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Commissioned Reports

Built Environment: A Synthesis of Review of Evidence

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RRASP Réseau de recherche sur l'amélioration de la santé des populations
PHIRN Population Health Improvement Research Network
RORRHS Réseau ontarien de recherche sur les ressources humaines en santé
OHHRRN Ontario Health Human Resources Research Network

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The growing incidence of chronic diseases has, in part, contributed to increased political and societal pressures to ensure public funds are allocated to the provision of services with known effectiveness. In other words, there is a call to action to ensure the programs and services implemented across Canada in population and public health are effective, and that they will result in improved health outcomes for Canadians. There is some evidence to suggest that current practices related to the promotion of the built environment may not adequately address inequities in health, and may even increase disparities. The purpose of this paper is to identify and summarize research findings on the effectiveness of population based interventions on the built environment, which was identified as a priority topic area in the annual report of the Ontario Chief Medical Officer of Health to the legislative assembly.

The health-evidence.ca registry was searched for reviews on the built environment in May 2011. A standardized quality assessment tool was used to assess the methodological quality of each identified review by two independent reviewers. All search results were limited to reviews rated as being of strong methodological quality. Extracted data included age of participants studied in the review, research design, methodological quality rating, details of the interventions evaluated, details describing which outcomes where evaluated as well as how they were measured, and outcome data.

The built environment search identified 37 high quality reviews, 27 of which reported on outcomes relevant to this synthesis. Outcomes reported on most frequently included: injuries and safety (N=11), mental health (N=8), physical activity behaviour (N=7), and household air quality (N=5). Participants studied ranged from the general population to children, adults, older adults, and ethnic and low income populations. Settings included roadways, worksites, and homes. The interventions evaluated can be classified into the following categories: traffic safety, occupational health, supportive housing, physical environment, falls prevention, home safety, child safety, and physical activity interventions.

The evidence related to the built environment with respect to injury prevention suggest that home safety education and/or the provision of low cost or free equipment to prevention injuries did not result in fewer injuries occurring among children in homes or visits to the emergency department.

A variety of built environment interventions focused on improving mental health outcomes among different populations. In instances where housing or neighbourhood regeneration is being implemented, there is some evidence of a positive effect on mental health outcomes among adults and male children, but not female children. Positive effects are observed in some studies as long as 2-3 years post intervention. In addition, there is some evidence, albeit not from rigorous studies, that access to green spaces, as well as rehousing, refurbishment, and relocation interventions are associated with better mental health outcomes. Alternatively, in instances where the impact of witnessing crime or being a victim of crime was explored, the evidence illustrates poorer mental health outcomes among both adults and children. Similar results are reported for neighbourhood disorder. The relationship between population density

and psychological outcomes is mixed, with some evidence reporting worse psychological outcomes for adults living in high density areas, and others reporting no association.

Education about allergen exposure and the provision of allergen reduction equipment is associated with statistically significant reductions in physician diagnosed asthma in children, and number of days ill, but not asthma symptoms, such as wheezing and lung function. While the evidence on dust mite control is not rigorous, it illustrates that the provision of mite impermeable bedding covers is associated with significant reductions in dust mite load but not dust levels in homes. Finally, there is a growing body of evidence to suggest that interventions targeting children's exposure to environmental tobacco smoke, particularly in the home, achieves some degree of success in reducing children's exposure to tobacco smoke.

There was considerable evidence evaluating the impact of built environment interventions on physical activity behaviours. The evidence on travel behaviour change programs is mixed and is not of high methodological quality. While limited evidence exists illustrating a reduction in car use and an increase in walking as opposed to driving, an equal amount of evidence reports no impact on transport behaviour. There is limited evidence that worksite incentives (i.e. subsidy of employees who choose not to drive) have a positive impact on changing travel behaviour.

Interventions targeted at promoting walking and cycling generally (i.e. during leisure time), appear to having beneficial effects on behaviour. For example, brief, face-to-face counselling provided in the workplace, or by clinicians or exercise specialists in primary care was associated with increased self-reported walking at six weeks, and to a lesser extent in the longer term. Interventions delivered via the telephone and/or internet to individuals, and those directed at groups through lay mentored meetings, led walks and group educational sessions, as well as pedometers were also associated with a statistically significant increase in walking in the short term. Successful community-based program to promote walking tended to include a substantial mass media campaign.

Similar findings were observed for cycling. Interventions focused on promoting active communing (i.e. using bikes for transport to anywhere versus a car), along with educational activities and improving the cycle route network in cities, were found to increase the proportion of people cycling, the frequency of cycling per week, and the distance travelled. However, particularly in relation to the proportion of people cycling and distance travelled, the overall effect size remains relatively small. While bike path usage increases with media and social marketing campaigns, and was sustained in the long term, this did not translate into increased population prevalence of cycling.

Improved street lighting or infrastructure projects that increase the ease and safety of street crossing, ensure sidewalk continuity, introduce or enhance traffic calming, such as center islands or raised crosswalks, or enhance the aesthetics of the street area (i.e. landscaping) found positive effects on physical activity behaviour.

This review of the literature represents many systematic reviews and meta-analyses, primary studies and thousands of people. To some extent, the results illustrate that many population health and public health programs are associated with benefits to various populations,

particularly related to outcomes such as physical activity and mental health symptoms. However, there remains cause for concern given some of the evidence suggests that various interventions may in fact widen health disparities. Much more research is needed to fully explore if and how interventions impact heath outcomes in different sub populations. However, the evidence presented here provides some direction for moving forward with practice, draws attention to some areas that require ongoing evaluation, and identifies some practices that may not be producing the expected impact and therefore should be examined critically in terms of future investment. While a great deal has been accomplished in population and public health programs there is still much work to be done!

BACKGROUND

Built Environment

As defined by the Public Agency of Canada [1], built environment "is part of our physical surroundings and includes the buildings, parks, schools, road systems, and other infrastructure that we encounter in our daily lives." These environments can influence physical and mental health through factors such as community design, safe water, safe neighbourhoods, and access to education, public transit, and recreation services [2]. Built environment also includes adequate housing, since it is a critical component to each individual's environment [2]. As such, housing outcomes can directly and indirectly impact health. For example, respiratory illnesses and allergies can be related to mould, damp, or poorly ventilated houses [2]. Subsequently, the built environment also provides the setting for many of the social determinants of health [3].

Evidence-Informed Decision Making

Evidence-informed decision making (EIDM) is accepted in Canada as necessary for the provision of effective health care services. The goal of the public health sector in Canada is to promote health and reduce the amount of disease, premature death, and pain and suffering in the population, through health promotion, disease and injury prevention, and health protection [4]. The effectiveness of public health services has direct implications for health system outcomes and expenditures, as the following example illustrates. In 2005, chronic diseases, such as cardiovascular disease (CVD), cancer, emphysema, and diabetes, accounted for 35 million deaths worldwide [5]; had been increasing steadily over the past two decades; and in 2002, the economic burden of CVD and cancer alone in Canada was $32.7 billion [6]. Overweight and physical inactivity, recognized risk factors for chronic diseases [7,8], have also risen steadily in the past two decades. Canadian data suggests a 10% decrease in sedentary behaviour would result in health savings of $150 million per year [9].

The growing incidence of chronic diseases has, in part, contributed to increased political and societal pressures to ensure public funds are allocated to the provision of services with known effectiveness. In other words, there is a call to action to ensure the programs and services implemented across the public health sector in Canada are effective, and that they will result in improved health outcomes for Canadians. The purpose of this commissioned work is to identify and summarize research findings on the effectiveness of population based interventions in three priority topic areas identified in the annual report of the Ontario Chief Medical Officer of Health to the legislative assembly related to: 1) community-based diet and nutrition; 2) built environment; and 3) social determinants of health.

METHODS

The www.health-evidence.ca online registry is a free, searchable database of quality-appraised systematic reviews evaluating the effectiveness of public health interventions. The health-evidence.ca registry is populated through an extensive ongoing search (1985-present) of seven electronic databases (MEDLINE, EMBASE, CINAHL, PsycINFO, Sociological Abstracts, BIOSIS, SportDiscus), handsearching of 46 journals, and screening the reference lists of all relevant reviews [10]. Reviews are assessed for relevance, and then relevant reviews are indexed by commonly-used public health terms and quality assessed by two independent reviewers who come to agreement on the final rating of each review (strong, moderate, weak). More detail on www.health-evidence.ca has previously been published [10].

