of social support for walking (M), which may in turn stimulate LTW (O).
- Urban regeneration in deprived areas (C) that increase the amount of social capital may increase opportunities for social interaction while walking (M), which may in turn stimulate LTW (O).

Some evidence suggested that a reduction in fear following an urban regeneration might have more impact on LTW among women, families, and those who walk alone, but evidence was limited and restricted to the pathway of fear.

## Discussion

This realist review aimed to explore how urban regeneration programs might stimulate LTW among adults in deprived areas. A synthesis of 13 peer-reviewed articles provided evidence to suggest that urban regeneration might stimulate walking by making deprived neighborhoods less frightening, more relaxing, and more convenient to walk in. Only limited evidence suggested that urban regeneration might stimulate walking among adults in deprived areas by creating more settings for walking, more social support for walking, and more opportunities for social interaction while walking.

## Limitations

Several considerations must be considered when interpreting the results of this realist review. Evidence to test and refine our initial program theory originated solely from qualitative studies. Though these studies contained valuable information on mechanisms that was not present in the quantitative studies found, we recognize that selection bias may have occurred. Most of the studies used focus

groups, which may be attended by more motivated and engaged residents. If so, the opinions of residents who are less involved with their neighborhoods may remain unknown, with the possible effect of overestimating the impact of the environment on walking.

Most of the studies included in our review described how the existing neighborhood environment had an impact on LTW, and only few studies described how urban regeneration had an impact on LTW. Though these studies provide valuable clues about how urban regeneration might possibly stimulate LTW, residents may respond differently to actual neighborhood changes than to existing conditions, or they may not respond at all. For example, evaluation studies of renewed cycle-walkways concluded that changing only a few aspects of the environment was not sufficient to get people walking.<sup>37,44</sup> It remains unclear how much change is needed and which problems must be addressed to enforce change. More qualitative evaluation studies are needed to assess how real-world interventions in deprived areas actually influence LTW.

This study helped to better understand *how* urban regeneration might stimulate LTW. However, we gained only limited insight into the groups of people *for whom* urban regeneration may stimulate LTW the most. We did find evidence to suggest that urban regeneration programs may have more impact on women, families, and people who walk alone, but evidence was limited and restricted to the mechanism of fear. We also gained limited insight into the *conditions* under which urban regeneration stimulates LTW in deprived areas, except for the fact that all our evidence originated from deprived areas. The studies included in our review originated from a wide range of countries. Country-level factors, such as culture and geographical characteristics, may affect how urban regeneration programs influence LTW, but these characteristics were not explicitly addressed. For example, the potential impact of urban regeneration on LTW may depend on current crime rates or income inequalities and the degree to which these can be addressed at local levels. While some pathways seemed to be universal, such as the role of fear, others were only mentioned in studies from one or a few countries. Therefore, it is difficult to determine the generalizability of our refined program theory across countries.

### *Implications for Theory*

Results of this study have implications for existing theories on the relation between the neighborhood environment and PA. Generally, existing theories are too fragmented and narrowly focused to be able to fully explain the complexity of environmental influences on PA. Our review points to various neighborhood problems that simultaneously influence LTW. Moreover, the three evaluation studies included in our review indicated that improving just some aspects of the neighborhood environment does not improve LTW, as the many other unresolved environmental problems keep adults from walking.



When looking at individual theories, results of this study provide strong evidence for Evan and Cohen's environmental stress theory,<sup>33</sup> which posits that crime, traffic, and other safety problems create stress and fear, and hence hinder PA. This idea is confirmed by all studies included in our review. Moreover, our review indicates that fear may be caused not only by safety problems but also by poor physical neighborhood design. This is consistent with Newman's theory of defensible spaces.<sup>47</sup> This theory posits that the physical layout of neighborhoods may influence natural surveillance options, thereby influencing how much residents feel in control of the areas around their homes and consequently how fearful they are. Our review also indicates that safety problems in particular create fear and hence limit LTW among certain groups of residents, such as women, families, and those who walk alone. Women may worry more frequently about crime than men because they feel less able to defend themselves, more likely to be a victim, less in control of the situation, and more likely to experience serious consequences of victimization.<sup>48</sup> These patterns underline that urban responses to fear of crime should not ignore the social meaning of space, as power relations play a central role in the construction of fear of crime.<sup>49</sup> More generally, these patterns illustrate how important it is for theories and studies to recognize gender differences in the health impact of urban regeneration.

We found support for Kaplan's restorative environments theory,<sup>50</sup> which posits that nature offers fascination and a sense of being away, thereby bringing relaxation and stress release, and stimulating PA. Moreover, our review indicated that nature only offers relaxation and stress release if well maintained and properly landscaped. We also found some evidence to suggest that relaxation may be enabled not only by nature but also by interesting architecture.

There was mixed support for Kawachi and Berkman's ideas about the role of social capital in PA.<sup>51</sup> Half of the studies included in our review indicated that high levels of social capital may indeed provide social support (especially emotional support) for walking and hence may promote walking. However, none of the studies provided evidence to suggest that social capital may influence LTW through changing social norms. In addition to the theory, some studies suggested that high levels of social capital might promote walking by providing more opportunities for social interaction while walking.

Only a few studies provided evidence to test Barker's behavior setting theory.<sup>52</sup> This theory posits that LTW facilities in the neighborhood create settings for PA, which stimulates PA. The two studies that did explore the role of settings both mentioned unavailability of LTW facilities in deprived areas as a barrier for walking.

## Conclusions

Results of this realist review provide evidence to suggest that urban regeneration programs may stimulate LTW among adults in deprived areas, not so much by

creating more settings for LTW or by enhancing social stimuli to walk, but more so by creating a neighborhood environment that is less frightening, more relaxing, and more convenient for adults to walk in.

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