

Title: Community severance and health: what do we actually know?

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Abstract

Community severance occurs where road traffic (speed or volume) inhibits access to goods, services, or people. Appleyard and Lintell's seminal study of residents of three urban streets in San Francisco found an inverse relationship between traffic and social contacts. The extent of social networks predicts unhealthy behaviors, poor health, and mortality; high rather than low social integration is associated with reduced mortality with an effect size of similar magnitude to stopping smoking. Although community severance diminishes social contacts, the implications of community severance for morbidity and mortality have not been empirically established. Based on a systematic literature search, we discuss what is actually known about community severance. There is empirical evidence that traffic speed and volume reduces physical activity, social contacts, children's play, and access to goods and services. However, no studies have investigated mental or physical health outcomes in relation to community severance. While not designed specifically to do so, recent developments in road design may also ameliorate community severance.

Key words: Community severance, health, traffic, transport, travel, social networks

Introduction

Road transport can provide access to many destinations beneficial to health, including employment and education, but can also cause many problems, particularly for those living nearby. While injury (and fatalities), air and noise pollution are the most commonly noted, there are many other adverse effects of traffic.¹ In 1972, novel work by Appleyard and Lintell in San Francisco demonstrated that the physical presence of traffic, particularly heavy goods vehicles, in urban streets disrupts the interpersonal networks and social contacts of residents.² This reduced access to goods, services and people has been termed 'community severance'³⁻⁵ (Box 1). A systematic literature review undertaken in 2001 found no studies directly examining the effects on health either of community severance or of diminished social contacts or support due to roads.⁶ It concluded that community severance was a plausible but unproven cause of poor health.

However, severance is frequently stated as a health effect of roads in systematic reviews,^{7, 8} in peer-reviewed papers on policy and health⁹ and on health impacts of transport,¹⁰ and in regional,¹¹ national,⁵ and international reports¹² from around the world. For example, a World Health Organization report on economic valuation of health impacts of road transport listed community severance as a health impact that 'could not yet be monetarized'.¹² However, few authors have examined the evidence behind such statements. Those that actually provide further information (e.g.^{3, 5, 13}) summarize the evidence from Appleyard and Lintell's seminal study² and relate this to the indirect health consequences of disrupted social networks and social support, usually citing Berkman and Syme's pioneering work on the health effects of decreased social contacts: the extent and quality of individuals' social networks in their Alameda County study affected future mortality and morbidity, even among those who were healthy at baseline.¹⁴ Subsequent work has shown that the extent of social networks is related to unhealthy behaviours,^{15, 16} poor health,¹⁷⁻¹⁹ and mortality.^{14, 20-23}

Based on an updated literature review, this paper discusses the published evidence relating to community severance, the extent of evidence on its effects on health, and how severance might be quantified.

Box 1. Definitions of community severance

Although the term “severance” was used by Liepmann in 1944, when discussing the “severance of dwelling and work-place” and the effects of this on community life,²⁴ it was not considered by transport authorities until much later. In 1969, the UK government Urban Motorways Committee recommendation regarding the inclusion of indirect social costs when planning main urban roads specifically included ‘severance’ which, it was perceived, involved the physical separation, noise, visual effects, and disruption of neighborhood lifestyles caused by heavy traffic.²⁵ A more formal definition of “community severance” for trunk roads was made by the Department of Transport in 1983:

“the separation of residents from facilities and services they use within their community, from friends and relations and, perhaps, from place of work as a result of changes in road patterns and traffic levels.”²⁶ quoted in ²⁵

More recently, ‘community severance’ has been considered more broadly as:

“the sum of the divisive effects a road has on those in the locality”.²⁵

A 2005 review listed 12 definitions of community severance used between 1924 and 2001; many of these were limited to effects on travel behaviour.²⁷

Method

We reviewed the evidence, drawing on both the 2001 review⁶ and a search for literature published in the past 10 years. In March 2010, we searched Pubmed, Psycinfo, Embase and IBSS databases for publications since 2000 using the phrases 'community severance', 'community AND severance', 'community AND transport', 'severance AND roads' and 'severance AND transport'. This search yielded eight hits for 'community severance' and eleven for the other search terms included, of which four were new papers or reports not included in the original review containing information relevant to this review. A search for the term "community severance" in UCL's MetaLib Cross Search, including transport, engineering and planning databases, from 2000 onwards found 22 hits, of which six were duplicates and only six were new papers or reports containing information relevant to this review.