The health-evidence.ca registry was used to search for reviews on the built environment in May 2011. The term "built environment" was used to search the Main topic lists and Intervention strategy sections of the registry. All search results were limited to reviews rated as being of strong methodological quality.

Two reviewers used a standardized quality assessment tool to assess the methodological quality of each identified review. Using a ten-point quality assessment tool (available at: http://www.health-evidence.ca/downloads/QA%20tool_Doc%204.pdf), all reviews were assessed by two reviewers independently and disagreements resolved through discussion. The ten criteria used to assess methodological quality were: (1) a clearly focused question; (2) inclusion criteria explicitly stated; (3) comprehensive search strategy; (4) adequate number of years covered in the search; (5) description of level of evidence; (6) assessment of the methodological rigor of primary studies; (7) methodological quality of primary studies assessed by two reviewers and results given; (8) tests of homogeneity or assessment of similarity of results conducted and reported; (9) appropriate weighting of primary studies; and (10) author's interpretation of results supported by the data. Each criterion, worth one point each, was given equal weight in the overall assessment score. Reviews were given an overall score out of 10 and were classified into three categories: Strong, Moderate, and Weak. Reviews receiving an overall rating of eight or more were considered strong, those with a score of five to seven, moderate, and those with four or less, weak. Quality ratings for reviews included in this synthesis project ranged from 8-10.

All outcome data was extracted from all the reviews included in this project and organized into a matrix table. Additional tables were then created according to the most prominent outcomes to further summarize and present the data for each of the topic areas. Data extraction was conducted on strong reviews using a previously developed tool. Extracted data included author and year of publication, methodological quality rating, author's country, number of included studies, research design, population examined, interventions evaluated, details describing which outcomes where evaluated, the effectiveness of the intervention, the results, and additional comments. The data are presented in Tables 1 to 3.

RESULTS

The built environment search identified 37 high quality reviews, 27 of which reported on outcomes relevant to this synthesis, of which 11 were systematic review, eight were meta-analyses, two were narrative reviews, and three reviews found no studies. Outcomes reported on most frequently included: injuries and safety (N=11), mental health (N=8), physical activity behaviour (N=7), and household air quality (N=5). Six of the 17 reviews included randomized controlled trails only, 14 included both RCTs and other types of studies (non-RCTs, quasi-RCTs, quasi experimental, controlled before-and-after studies, cross-over studies, controlled trials, or cohort studies), two reviews included only controlled before-and-after trials, five reviews include prospective cohort studies, as well as cross-sectional, interrupted times series, and/or retrospective cohort studies, two review did not clearly identify the types of studies included, and two reviews found no studies meeting their inclusion criteria. Twelve of the reviews scored 10 out of a possible 10 points on methodological quality, nine reviews scored nine, and six reviews scored eight. The majority of the reviews were conducted in the UK (N=15), followed by Canada (N=4), Australia (N=3), United States (N=2), and New Zealand (N=1). The number of primary studies included in the reviews ranged from no studies to 99. Based on the 27 included reviews, the populations varied greatly. Participants ranged from the general population to children, adults, older adults, and ethnic and low income populations. Settings included roadways, worksites, and homes. The interventions evaluated varied significantly across the reviews but can be classified into the following categories: traffic safety, occupational health, supportive housing, physical environment, falls prevention, home safety, child safety, and physical activity interventions.

INJURIES & SAFETY

The evidence related to the built environment with respect to injury prevention included reviews evaluating traffic related injuries, work related injuries, and home related childhood injuries. One review also explored injury rates following privatization of industry (privatization of electrical/natural gas, mining companies).

Interventions to prevent and/or reduce the incidence of injuries to children occurring in the home were evaluated. Interventions included home safety education, as well as the provision of low cost, discounted or free equipment for increasing home safety practices, as well as parenting interventions. While home safety education increased safety behaviours among parents, fewer injuries among children in the home did not occur. For example, home safety education increased the proportion of families who had: safe hot tap water temperatures; functioning smoke alarms; fire guards; medicines, cleaning products and sharp objects stored out of reach; syrup of ipecac present in the home; poison control centre number accessible; fitted stair gates; and covered electrical sockets. However, home safety education and the provision of safety products was not associated with a reduction in thermal injuries, poisoning, and other medically attended or self-reported injuries among children, or in keeping hot drinks, food or matches out of reach; possession of a fire extinguisher; having window locks (although some evidence of effectiveness is observed for families with male children and older children); possession of non slip bath mats; using child restraints in cars; safe sleep practices. The

evidence also suggests that parent education interventions are more effective for having poison control centre number accessible when one or more parent was not in paid employment, and when the home was not owner occupied for outcomes such as safe tap water temperatures, as well as the use of fitted stair gates.

In contrast, children of parents exposed to either a home visiting parenting program or a paediatric practice-based intervention compared to no intervention, experienced a lower risk of home related medically or non-medically attended injuries, burns, and scratches. There is also limited evidence demonstrating a reduction in emergency department visits following exposure to home visiting parenting programs. However, the findings must be interpreted cautiously given the outcome was measured using self-report.

The effectiveness of red-light cameras to reduce car crash casualties, the number of crashes, and red light violations was evaluated. While few studies were adequately controlled, the evidence suggests that red light cameras are an effective strategy in reducing total casualty crashes, but not right angle casualty crashes, total crashes or red light violations. The evidence also illustrates that the use of street lighting on roads previously unlit, or better lighting on roads previously lit, is associated with a statistically significant reduction in both total crashes and total injury crashes. Street lighting was found to reduce total crashes by 55% with the true value ranging from 31% to 71%, and total injury crashes by 22% with the true value ranging from a 3% to 37% reduction.

With respect to occupational health and safety interventions, generally the evidence suggests that interventions such as training plus a safety audit, training alone, and engineering interventions (i.e. ventilation systems) have mixed effects on work related injuries and illness. More specifically, some studies observed small positive effects, while an equal number of studies reported no impact. In particular the evidence illustrates that injury and illness prevention programs in the work setting are effective in reducing falls, preventing back injuries among nurses working on high risk floors, preventing eye injuries, and preventing hearing loss (only when hearing protection is mandatory rather than voluntary), but not in preventing logger injuries, hearing loss, and use of substances. The evidence is mixed with respect to repetitive strain injuries such as from computer use, with the tendency for there to be more studies reporting no effect on repetitive strain injuries in comparison to those reporting a significant reduction. Finally, there was some evidence that encouraging nurses with back injuries to engage in specific exercises was effective in reducing daily reported pain at 6 and 24 months in comparison to usual care (standard general practice physician).

With respect to privatization, the evidence did not illustrate an association between privatization and injury rates in any sector. For example, no difference in injury rates was reported where privatization had occurred in water, gas, electrical and mining industries.

MENTAL HEALTH OUTCOMES

Evidence on the association between the built and natural environment and mental health outcomes has also been evaluated. For example, the evidence indicates there is a significant association between being born in an urban centre and developing schizophrenia. In addition, the findings suggest the greater the degree of urbanicity, the greater the risk of schizophrenia. Alternatively, living in sparsely populated areas is associated with higher suicide rates among males. The evidence from good quality studies is lacking to determine the impact of high household density on mental health outcomes among children and adults.

In instances where housing or neighbourhood regeneration is being implemented, there is some evidence of a positive effect on mental health outcomes among adults and male children, but not female children. Positive effects were observed in some studies as long as 2-3 years post intervention. In addition, there is some evidence, albeit not from rigorous studies, suggesting that poor neighbourhood and or housing quality is associated with poorer mental health outcomes and that access to green spaces is associated with better mental health outcomes. There is also evidence suggesting that interventions that target rehousing, refurbishment, and relocation are associated with improved mental and physical health outcomes in the longer term (18 months), although the majority of studies are not of high quality. Alternatively, in instances where the impact of witnessing crime or being a victim of crime was explored, the evidence illustrates poorer mental health outcomes among both adults and children. Similar results are reported for neighbourhood disorder. The relationship between population density and psychological outcomes was mixed, with some evidence reporting worse psychological outcomes for adults living in high density areas, and others reporting no association. With respect to noise, the evidence does not illustrate a relationship between aircraft noise and adverse mental health outcomes in children, while road traffic noise was found to be associated with greater risk of anxiety but not depression amongst adults.