The inclusion criteria were primary studies, reviews, and technical reports published in English; we also included relevant papers, abstracts, and reports cited in other publications. We included publications reporting any study design that could inform investigations into health impacts of community severance. Because of the paucity of information about community severance and health, we included any study that appeared relevant to at least one aspect of the topic, but we excluded the papers and reports that merely mentioned community severance as an accepted health consequence of road transport.

Results

There is a lack of longitudinal (or other) studies examining both community severance and health. Although more recent transport studies consider transport's social impacts more frequently than in the past, they still tend to ignore its impact on health. Community

severance continues to be listed as a health impact of transport (eg²⁸). Articles (eg²⁹) cite reviews as providing evidence of health impacts of community severance that actually only make the links described in the introduction to this paper.⁷

We found no prospective studies of community severance and health, while the cross-sectional studies were limited to factors likely, but not necessarily, to affect health outcomes. Most of the evidence for health consequences of community severance are predicated on a series of links that are connected to road traffic or to health outcomes, but not both (Figure 1). We therefore describe what is known and highlight where gaps remain in the evidence relating community severance and health.

Impact on travel

The divisive effects of major roads result in fewer journeys on foot being made due to their increased duration or because of the poorer quality of the environment. While a distinction between the two (considered 'real severance' and 'perceived or psychological severance' respectively) was important to transport planners, Grigg and Ford comment that the impacts on households is similar for both.³⁰ Roads divide otherwise coherent areas physically and psychologically; separate housing from local facilities such as schools and shops; and lead to pedestrian journeys foregone and amenities underutilized.³¹

Major roads reduce the number of being taken journeys on foot due to their impact on the nature of the journal itself and the local environment. While new, dual carriageway roads are hailed as "saving" lives due to the demonstrated reduction in pedestrian casualties, this occurs as a direct result of the pedestrian journeys foregone.³² In a survey of 709 retired Americans, many participants, particularly those who walked a good deal, said they would never cross a busy street with heavy, fast traffic, no matter how badly they wanted to reach

the other side.³³ This reaction is in part driven by the inappropriate nature of mechanisms intended to reduce community severance. Hoxie and Rubinstein (1994) found that 27% of older pedestrians were unable to reach the opposite curb in the time allotted by pedestrian crossing machines.³⁴ More than one in ten New Haven residents aged 72 or older reported difficulty crossing the street. These respondents were eight times more likely to leave the house less than once a month. Fewer than 1% had a walking speed of 1.22 meters per second or more, sufficient to cross the road in the allotted time.³⁵

Lack of access to private transport increases social isolation for those with difficulties using public transit, walking or cycling. Severance affects in particular older people, who have been found to be less likely to visit specific friends or facilities, and children, who had resultant restrictions on independent travel.³¹ In Huddersfield, England, although fewer than 10% of respondents overall avoided activities because of a reluctance to cross the main road, this increased significantly with age, despite almost three-fifths of these individuals reporting themselves to be fully mobile.³⁶

Impact of traffic on social networks

Many cross-sectional and longitudinal studies have found evidence of a relationship between social network quality and indicators of poor health,^{17-19, 37-46} mortality,^{14, 20-23, 47-53} and negative health behaviors more generally.^{15, 16, 54-56} These studies have assessed social network quality in a number of different ways which would find support in theories of community severance, including: numbers of close relationships with friends, acquaintances, relatives and/or neighbours^{18, 21, 52}; the quality of social relationships⁵⁰; extent and diversity of social contact with friends, neighbors and family outside the home³⁷; frequency of social interactions; number of social roles; different forms of perceived social support^{14, 20, 43, 47, 48, 50, 53, 57}; number of social activities or activities outside the home^{23, 49}; participation in

organisations⁵⁰; community involvement⁴¹; and community and neighborhood satisfaction⁴⁴ (Box 2). A recent meta-analysis of 148 studies found a 50% increased likelihood of survival for study participants with stronger social relationships, regardless of age, sex, baseline health status, cause of death, or length of follow-up period. The effect was stronger for more complex assessments of social integration.⁵⁸

Evidence on the existence of traffic related community severance originates with findings from Appleyard and Lintell's classic study of three parallel streets in San Francisco which carried light, moderate and heavy traffic. This found that the number of friends and acquaintances reported by residents was inversely proportional to the volume of traffic on the street where they lived.² While the street with little traffic offered an opportunity for social interaction which promoted a rich social climate and a strong sense of community, the street with heavy traffic was used solely as a 'corridor' along which to pass but not linger. These findings have been replicated by a recent, similar study in Bristol.⁵⁹ In contrast, social interaction is enhanced by safe, healthy, attractive and well-maintained streets and public places with access to high-quality parks and green spaces.⁶⁰

Appleyard and colleagues' larger study of 22 streets⁶¹ demonstrated that while there was little correlation between traffic and the location of friends and relatives, numbers of friendships and acquaintances on the street was inversely associated with traffic volume, particularly the number of acquaintances (people known by sight) living on the other side of the road. Work in Zurich found that mothers living on almost traffic-free streets had more than twice the number of, and stronger, social contacts within the immediate neighborhood than similar middle-class mothers living on streets with more traffic.⁶²

Box 2. Theoretical underpinning for health effects of social integration

A number of studies support the notion that social support acts as a buffer to moderate stressful life events and symptoms of distress.^{53, 63, 64} These suggest that the implications of community severance for social contacts could directly contribute to poorer health. Although socio-economic, cultural and demographic factors have statistically important associations, Biegel felt that environmental factors, such as a sense of belonging and neighborhood stability, were the most important determinants of an individual's social support system. This sense of belonging is closely related to interactions between neighbors and friends within the neighbourhood.⁶⁵ Bellair⁶⁶ found that social interaction with neighbors substantially mediated the associations between socio-economic status, heterogeneity, and residential stability and crime rates.

Other aspects of traffic on livability of streets and therefore on health

Most reports on transport and health^{3, 5} emphasize the health and mortality impact of the inverse relationship between traffic and social contacts.^{2, 61} However, Appleyard and colleagues^{2, 61} and Davis⁶⁷ demonstrated many other facets of the health impact of increasing traffic on the livability of streets: road traffic collisions; perceived risk of injury⁶⁸ and subsequent curtailment of healthy behaviors (such as walking and cycling); and the use of residential streets as places to meet and play.

An investigation of the relative influences of individual, social environmental and physical environmental correlates of walking in Perth, Australia found that those living on streets with major traffic (particularly when there were no trees), no pavement, or no shop, and those who perceived their neighborhood less attractive and safe for walking and with fewer

interesting walks were less likely to walk at levels recommended for health benefits.^{69, 70} The presence or absence of walkable green streets is related to longevity, even after adjustment for demographic and socio-economic factors and baseline health status.⁷¹

The Transport Research Laboratory commented on the threat to pedestrians of: narrow pavements; vehicles ignoring red traffic lights and pedestrian crossings, and mounting pavements; and of the hazard to pedestrians and cyclists of speeding traffic.³¹ In three areas of London studied, between one-third and one-half of comments by respondents concerned the perceived health risks associated with traffic, particularly for children and the elderly.³¹

Children have more restrictions on their independent mobility than formerly⁷² and their levels of physical activity and fitness are also falling,⁷³ partly through reduced walking and cycling, with resultant long-term health impacts, particularly related to high obesity levels.⁷³ Children who walk or cycle in Britain have twice the European average risk of death from a road traffic collision.⁷⁴ Parental concern regarding child safety and traffic⁷⁵ and a lack of lights or crossings on road and (objectively measured) interaction with busy roads (either as barriers or corridors) en route⁷⁶ have been shown to be significant impediments to children actively commuting to school. Fear of attack by strangers is another reason for parental concern and restrictions placed on children's unescorted movements.³⁶ Traffic, whether moving, stationary or parked, reduces the visual amenity of streets,⁷⁷ although parked vehicles can also become informal chicanes, reducing traffic speed. Increasing traffic volume also inhibits the use of streets for social purposes.² In San Francisco, the proportion of parents forbidding street play increased from 40% on light traffic streets to 85-90% on heavy or very heavy streets.^{31, 61, 78}