HOUSEHOLD AIR QUALITY

Interventions to address household air quality include education about allergen exposure reduction, provision of allergen reduction equipment, energy efficiency measures, and dust control. Education about allergen exposure and the provision of allergen reduction equipment is associated with statistically significant reductions in physician diagnosed asthma in children, and number of days ill, but not asthma symptoms such as wheezing and lung function. The available evidence on dust mite control is not of high quality. Nonetheless, the evidence illustrates that the provision of mite impermeable bedding covers is associated with significant reductions in dust mite load. However education and dust control measures were not found to be effective in reducing dust levels in homes. Finally, there is a growing body of evidence to suggest that interventions targeting children's exposure to environmental tobacco smoke, particularly in the home, achieve some degree of success in reducing children's exposure to tobacco smoke. The evidence on energy efficiency measures is not of sufficient quality at this time to draw definitive conclusions on its impact on respiratory and other health outcomes.

PHYSICAL ACTIVITY BEHAVIOURS

Six reviews representing 101 studies explored the impact of built environment interventions on physical activity behaviours. One review did not find any studies meeting the author's inclusion criteria. Interventions evaluated include: travel behaviour change programs (i.e. aim to change travel behaviour from relatively inactive transport to more active transport - reduce single car use in favour of walking, cycling and/or public transport for travel to schools, tertiary institutions and workplaces); interventions to promote walking and cycling; environmental policy strategies (such as transit oriented development, street layouts, and the location of stores, jobs and school); point-of-decision prompts (such as motivational signs near stairwells); and interventions aimed to increase energy expenditure at work.

The evidence on travel behaviour change programs is mixed and is not of high methodological quality. While limited evidence exists illustrating a reduction in car use and an increase in walking as opposed to driving, an equal amount of evidence reports no impact on transport behaviour. There is limited evidence that worksite incentives (i.e. subsidy of employees who choose not to drive) have a positive impact on changing travel behaviour. However, the quality of many of the available studies does not allow for definitive conclusions on the impact of travel behaviour change programs to be identified at this time.

Interventions targeted at promoting walking and cycling generally (i.e. during leisure time), appear to having beneficial effects on behaviour. For example, brief, face-to-face counselling provided in the workplace, or by clinicians or exercise specialists in primary care was associated with increased self-reported walking at six weeks, and among some studies in the longer term. Interventions delivered via the telephone and/or internet to individuals, and those directed at groups through lay mentored meetings, led walks and group educational sessions were also associated with a statistically significant increase in walking. The use of pedometers to promote walking (i.e. 10,000 steps per day) was associated with a statistically significant increase in walking and/or step counts in the short term (4-12 weeks). However, these positive effects were not maintained after 24 weeks.

Community level interventions to promote walking produced mixed effects with some evidence suggesting a positive impact and others reporting no effect on walking. Furthermore, the most rigorous study evaluating community level interventions to promote walking reporting a positive effect also included a substantial mass media campaign.

Similar findings were observed for cycling. Interventions focused on promoting active communing (i.e. using bikes for transport to anywhere versus a car), along with educational activities and improving the cycle route network in cities, were found to increase the proportion of people cycling, the frequency of cycling per week and the distance travelled. However, particularly in relation to the proportion of people cycling and distance travelled, the overall effect size remains relatively small. While bike path usage increased with media and social marketing campaigns, and was sustained in the long term, this did not translate into increased population prevalence of cycling. In other words, those who cycled before the intervention, continued to cycle and utilized bike path systems consistently following their development, but the availability of bike paths did not lead to more people taking up cycling.

Currently there is limited evidence available to ascertain with any certainty if community-level cycling promotion activities promote sustained cycling, and at a level that achieves health benefit.

In terms of street-scale urban design and land use: improved street lighting or infrastructure projects that increase the ease and safety of street crossing, ensure sidewalk continuity, introduce or enhance traffic calming such as center islands or raised crosswalks, or enhance the aesthetics of the street area (i.e. landscaping) found positive effects on physical activity behaviour. While overall physical activity increased by 35%, the level of physical activity ranged from 16% to 62% and was based on moderate quality studies. It is important to note that all of the interventions were related to access, aesthetics, and safety.

Transportation and travel policies and practices (which strive to improve pedestrian, transit, and light rail access to increase pedestrian and cyclist activity and safety, reduce car use, and improve air quality), found no effect on physical activity behaviour. Interventions included creating and/or enhancing bike lanes, requiring sidewalks, subsidizing transit passes, providing incentives to car or van pool, increasing the cost of parking, and adding bicycle racks on buses.. This was based on one study of moderate methodological quality on the mode of choice for walking to school. However a statistically significant positive effective was not reported.

Point-of-decision prompts, such as motivational signs placed at or near stairwells, or at the base of elevators and escalators, encouraging people to use the stairs, was found to be effective. While the increase in stair use was small, 2.4% increase, it was found to be statistically significant in 15 of 21 studies. However, there was no significant relationship between baseline stair use and absolute change, or between the period of observation (leaving point-of-decision prompts in place and observed passersby for different lengths of time from 1 to 12 weeks) and relative change in stair use.

Workplace interventions to reduce sitting found no significant differences in workday sitting.

CONCLUSIONS

This review of the literature represents many systematic reviews and meta-analyses, primary studies and thousands of people. To some extent the results illustrate that many population health and public health programs are associated with benefit to various populations, particularly related to outcomes such as physical activity and mental health symptoms. However, there remains cause for concern given some of the evidence suggests that various interventions may in fact widen health disparities. Much more research is needed to fully explore if and how interventions impact heath outcomes in different sub populations. However, the evidence presented here provides some direction for moving forward with practice, draws attention to some areas that require ongoing evaluation, and identifies some practices that may not be producing the expected impact and therefore should be examined critically in terms of future investment. While a great deal has been accomplished in population and public health programs there is still much work to be done!

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TABLES

TABLE 1: QUALITY ASSESSMENT OF INCLUDED BUILT ENVIRONMENT REVIEWS (N=27)

Study Details		Quality Assessment Criteria* ('x' indicates criteria met)											
Author	**Year**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total /10**	**Rating**
Aeron-Thomas	2005	x	x	x	x	x			x	x	x	8	Strong
Bambra	2007	x	x	x	x	x	x		x		x	8	Strong
Beyer	2009	x	x	x	x	x			x	x	x	8	Strong
Breslin	2010	x	x	x	x	x	x	x	x	x	x	10	Strong
Brewer	2007	x	x	x	x	x	x	x	x	x	x	10	Strong
Chau	2010	x	x	x	x	x	x	x	x	x	x	10	Strong
Chilvers	2006	x	x	x	x	x	x		x	x	x	9	Strong
Clark	2007	x	x	x	x	x			x	x	x	8	Strong
Egan	2007	x	x	x	x	x	x		x		x	8	Strong
Gillespie	2009	x	x	x	x	x		x	x	x	x	9	Strong
Heath	2006	x		x	x	x	x	x	x	x	x	9	Strong
Hoehner	2008	x	x	x	x	x	x	x	x	x	x	10	Strong
Hosking	2010	x	x	x	x	x	x	x	x	x	x	10	Strong
Kendrick	2007	x	x	x	x	x		x	x	x	x	9	Strong
Kendrick, Watson	2008	x	x	x	x	x	x	x	x	x	x	10	Strong
Kendrick, Barlow	2008	x	x	x	x	x			x	x	x	8	Strong
Kennedy	2010	x	x		x	x	x	x	x	x	x	9	Strong
Macdonald	2008	x	x		x	x	x		x	x	x	8	Strong
Martin	2008	x	x	x	x	x		x	x	x	x	9	Strong
Ogilvie	2007	x	x	x	x	x	x	x	x	x	x	10	Strong
Priest	2008	x	x	x	x	x	x	x	x		x	9	Strong
Sheikh	2010	x	x	x	x	x	x	x	x	x	x	10	Strong
Soler	2010	x	x	x	x	x	x	x	x	x	x	10	Strong
Thomson	2001	x	x	x	x	x	x	x	x	x	x	10	Strong

Williams	2007	x	x		x	x	x	x	x	x	x	9	Strong
Yang	2010	x	x	x	x	x	x	x	x	x	x	10	Strong
Yeoh	2008	x	x		x	x	x		x	x	x	8	Strong

*Criteria for quality assessment: (1) clearly focused question; (2) appropriate inclusion criteria to select primary studies; (3) comprehensive search strategy described; (4) search strategy covered adequate number of years; (5) description of level of evidence; (6) assessment of methodological quality; (7) results transparent (two independent reviewers quality assessed); (8) appropriate to combine/compare studies; (9) appropriate methods for combining results; (10) author's interpretations supported by the data.

TABLE 2: CHARACTERISTICS OF BUILT ENVIRONMENT REVIEWS

Review (Author (Year))	Country	Review Type	# of Studies Included	Participants	Intervention	Outcome
Aeron-Thomas (2005)	UK	MA	10 CBAs	General population who use streets	Cameras at intersections to detect red-light violations	Primary Outcomes: 1.Casualties from road traffic at camera sites and areas 2.Crashes at camera sites and areas Secondary Outcomes: 1.Red-light violations of drivers
Bambra (2007)	UK	SR	19 (14 prospective cohorts, five repeat cross-sectional)	General population at various worksites	Task restructuring -Task variety -Teamworking -Autonomous groups	Specific diseases, impacts on health inequalities, general measures of physical health and psychological well-being
Beyer (2009)	UK	MA	17 CBAs	General population who use streets	Street lights	Number of crashes, injury crashes, and fatal crashes
Breslin (2010)	CA	SR	5*	Employees of small businesses	Program aimed to reduce occupational health problems	Attitudes and beliefs, behaviours, health, workplace exposures
Brewer (2007)	CA	SR	46 (21 RCTs, 20 non- RCTs, 3 randomized crossovers, and 2 quasi-experimental	General population at various worksites	- Engineering controls (e.g. workstation adjustments) - Administrative controls (e.g. implementing rest breaks) - Personal protective equipment (e.g. screen	Musculoskeletal or visual health outcomes

Review (Author (Year))	Country	Review Type	# of Studies Included	Participants	Intervention	Outcome
			)		filters or arm rests)	
Chau (2010)	AU	SR	6 (3 RCTs. 2 randomized trials, 1 pre-post study)	Adults	Any intervention that aimed to increase energy expenditure	A specific measure of sitting or activities ≤1.5 METs (including measures of sitting with or without duration)
Chilvers (2006)	UK	MA	0	Adults with severe mental disorder(s)	Supported housing schemes, outreach support schemes, standard care	Service utilization, medical/mental state changes, satisfaction, social functioning, quality of life, economic outcomes
Clark (2007)	UK	SR	99 (94 primary studies (mostly cross-sectional, a few RCTs & prospective cohorts, & 1 qualitative study)), 3 SRs, 2 narrative reviews)	Children and adults	Physical environment (access to green space, exposure to neighbourhood violence, housing and neighbourhood quality/regeneration, housing tenure, neighbourhood disorder, noise, spatial/population density, neighbourhood population density, urbanicity)	Mental health outcomes
Egan (2007)	UK	SR	11 (3 prospective cohorts, 8 ITS)	General population whose health could be affected by privatization (e.g.	Privatization of public sector industries and utilities (e.g. common carrier transportation, communication services,	Any health outcome measure of physical health, mental health, and injuries or absenteeism (e.g. physical or self-reported measures, or

Review (Author (Year))	Country	Review Type	# of Studies Included	Participants	Intervention	Outcome
				employees, customers, general public)	energy, water, sanitation, etc.)	routinely collected data)
Gillespie (2009)	NZ	MA	111 (10 cluster randomized, and majority individually randomized)	Older adults living in a community setting	Fall reduction interventions (e.g. exercise to improve balance, education, environmental modification etc.)	Primary Outcomes: 1. Rate of falls 2. Number of fallers Secondary Outcomes 1. Fall-related fractures 2. Adverse effects of intervention 3. Economic outcomes
Heath (2006)	US	SR	12 cross-sectional	General population	Environmental and policy strategies, such as zoning regulations and building codes, and environmental changes brought about by government policies or builders' practices, such as policies encouraging transit-oriented development, and policies addressing street layouts, the density of development, the location of more stores, jobs and schools within walking distance of where people live	Physical activity behaviour, such as walking or biking for transportation, and total physical activity and outdoor active play
Hoehner (2008)	US	SR	19*	Children living in Latin America	Campaigns, message delivery, classroom health education, school-based	Physical activity behaviour, aerobic capacity

Review (Author (Year))	Country	Review Type	# of Studies Included	Participants	Intervention	Outcome
					physical education, social support, policies	
Hosking (2010)	NZ	SR	17 (4 RCTs, 2 cluster randomized trials, 11 CBA)	General population whose health could be affected by organisational traffic plans	Travel behaviour change programs	Primary Outcomes: Any health outcomes (e.g. obesity, mental health, respiratory illness) Secondary Outcomes: Physical activity, changes in travel mode, distribution of relevant health effects
Kendrick (2007)	UK	MA	80 (43 RCTs, 9 non-RCTs, 27 CBAs, one study design insufficiently described as non-RCT or CBA)	Children and their families	Home safety education	Home safety equipment and safety practice outcome measures (E.g. Proportion of families with safe hot tap water temperatures, functional smoke alarms, storing medicines out of reach, storing cleaning products out of reach, syrup of ipecac accessible, poison control center number accessible, fitted stair gates, socket covers on unused sockets, storing sharp objects out of reach, rate of thermal injuries, rate of poisoning, range of injuries etc.)
Kendrick, Watson	UK	MA	13 (10 RCTs, 2 non-RCTs. 1 CBA)	Children	Home-safety education, access to fall-safety equipment	Use of specific fall prevention equipment or techniques

Review (Author (Year))	Country	Review Type	# of Studies Included	Participants	Intervention	Outcome
(2008)						
Kendrick, Barlow (2008)	UK	MA	11 (9 RCTs, 1 non-RCTs, 1 partially randomized trial)	Parents of children aged 0-18 years	Various parenting interventions aimed at preventing unintentional childhood injuries (e.g. multi-faceted home visiting program, paediatric practice-based interventions, providing safety advice etc.)	Injuries, home safety outcomes, HOME scores, safety equipment and practices, home hazards
Kennedy (2010)	CA	SR	36 (23 RCTs, 8 non-RCTs, 5 cross-over)	General population at various worksites	Exercise programs, ergonomics training, biofeedback training, cognitive behavioural training, job stress training, workstation adjustment, alternative keyboards, alternative pointing devices, arm supports, new chair, rest breaks, participatory ergonomics, broad-based musculoskeletal injury prevention program, prevention strategies and physical therapy, early intervention program, miscellaneous work redesign, multi-component patient handling	Upper extremity musculoskeletal disorder outcomes
Macdonald (2008)	UK	MA	14 RCTs	Individuals diagnosed with	Allergen impermeable bedding, household cleaning	Outcomes measuring development or severity of

Review (Author (Year))	Country	Review Type	# of Studies Included	Participants	Intervention	Outcome
				asthma, children at high risk for developing asthma	products and equipment, education programs, changes to home environment	atopy
Martin (2008)	UK	SR	0	Adults over the age of 18, living in their home in a community setting	Social alarms, electronic assistive devices, telecare social alert platforms, environmental control systems, automated home environments and 'ubiquitous' homes	Any objective measure recording an impact on quality of life, and measures of health or social care requirements, e.g.: • quality of life measures; • health-related quality of life measures; • prevention of admission to institutional care, i.e. residential/nursing home; • healthcare professional workload; • economic outcomes (a) costs to healthcare provider; (b) costs to participant; • measures of service satisfaction; • measures of device satisfaction; • healthcare professionals' attitudes or satisfaction
Ogilvie (2007)	UK	SR	48 (19 RCTs, 29 non-RCTs)	General population	Interventions promoting walking; advice, remote support, group-based,	Change in time spent walking