The average age at which children were permitted to cross roads, cycle on roads, use buses alone or return home from school unaccompanied increased by two years between 1971 and 1990⁷²; this survey is currently being repeated (R Mackett, personal communication). In a 1997 survey, 69% of primary school children aged six to seven or nine to 10 in an inner London borough walked to school and 26% travelled by car. In a survey of 1,700 households in Huddersfield in 1995, children living nearer to the main road were permitted significantly fewer travel freedoms and fewer play areas.³⁶ The amount of time spent outside was considerably shorter in streets perceived by mothers as potentially dangerous, where children were allowed to play only with adult supervision.⁶² Difficulties in accessing parks because of motor traffic was a problem for older primary schoolchildren. While their preferred travel mode around their local area was cycling or walking, only 1% of the older children cycled to school. Only 3% of young bicycle owners were permitted to cycle on main roads.⁷⁹ Traffic was the aspect of their neighborhood most frequently cited, both by Grade 8 pupils and inner city primary schoolchildren, as negative.⁸⁰ These restrictions encourage sedentary lifestyles and limit independence, which impact on physical health, self-esteem and mental well-being. Although school-based interventions can quadruple cycling rates⁸¹ the situation nationally has changed little, with only 2% of secondary school children cycling to school.⁸²

When traffic prevents children from playing on the streets, this reduces their opportunities for social interaction. Children living in Zurich streets without traffic had twice as many playmates in the neighborhood than the children not allowed outside unsupervised.⁶² Children's development may be impaired by reduced opportunities to explore new environments and learn new skills.⁶⁷ Hüttenmoser and colleagues found that five-year-olds not allowed to play unsupervised had reduced motor and social skills and independence, compared with children who lived in traffic-free streets. Both groups were from middle-class homes.⁶² In Vauxhall, inner London, the consequences of the reduction in independence

reported by Hillman *et al*⁷² meant that, unlike adults, children in the mid-1990s were unable to recall a favorite place outside the home in the local neighbourhood.⁸³

Appleyard and Lintell's study of the environmental quality of San Francisco streets found that noise, stress and perceived air pollution (dirt and dust) were positively associated with traffic intensity but levels of social interaction, territorial extent, awareness of the street environment and safety were negatively associated with traffic. Residents' description of their "home territory" also varied by traffic level: those living with light traffic included their whole building and even the whole street as their 'home', while those with heavy traffic felt that the intrusion of traffic noise restricted their usable living space such that even parts of their own accommodation was not 'home territory'. In 1973, 46% of respondents to the US Annual Housing Survey reported street noise and 29% heavy traffic as an undesirable characteristic of their neighbourhood.⁶¹ In the San Francisco study, traffic noise interfered with sleep, conversation or watching television for more than one-third of respondents and with eating or working in one-fifth: almost one-third of respondents on heavily trafficked streets had moved their main living areas to address this.⁶¹ In Huddersfield, traffic noise interfered with relaxation and sleeping for 20% and home-based leisure activities for 10% of respondents.³⁶ People are also disturbed outdoors by smoke, fumes and odor from traffic-derived air pollution not only because of the smell and soiling but also out of concern for effects on health.⁸⁴ Traffic noise, fear of traffic injuries, and dirt and fumes from traffic were considered very important quality of life issues by around one-quarter of respondents.³⁶ Austrian children living in noisier neighborhoods (including noise from road and rail traffic) had raised resting systolic blood pressure and urinary cortisol excretion, increased heart rate reactivity to a laboratory stressor (reading test), and scored more highly for perceived stress symptoms, compared with similar children from quieter neighbourhoods.⁸⁵ Interventions on a housing estate that included traffic management improved mental health.⁸⁶

Measurement of community severance

Community severance cannot be quantified effectively at present. Improvements in access may be measurable, as may increases in walking and cycling. However, evidence of the changes in inequalities that these would provide are not available from routine data.

Reductions in injury and deaths from road traffic collisions can be modeled with reasonable accuracy for given changes in traffic behavior. The impact on inequalities relating to type of road user should also be quantifiable but those relating to age or social class will be harder to quantify. Valuable indicators of community severance amenable to empirical assessment include traffic speed and/or volume, noise levels and pedestrian delay in crossing roads^{67, 77, 87} (Box 3).