Review (Author (Year))	Country	Review Type	# of Studies Included	Participants	Intervention	Outcome
					pedometers, community-level, school travel initiatives, individualized promotion of active travel	
Priest (2008)	AU	SR	36 (30 RCTs, 6 CTs)	People who care for and educate children (0-12)	Interventions aimed at reducing child exposure to environmental tobacco smoke	Child Outcomes: -Biochemical measures -Frequency of illness or respiratory problems -Use of health services Adult Outcomes: -Behaviour change -Change in knowledge or beliefs -Maternal smoking status at postpartum -Measures of wellbeing and mental health -Family functioning -Economic
Soler (2010)	US	SR	11 time series studies	General population	Point-of-decision prompts, such as motivational signs, placed at or near stairwells or at the base of elevators and escalators, encouraging people to use the stairs	Stair use
Sheikh (2010)	UK	MA	9 RCTs	All patients with a diagnosis of	House dust mite control measures including physical	Primary outcomes: 1. Quality of life, general

Review (Author (Year))	Country	Review Type	# of Studies Included	Participants	Intervention	Outcome
				allergic rhinitis made by a qualified physician	and chemical treatments, or a combination of these approaches	well-being. 2. Days off/sick leave from school/work. 3. Nasal symptom scores. 4. Any adverse outcome as reported in trials. Secondary outcomes: 1. Nasal peak inspiratory flow. 2. Nasal provocation tests. 3. Rhinomanometry. 4. Medication usage. 5. Compliance with treatment. 6. Percentage of drop-outs.
Thomson (2001)	UK	SR	18 (11 prospective, 7 retrospective)	General population with housing improvements	Housing interventions were defined as rehousing, and all physical changes to housing were defined as infrastructure —for example installation of heating, insulation, double glazing, and general refurbishment.	Based on a social model of health and included socio-economic changes and illness based outcomes
Williams (2007)	CA	SR	15 (4 RCTs, 7 cohorts with controls, 4 cohorts without controls)	Injured workers with low back pain	Workplace rehabilitation interventions (e.g. modified work, ergonomics, exercises, supervisor involvement etc.)	Health, occupational, and economic outcomes

Review (Author (Year))	Country	Review Type	# of Studies Included	Participants	Intervention	Outcome
Yang (2010)	UK	SR	25 (2 RCTs, 23 CTs)	General population who can use bicycles	Cycling promotion, individualized marketing of environmentally friendly transportation, interventions to change general travel behaviour	Proportion of trips made by cycle, cycling trip frequency per person, distance cycled per person, cycling time per person per day, other measures of bike use
Yeoh (2008)	AU	MA	12 (11 RCTs, 1 quasi-randomized trial)	Children (0-18), mainly those living in areas of lower socioeconomic status	Educational (e.g. parental awareness, dust control) and environmental (e.g. cleaning, maintenance etc.)	Cognitive outcomes, blood lead levels, household dust measures

CA – Canada
US – United States of America
UK – United Kingdom
AU – Australia
NZ – New Zealand
SR – systematic review
MA – meta-analysis
RCT – randomized controlled trials
CBA – controlled before-and-after studies
CCT – concurrent controlled trials
CCT – concurrent controlled trials
ITS - interrupted time series
* - not specified

TABLE 3: DATA EXTRACTION OF OUTCOMES FOR BUILT ENVIRONMENT

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
INJURIES AND SAFETY						
Aeron-Thomas (2005)				x	0.71 (95% CI 0.55 to 0.93)	Total casualty crashes; Rate ratio of one study adjusted for both spillover effect and regression to the mean (RTM)
				x	0.87 (95% CI 0.77 to 0.98), (P=0.60)	Pooled rate ratio for three studies adjusted for RTM (but not spillover), all had CIs that included the value 1.0 with no significant heterogeneity.
				x	0.80 (95% CI 0.58 to 1.12)	Rate ratio of one nonadjusted study
						Right-angle casualty crashes; (Partially adjusted studies and studies with no adjustments)
				x	0.76 (95% CI 0.54 to 1.07), (P=0.24)	Pooled rate ratio of two studies that partially adjusted for RTM. No signs of heterogeneity.
				x	0.74 (95% CI 0.39 to 1.44)	Rate ratio of one unadjusted study
						Rear-end casualty crashes (Partially adjusted studies and studies with no adjustments)

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
				x	0.82 (95% CI 0.50 to 1.34), (P=0.16)	Pooled rate ratio for two studies that partially adjusted for RTM. No evidence of heterogeneity.
				x	0.99 (95% CI 0.59 to 1.66)	Rate ratio of one unadjusted study. All three studies had CIs that included 1.0.
				x	0.93 (95% CI 0.83 to 1.05)	Total crashes (including damage-only crashes) Rate ratio for one study that adjusted for both RTM and spillover.
				x	0.92 (95% CI 0.73 to 1.15)	Rate ratio for one study that was partially adjusted.
				x	0.74 (95% CI 0.53 to 1.03), (P=0.008)	Pooled rate ratio of five unadjusted studies. Three had CIs that included 1.0. Significant evidence of heterogeneity.
Beyer (2009)				x	0.45 (95% (CI) 0.29 to 0.69) (P = 0.85)	Streetlights in reducing total crashes with street lights installed for the first time
	x				0.68 (95% CI 0.57 to 0.82) (P = 0.11)	Street lights vs. day light in reducing crashes
				x	0.45 (95% CI 0.29 to 0.69) (P = 0.85)	New street lighting with a separate area control of unlit roads in reducing total crashes.

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
Breslin (2010)				x	Two studies assessed rate of injury and frequency of illness. One medium quality study found no significant effect. The two studies provided limited evidence that training plus a safety audit has an effect on occupational health and safety (OHS)-related outcomes.	Training plus safety audit. Narrative summary
				x	One medium quality study consisted of an educational component (REACH OUT), a train-the-trainer program. The study found a positive effect on illness rate and showed a positive effect on perceived access to personal protective equipment. But there was insufficient evidence to determine that training had an effect on OHS-related outcomes.	Training only Narrative summary
				x	One medium quality study found a positive effect of engineering control on workplace exposure outcomes. But with a single medium quality study, there is insufficient evidence.	Engineering only Narrative summary Workplace exposure refers to potentially harmful chemical, physical or biological agents in the work environment.

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
				x	One high quality and two medium quality studies that assessed health outcomes (e.g. injury/illness rates), one showed positive effects. All had a training component, and two had a safety audit component. There was insufficient evidence that health outcomes were influenced by the intervention.	Engineering only Narrative summary
Brewer (2007)			x		Five medium quality studies (60% negative and 40% positive). Falls protection and eye prevention studies reported positive effects; logger safety training, hearing protection, and drug testing studies showed no effect on the effectiveness of injury/illness prevention and loss control programs (IPCs).	Programs (regulatory) Programs included logger safety training, fall protection, eye protection, hearing protection and drug testing. Narrative Summary
			x		Three medium quality studies. Back belts had no effect. Pre-employment strength testing study had both positive effects (for MSD injuries and injury costs) and no effects (for non-MSD injuries). The hearing protectors study had both positive effects (for mandatory policies) and negative effects (for voluntary policies).	Policy (employer-level) Components included back belts, hearing protectors and pre-employment strength testing. Narrative summary

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
			x		One high quality study and two medium quality studies. The high quality study found both positive and no effects for the trackball; however the positive effects were just for the left side of the body, which was the non-mousing side for all study participants. The medium quality studies found a positive effect for alternative versus conventional keyboards, and no effects for two other split keyboards, when compared to a conventional keyboard.	Data entry devices – office Narrative summary
			x		Two studies. One high quality study found positive effects on musculoskeletal (MSK) outcomes. One medium quality study found no effect.	Arm supports – office Narrative summary
				x	Three studies. One high quality and two medium quality studies. No effect found for workstation adjustments.	Workstation adjustments Narrative summary
	x				Three studies. One high quality and two medium quality studies. All found positive effects.	Workstation adjustments and training Narrative summary
Egan (2007)			x		Eight poor quality studies. One study found that the mean incidence of train crash fatalities	Privatization and injuries Narrative summary

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					per fatal accident was higher in the post-privatization period (1997–2002: n=11.6) than in the entire period (1967–2002: n=4.1). The increase in accident severity could be a result of random clustering of infrequent events. Three studies of bus privatization/ deregulation found average annual bus-related injuries decreased by 2.6% after the intervention (ie. privatization), however there were multidirectional effects in injury rates, e.g., buses involved in multi-vehicle accidents resulting in injuries increased (+7.5%), whereas buses involved in single-vehicle injury accidents decreased (–5.6%) following the intervention. Both were statistically significant, but no p values, CIs or other effect size data were reported. Also found increases in injuries per passenger journey and decreases in injuries per estimated bus-km. No conclusive evidence that the	

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					privatization of the UK water, gas, electricity and mining industries significantly affected the employee injury rates.	
Hosking (2010)				x	No evidence that organizational travel plans have an effect on risk factors such as injuries	Narrative summary
Kendrick (2007)				x	IRR 1.12, 95% CI 0.81, 1.56	Thermal injuries: Three studies: one adjusted for clustering (coefficient of variation of 0.98), another study was not adjusted, and the third study was adjusted (coefficient of variation 0.25). Lack of evidence that home safety education with or without the provision of safety equipment reduced thermal injuries.
				x	IRR 1.18, 95% CI 0.84 to 1.65	Adjusting the post intervention rates for the third study had little impact.
	x				OR 1.34, 95% CI 1.00 to 1.80	Safe hot tap water temperature: Families in the home safety education arms were more likely to have a safe hot tap water temperature than control group families.
					Non owner occupier 2.83 (1.72, 4.66) Owner occupier 1.56 (1.05, 2.47)	Safe tap water temperatures may be more effective in non owner occupier families than in owner

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
						occupied accommodation.
				x	IRR 1.03, 95% CI 0.78 to 1.36	Poisoning: Three studies: two were not adjusted for clustering, and another was adjusted (coefficient of variation of 0.25). Lack of evidence that home safety education with or without the provision of safety equipment reduced the rate of poisoning
	x				OR 3.66, 95% CI 1.84 to 7.27 1 or more parent not in paid employment 7.59 (3.52, 16.55) Both parents in paid employment 1.47 (0.63, 3.45)	Poison control centre number accessible: Families in the home safety education arms were significantly more likely to have the poison control centre number accessible. Families with at least one parent not in paid employment were significantly more likely to have the poison control centre number accessible than those with employed parents.
				x	IRR 1.00, 95% CI 0.88 to 1.14	Medically attended and self-reported injuries: Eight studies; one was adjusted (coefficient of variation of 0.30), another study was not adjusted and the remaining 4 studies were adjusted (coefficient of variation

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
						of 0.25). No evidence that home safety education was effective in reducing the rate of medically attended or self reported injury
				x	IRR 1.04, 95% CI 0.96 to 1.12	Adjusting for baseline injury rates in the controlled before-and-after studies (CBAs) had little impact.
				x	Randomised and non-randomised trials (IRR 1.04, 95% CI 0.96 to 1.13) or CBAs (IRR1.03, 95% CI 0.69 to 1.54)	As the randomised and non-randomised trials comprised interventions delivered on an individual level to children or families whilst the CBAs comprised interventions delivered to whole communities, effect sizes were calculated. Restricting analyses to a fixed-effect model produced similar results.
	x				OR 1.85, 95% CI 1.24 to 2.75	Functioning smoke alarms: Families in the home safety education arm were significantly more likely to possess a functioning smoke alarm than control group families.
	x				OR 1.40, 95% CI 1.00 to 1.95	Use of fire guards: Some evidence that home safety education was effective in increasing use of fire guards.

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					Females 1.46 (1.14, 1.90) Males 0.89 (0.69, 1.14)	Fire guard use was more effective in families with female than families with male children.
				x	OR 0.88 95% CI 0.66 to 1.18 Odds ratio at age 0 1.36 (0.72, 2.62) Increase in odds ratio for 1 year increase in age 0.72 (0.49, 1.06)	Keeping hot drinks or food out of reach of children: Families in the home safety education arms were not more likely to keep hot drinks out of reach of children than control group families. May be more effective in families with younger rather than older children.
				x	OR 1.23, 95% CI 0.56 to 2.68	Storage of matches: Lack of evidence that home safety education was effective in increasing the safe storage of matches.
				x	OR 0.95, 95% CI 0.40 to 2.23	Possession of a fire extinguisher: Lack of evidence that home safety education was effective in increasing possession of a fire extinguisher
	x				OR 1.58 95%CI 1.18 to 2.13	Storage of medicines: Families in the home safety education arms were significantly more likely to store medicines safely than control group families

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
	x				OR 1.63, 95% CI 1.22 to 2.17	Storage of cleaning products: Families in the home safety education arms were significantly more likely to store cleaning products safely than control group families, but effect sizes varied significantly between studies.
	x				OR 1.26 95% CI 1.05 to 1.51 Non owner occupied 1.96 (1.43, 2.68) Owner occupied 1.19 (0.92, 1.58)	Fitted stair gates: Families in the home safety education arms were significantly more likely to have a fitted stair gate than control group families. Significantly more effective in amongst families living in non owner occupied accommodation.
				x	OR 1.16, 95% CI 0.84 to 1.59 Boys 1.48 (1.16, 1.88) Girls 0.85 (0.65, 1.11)	Possession of window locks or screens or windows with limited opening: Families in the home safety education arms were not significantly more likely to possess window locks than control group families and effect sizes varied significantly between studies. Significantly more effective amongst families with male

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
						children.
					Single parent family 0.89 (0.58, 1.38) Two parent family 1.40 (1.11, 1.78)	May be less effective amongst single parent families
					Odds ratio at age 0 0.97 (0.66, 1.43) Increase in odds ratio for 1 year increase in age 1.08 (0.82, 1.41)	More effective amongst families with older rather than younger children.
				x	OR 1.16, 95% CI 0.51 to 2.63	Possession of non-slip bath mats or decals: Families in the home safety education arms were not significantly more likely to have a non-slip bath mat or decals .
Kendrick, Barlow (2008)						Medically attended or self-reported injury: (primary analysis included only RCTs, with a secondary analysis including all designs)
	x				RR 0.82, 95% CI 0.71–0.95	*Primary Analysis:* 9 RCTs found intervention arm families had a significantly lower risk of injury than control arm families
	x				RR 0.82, 95% CI 0.73–0.91	*Secondary Analysis:* 11 studies (nine RCTs and two non-

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
						randomized studies) found very similar results
	x				OR 0.67, 95% CI 0.49 –0.90	Only one study evaluated an intervention other than a multi-faceted home visiting programme, which contained a RCT and controlled before and after studies (CBAs), found a significant reduction in emergency department use for injuries only in the CBA part,
	x				Burns: RR 0.81, 95% CI 0.71–0.93; Scratches: RR 0.84, 95% CI 0.74–0.96; Unspecified injury: RR 0.83, 95% CI 0.71–0.96	Sensitivity analyses indicated that findings were robust to the varying definitions of injury.
					It was not possible to combine home safety outcomes because of the differing tools used to measure home safety.	Home safety outcomes
				x	Three studies found no significant differences in keeping poisonous substances out of reach or using child restraints in cars, safe-sleep practices, lowering temperature on water heaters, using socket covers, locks on cabinets, car seats, having working smoke detectors, knowing the number	Safety equipment and safety practices Narrative summary

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
	x				to call if their child swallowed something harmful, or using stickers on bottles of poisonous liquids. Three studies found effects on child-care skills (included sleep safety), use of socket covers and stair gates. As well as seven items on car seat use, safe storage of firearms, functioning smoke detectors, scald prevention activities, and safe infant sleep practices, but this difference was mainly due to differences in gun storage practices.	
Kennedy (2010)				x	Three high quality studies and one medium quality study found no effect of workstation adjustments on upper extremity musculoskeletal disorders (MSD) outcomes.	Workstation Adjustment Narrative summary
			x		Four medium quality studies. Two found no effect and two had a positive effect. These studies found mixed effect that ergonomic training has an effect on upper extremity MSD outcomes.	Ergonomics Training Narrative summary
	x				One high quality study found a	Ergonomics Training and