Box 3. Measurement of community severance

Pedestrian delay

In 1969, the Urban Motorways Committee proposed pedestrian delay – assessed as delays prior to leaving the curb, or in total crossing time - as the most important indicator of severance by major urban roads,²⁵ and it has been used in several studies.^{30, 88} In San Francisco, 94% of pedestrians on the light traffic street reported waiting not at all or only a few seconds, compared with 49% on the street with medium, 25% heavy and 19% very heavy traffic. Median reported delay was nil on the street with light traffic, half a minute with medium or heavy traffic, and one to two minutes with very heavy traffic.⁶¹

The Buchanan report showed that the wider the road, the lower the volume of traffic required to cause the same pedestrian delay, suggesting a potentially important additional consideration for this measure.⁷⁷ The Kensington report considered that a peak figure of 300 vehicles/hr provided an appropriate environmental standard, because of the adverse impacts

from noise, fumes, vibration and the limitation of free pedestrian movement. This report concluded that with 500 or more vehicles passing per hour, at least 50% of pedestrians would be delayed.⁷⁸ Another effective approach to assessing pedestrian delay would be to classify streets according to the proportion of street-dependent and vulnerable pedestrians, who need a longer gap in traffic to cross safely.⁷⁷ Three studies, all of shopping streets, measured and modeled pedestrian delay. Two assessed delay prior to leaving the curb, while one assessed total crossing time.³⁰

Complex severance index for vulnerable populations

One approach which combines several indicators was proposed by the Standing Advisory Committee on Trunk Road Assessment (SACTRA) and the Transport and Road Research Laboratory (TRRL) and involved identifying vulnerable groups in the area and the facilities (such as post office or health center) they are likely to use, with a catchment area delineated for each facility.²⁵ The number of people living within this catchment area but separated from these facilities by major roads would form a measure of severance. Unfortunately, however, decisions regarding the critical delineation of these catchment areas remain arbitrary. The population affected included groups vulnerable because of lower physical mobility (such as the elderly, disabled or pre-school children), higher safety needs (such as schoolchildren, the disabled, and other vulnerable adults), or because of locality dependence (such as certain ethnic and religious or low income groups). They proposed a severance index which incorporated the above matrix, together with traffic density and a mitigation factor representing the presence and acceptability of crossing facilities.

Environmental determinants of walking and cycling

Pikora et al describe the results of a Delphi exercise to develop a framework to assess environmental determinants of walking and cycling.⁸⁹ This framework included the impact of

a number of indicators relevant for an assessment of community severance including:

- the suitability of surfaces for walking/cycling;
- street width, curb type and the presence of vehicle parking;
- traffic volume, speed and the presence of management and control devices;
- the nature of traffic crossings and crossing aids and verge widths;
- street design and the design and distance of intersections and other access points;
- issues of personal safety such as lighting, surveillance and path/lane obstruction; and
- aesthetic factors such as the presence of trees, street maintenance, cleanliness and pollution.

Potential solutions to community severance

Changes in road design and planning policies and practice in the USA, particularly over the past decade, will have ameliorated community severance, even where this problem was not specifically acknowledged. For example, the narrower roads and wider sidewalks required by new street standards in Columbia, Missouri⁹⁰ will have made it easier to use the streets for social purposes and to cross the road. By 2005, more than two dozen jurisdictions had adopted laws or policies requiring that almost all roads (not only those designated as part of a cycle or pedestrian network) be suitable for cyclists, pedestrians, and disabled travelers.

Promoted in some cases for environmental reasons, both to deal with stormwater (through landscape-based features that prevent run-off, facilitate reuse, or naturally recycle the water⁹¹) and because trees act as a carbon sink,⁹² 'green streets' also make provision for multiple travel modes, particularly walking and cycling. Implementation of green streets can

increase walking and also social interaction, including children playing outside more.⁹¹ Many other policies can encourage walking and cycling.¹ These include the introduction of specific facilities (e.g. dedicated cycle paths, showers in offices) and also changes to the general environment both which reduce negative influences (crime reduction, safe crossings with shorter waiting times, lower speed limits) and enhance positive aspects (well-maintained and clean pavements, attractive street furniture).⁹³ Well-designed, well-maintained, coherent, and resilient street furniture can enhance public spaces.⁹⁴ Street furniture, such as benches and litterbins can increase the conviviality of the pedestrian environment but can also act as a barrier, presenting obstacles to pedestrians, particularly those with disabilities.⁹⁵

It has been suggested that while ‘traffic calming’ is needed for residential streets, ‘traffic taming’ is required for arterial streets to become suitable for pedestrians, cyclists, and communities⁹⁶: merely adding cycle lanes and sidewalks when roads are widened to take more motor traffic is insufficient to promote all modes of travel.⁹⁰ A more recent response to promoting multi-modal travel is ‘Complete Streets’; roads designed to be safe for users of each travel mode, regardless of age or ability.⁹⁶