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					positive effect on the elbow/forearm and no effect on the neck, shoulder and wrist/hand. Provides limited evidence that ergonomics training plus workstation adjustments have a positive effect on upper extremity MSD outcomes.	Workstation Adjustment Narrative summary
			x		One high quality study and one medium quality study: the high quality study provides limited evidence that a keyboard with a new key switch force displacement has a positive effect and the single medium quality study provided insufficient evidence whether an adjustable split keyboard or a fixed split keyboard had an effect on upper extremity MSD outcomes.	Alternative Keyboards Narrative summary
			x		Two studies: One high quality study found positive effects for a trackball compared to a conventional mouse. Another high quality study found no effect for a vertical mouse compared to a conventional mouse. These studies provide mixed evidence that alternative pointing devices have an effect on upper extremity MSD outcomes.	Alternative Pointing Devices Narrative summary

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
	x				Three studies: two high quality studies found both positive and no effect, and one medium quality study found no effect. These studies provide moderate evidence that arm supports have a positive effect on upper extremity MSD outcomes.	Arm Supports Narrative summary
	x				One high quality study found a positive effect with the introduction of a curved seat pan chair (new chair) and a flat seat pan chair (modified chair) in garment workers. Limited evidence that both a new chair and a modified chair have a positive effect on upper extremity MSD outcomes.	New Chair Narrative summary
				x	A medium quality study evaluated a broad-based MSK injury prevention program which found both positive (shoulder outcome) and no effects (neck outcome). There is insufficient evidence to determine whether broad-based MSK injury prevention programs have an effect on upper extremity MSD outcomes.	Broad-Based MSK Injury Prevention Program (MIPP) Narrative summary
				x	A medium quality study evaluated an occupational health management approach involving	Prevention Strategies and Physical Therapy

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					prevention strategies, plus physical therapy, compared to standard care. While the study found positive effects for upper extremity employer outcomes (i.e. lost work days and workers' compensation outcomes), there is insufficient evidence to determine whether the prevention strategies combined with physical therapy have an effect on upper extremity MSD outcomes.	Narrative summary
				x	Four medium quality studies. Limited evidence that work redesign has no effect on upper extremity MSD outcomes. However, included disparate work redesign interventions (redesign of video display terminal workstations (VDT) in semiconductor manufacturing, change from line out to line production in car body sealing, raised bricklaying, mechanical assist for bricks/mortar transport) that occurred under a wide set of circumstances with no replication. There is insufficient evidence to determine whether work redesign has an	Miscellaneous Work Redesign Narrative summary

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					effect on upper extremity MSD outcomes.	
				x	One medium quality study found positive effects on shoulder outcomes for the "safe-lift policy" intervention (involving lifting and transfer equipment) and no effect for the "no strenuous lifting" intervention (involving new mechanical patient lifts). There is insufficient evidence to determine whether either multi-component patient handling intervention had an effect on upper extremity MSD outcomes.	Multi-Component Patient Handling Includes policy change, equipment purchase and training on equipment usage and patient handling. Narrative summary
Williams (2007)	x				Four articles consisting of one study were found. Findings showed that the rates of back injuries and lost-time back injuries decreased by 23% and 44%, respectively, in the intervention group with an increase in the control group. 6-month follow-up found that study nurses had significantly ($p<0.01$) lower scores on pain and disability at 6 months than nurses in the control group.	Early return to work/modified work Narrative summary

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					Another article examining changes over time found that the Oswestry Low Back Pain Disability scores were significantly lower (p =0.008) in the study nurses at 6 months after injury. Findings may be limited as only the nurse on high risk wards received the intervention.	
	x				Only two articles consisting of one study were found. At all follow-up time points (3, 6, and 12 months) the numbers with daily pain were smaller in both mini-intervention groups than usual care group (group 1 vs. group 3, p=0.002; group 2 vs. group 3, p=0.03). In group 1 pain was less bothersome (group 1 vs. group 3, p=0.032) and interfered less with daily life (group 1 vs. group 3, p=0.04) than among the controls. Average number of days on sick leave was 19 in group 1, 28 in group 2, and 41 in group 3 (group 1 vs. group 3, p=0.019). At 24 months, the mini-intervention decreased the occurrence of daily pain (group 1	Exercises and workplace visit Group 1: light mobilization and graded activity) Group 2: worksite visit Group 3: patients received treatment from general practice physicians (usual care) Intervention was conducted in the clinical setting and not the workplace.

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					vs. group 3, p=0.01) and bothersome pain (group 1 vs. group 3, p=0.05). The addition of a worksite visit to the exercise program did not add to its effectiveness.	
				x	One cohort study found the difference in the mean lost days for worksite physical therapy (PT) compared to the clinic PT was 29 (p<0.001) for lower back pain. The results are limited (no data on similarity of severity and duration of injuries; very small sample; disproportionate group sizes; and lack of PT intervention descriptions).	
	x				One study on participatory ergonomics found that most workers were satisfied with the program (median score was 7.8 on a 10-point scale) and 67% of the workers reported a stimulating effect on return to work. The ergonomic solutions were targeted at work design and organization of work (59%), and equipment design (39%). About half (48%) of the solutions were partially or completely	Ergonomics including exercises and lumbar supports. Narrative summary Participatory ergonomics (PE) is defined as active participation and strong commitment of both workers and management in the process of identifying risk factors in the workplace and choosing the most appropriate solutions for these risks.

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					implemented within 3 months after the first day of absenteeism. Limitations include small sample size, lack of a control group, and intervention bias.	
	x				Another study found that adaptation of job tasks and adaptation of working hours were effective for return to work after a period of more than 200 days of sick leave and adaptation of the workplace was found to be effective on the rate of return to work. Because of the observational design of the study, the results are uncertain in that studies with this design may be susceptible to bias and confounding.	
	x				One study found perceived benefit from the lumbar support as 7 on a scale of 0 – 10. Limitations of the study (no control group, compliance measured by self-report, and this was only one study), the use of lumbar supports as a workplace intervention for lower back pain is questionable.	

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
MENTAL HEALTH OUTCOMES						
Bambra (2007)			x		Four studies but only one intervention examined the psychosocial work environment. The study found a significant decrease in self-reported job pressure (Attitudes to Work Scale) and a non-significant increase in general and job-related strain (Warr Job Related Anxiety Scale and GHQ-12).	Task variety – Production line Narrative summary
				x	Four studies. Only one prospective cohort study found little change in psychosocial outcomes, using a self-rating depression score, but still found a reduction in sick leave and depression amongst men.	Teamworking – Manual employees Narrative summary
				x	One prospective cohort study found in the lowest occupational grades, customer service advisers had perceived stress, emotional strain and tiredness increased, but no significant changes in perceived stress, emotional strain or tiredness amongst managers. It is possible that there was poor implementation of the intervention by management.	Teamworking – Mixed-grad employees Narrative summary Work reorganization in a local government office
		x			Two studies found that control	Autonomous groups - Lean

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					and autonomy deteriorated (Task Control, Skill Utilisation and Work Demands Scales). One prospective cohort study found job anxiety and depression (Warr Job Related Anxiety Scale) increased in all three groups (lean teams, assembly lines, workflow formalization and standardization), but no difference in job-related strain. However, this lack of adverse effect may be linked to enhanced pay of the intervention group. Both studies found no significant effect on mental health (GHQ-12). It should be noted that the "just in time" interventions generally made only minor changes to the psychosocial work environment, so would not be expected to have a sizeable impact on health.	production and "just in time" Autonomous groups refers to more autonomous production groups in factory-based mass production system Narrative summary
				x	Two studies (prospective cohort and prospective repeat cross-section) but only the cohort study measured mental health. Mental health improved in the short term (after 6 months) but not in the longer term (after 30 months).	Autonomous groups - Autonomous work groups Narrative summary