“Complete Streets are streets for everyone. They are designed and operated to enable safe access for all users. Pedestrians, bicyclists, motorists, and public transportation users of all ages and abilities are able to safely move along and across a complete street. Complete Streets make it easy to cross the street, walk to shops, and bicycle to work. They allow buses to run on time and make it safe for people to walk to and from train stations.”⁹⁷

The notion of Complete Streets has been welcomed by parents, to enable children to walk to school safely; by school staff, who recognize that active travel can enhance learning; by transport professionals, who welcome the reduction in traffic that can result from facilitating

active travel and public transit; and by health professionals, due to the health gain from increased physically active transport.⁹⁸ One major achievement of the concept of Complete Streets is to shift attitudes, with non-car users becoming part of ‘everyone’ instead of ‘them’ when discussing and accommodating different transport modes.⁹⁸

The concept of Complete Streets embraces not only the design of individual roads but also changing the way designs are formulated and decisions made, to consider all travel modes routinely.⁹⁶ It has become institutionalized among transportation professionals, for example in California⁹⁹ and Massachusetts,¹⁰⁰ and best practice guidance has been produced for planners.¹⁰¹

Discussion

We found no study that related community severance, and its effects on behavior (such as social contacts, children’s independence, access to services), to short- or long-term mental or physical health outcomes, except for one study that found reduced motor development in children not allowed to play outdoors.⁶² Repeated statements on community severance and health have ascribed to a chain of associations effects of traffic on health and inequalities that are based on assumptions, even where each individual step is shown to be causal (Figure 1). What evidence there is, indicates that traffic volume and speed interfere with normal activities; other studies demonstrate that reduced social contact and reduced access to goods and services are detrimental to health. It is therefore likely, but unproven, that community severance by roads and traffic adversely affects health and wellbeing. The willingness of individuals to pay for calming measures which would reduce the speed, noise and waiting times associated with local traffic also speaks to its considerable impact on daily lives.⁸⁸ These associations cannot currently be quantified, and information is not routinely available with which to measure community severance or changes in exposure to this. Reports by transport professionals have generally considered community severance to be associated only with major roads,^{25, 30, 102, 103} whereas the social and health-related impacts

have also been described in relation to urban residential roads as soon as traffic is more than 'light'. In this context, it is interesting to note the shift in the USA from encouraging provision for active travel along residential streets to one of expectations of multimodal travel for most arterial roads as well.^{97;100}

Before health effects of community severance can be measured, a number of developments are required. The first step is to develop an agreed tool to quantify community severance itself, such as an index based on traffic volume and street width, or that proposed by Davis based on work by Appleyard and Lintell and by Gilbert based on pedestrian delay.⁶⁷ Once this has been piloted and validated, sufficient use of this tool to record background levels of community severance in a variety of locations and settings will be necessary before one can model the effects of transport proposals on community severance. These will then permit two further important research questions to be addressed. First, it is important to measure the effects of community severance on a range of health outcomes, including morbidity and well-being. Secondly, interventions that alleviate or prevent community severance and which may, therefore, enhance health and/or reduce inequalities need investigation. This could be linked to assessment of home zones, play streets, and complete streets, for example.

Conclusions

Appleyard and Lintell's results, showing a reduction in social contacts through the deleterious effects of traffic^{2, 61} have been linked with Berkman and Syme's¹⁴ and others' findings⁵⁸ of increased mortality in those with fewer social contacts. None of these studies of morbidity or mortality have examined reductions in social contacts as a result of new roads or of increased speed or volume of traffic on existing roads: the chain of inference for the health effects of community severance does not currently extend to direct observation. It seems inherently likely that the effects of community severance do indeed impact on health,

with adverse health consequences of reduced social contacts also occurring when this social disruption is due to road traffic. Given the scale of the effect on mortality of high social integration, which is of similar magnitude to stopping smoking,⁵⁸ it is of great public health importance that research is conducted to confirm the postulated links and to establish which are the important components of community severance for health and how they can be ameliorated.

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Figure 1 title: Theoretical model for the health effects of community severance

Figure 1 legend

Figure legend	
	Denotes association supported by good evidence
	Denotes bi-directional association supported by good evidence
	Denotes postulated effect