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
Clark (2007)		x			All seven longitudinal cohort studies found an association between being born in an urban area and schizophrenia, with most identifying an increased risk with increased urbanicity.	Urban birth and schizophrenia Narrative summary
		x			Four out of six cross-sectional studies found higher rates of suicide in males in more sparsely populated areas.	Population density and suicide Narrative summary
			x		Three out of six studies found no effect for females and population density; and two studies found an association by age.	
	x				One RCT found a positive effect on mental health of adults and male children three years post, but not female children.	Housing or neighbourhood regeneration Housing regeneration included damp-proofing, re-roofing and installing new windows in homes, and relocation to better housing and/or neighbourhoods. Neighbourhood regeneration includes improving deteriorated housing, repairing vandalized facilities, removal of graffiti, installing regular rubbish clearance, and building new schools, playgrounds, sports and park areas.
			x		Six longitudinal studies found a positive association between housing and neighbourhood regeneration and mental health. However, two studies found no improvements two years post and four of the studies also had a low response rate.	
	x				One SR found improvements in mental health, although the	

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					studies lacked detail on their design.	Narrative summary
		x x			One prospective longitudinal cohort study on adults found that a victim of property crime or violent crime was associated with poorer mental health 15 months after the crime. Six cross-sectional studies of children found that witnessing or being a victim of crime was associated with poorer mental health.	Neighbourhood violence Narrative summary
		x x			Two longitudinal studies found that perceived neighbourhood disorder was associated with poorer mental health. Five cross sectional studies found that greater neighbourhood disorder was associated with poorer mental health	Neighbourhood disorder, such as, crime and vandalism Narrative summary
			x		One longitudinal cohort study found no association. Three cross-sectional studies found high population density was associate d with increased rates of schizophrenia. Less robust. Found that urban-rural difference	Population density and schizophrenia Narrative summary

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					in incidence rates for schizophrenia but not prevalence rates	
			x		12 cross-sectional studies found mixed results. Three studies found no association. Four studies found higher population density was associated with higher rates of psychological morbidity. Two studies found mixed results for older adults; one found that living in an area of higher residential density was associated with an increased risk of depression and anxiety, whereas the other found that living in high density areas within a rural area was associated with fewer depressive symptoms.	Population density and psychological distress Narrative summary
				x	11 studies (two robust longitudinal studies and nine cross-sectional studies). One longitudinal study on children found that chronic aircraft noise was not associated with mental health. While the cross-sectional studies found mixed results; two studies found an association and two studies on specific disorders found unclear	Chronic noise exposure Narrative summary

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
		x			results. The other longitudinal study in adults found that road traffic noise was associated with higher scores for anxiety but not depression over five years. Cross-sectional studies found similar results.	
				x x x	Seven studies (three longitudinal studies and four cross-sectional studies). One longitudinal study found an association between high household spatial density in childhood and adult mental health for males, but not females. The other two longitudinal studies found no association. The cross-sectional studies found no association for adults. Two cross-sectional studies found that children from high spatial density homes may have poor psychological health. However there were limited sample sizes and unreported response rates.	Household spatial density Narrative summary

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					Ten studies (one prospective longitudinal cohort study and nine cross-sectional studies) and one review.	Housing and neighbourhood quality Narrative summary
				x	The cohort study found no association between neighbourhood quality and psychological illness.	
		x			The cross-sectional studies found an association between poor neighbourhood and/or housing quality and mental health.	
					Five weak cross-sectional studies.	Housing tenure
			x		Four studies found mixed results for adults, with three studies finding no association, and one finding an association.	Narrative summary
			x		One study found an association for children aged 12-14 years, but no association for 15-9 years.	
	x				Four cross-sectional studies found that access to green or open spaces was associated with better mental health. However all of the studies were less robust.	Access to residential green or open spaces Narrative summary
Egan (2007)		x			One study suggested an increase in measures of stress-related ill	Psychosocial impacts of privatization

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					health, as employees anticipated privatisation and mass redundancies.	Narrative summary
		x			Another study found respondents who were unemployed and seeking work (19%), or in insecure employment (29%), reported significant increases in GHQ 12 scores (mean difference 1.56 (95% CI=1.0 to 2.2) and 1.25 (95% CI=0.6 to 2.0)) and were more likely to report >3 GP consultations in the past year (OR=2.04 (95% CI 1.1 to 3.8) and 2.39 (1.2 to 4.7).	
			x		A prospective cohort study found 8 months after privatization, occupational stress indicator (OSI) mean scores (higher=worse) for mental health among clerical and administrative staff increased to 51.87, compared with 48.86 1 month before privatization (p=0.018). No significant changes in OSI mean score for manual workers or managers. Organizational changes had little effect on	

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					mental health scores for any occupational group after 20 months. A controlled repeat cross-sectional study found mental and physical ill-health symptom scores using the OSI, were similar for both intervention and control groups before and after privatization ($p > 0.05$). A cross-sectional study suggested a positive relationship between the degree of private ownership and employee ill-health indicated by OSI. The overall response rate was only 14%.	
Hosking (2010)	x				One study found significantly greater improvements in Short Form 36 (health-related quality of life measure) scores for the intervention group compared with the control group, for the sub scales of mental health, vitality and general health.	Workplace intervention in people contemplating or preparing for active transport Narrative summary
Thomson (2001)	x				All three studies of rehousing on the basis of medical need found improvements in self reported physical and mental health. The only prospective study was small and no study controlled for the	Medical priority rehousing Narrative summary

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					effects confounding variables.	
	x				Two prospective controlled studies reported effects of rehousing or refurbishment on health outcomes, including improvements in mental health. One study controlled for confounding and found an increase in illness episodes in the intervention group at 9 months but at 18 months larger reductions in illness episodes compared with the control group (the absolute difference was small (29 episodes/1000 people) and the rate of follow up was not stated). The other study reported improvements in mental and physical health, but the study was small and the comparability of the control group is unclear.	Rehousing, refurbishment and relocation or community regeneration Narrative summary
HOUSEHOLD AIR QUALITY						
MacDonald (2008)	x				Reduction in physician-diagnosed asthma RR = 0.79; 95% CI 0.66 to 0.94; p = 0.0093	Five studies provided education about allergen exposure reduction as well as allergen reduction equipment.
				x	Parent- reported wheeze RR = 0.95; 95% CI 0.78 to 1.15; p	

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					= 0.616	
				x	Lung function –0.084; 95% CI, -0.452 to 0.284	Three studies examined the impact of house dust reduction on the severity of asthma
	x				Reduction in days ill –0.361; 95% CI, –0.590 to –0.131	Two studies examined the impact of house dust reduction for days with symptoms
Priest (2008)					11 out of 36 studies reported success in achieving reduced children's environmental tobacco smoke (ETS) exposure between intervention and control groups	Reduction of children's ETS exposure, and smoking prevention, cessation, and any other tobacco control programmes Narrative summary
					Seven studies report reductions in household air nicotine and number of cigarettes smoked by parents per day	Narrative summary
Shiekh (2010)			x		Two out of nine studies were of good quality; the remaining seven studies were small and of poor quality. Seven of the nine trials reported that, when compared with control, the interventions studied resulted in significant reductions in house dust mite load.	Investigating the effectiveness of mite impermeable bedding covers Narrative summary
Thomson (2001)	x				All four studies found that energy efficiency measures improve respiratory and other symptoms.	Energy efficiency measures Narrative summary

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					Only one study adjusted for potential confounding variables. High rates of attrition in this and most other studies limit generalizability.	
Yeoh (2008)				x	WMD -1.15, 95% CI -2.91, 0.61; p = 0.14	Education Two studies on hard floor dust levels
				x	One study provided household carpet lead measures for dust. No clinically significant treatment effect (0.36mg/m2 (SD3.38) post-treatment geometric means for dust lead level in intervention group and 0.23mg/m2 (GSD 3.29) in control).	Household environment – dust control
				x	One study provided hard floor dust lead levels. No treatment effect (0.15µg/ft2 (SD 0.81) median changes for dust lead level in intervention group and 0.03µg/ft2 (SD 0.23) in control)	Combination of education and dust control
PHYSICAL ACTIVITY BEHAVIOUR						
Chau (2010)				x	No significant differences in workday sitting	Work place interventions to reduce sitting
Heath (2006)	x				Six moderate quality studies. Overall, the median increase in physical activity across the effect measures was 35% (inter-quartile range: 16% to 62%). The specific	Street-scale urban design and land use: improved street lighting or infrastructure projects that increase the ease and safety of street crossing, ensure sidewalk

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					interventions varied (relighting streets, redesigning streets, and improving street aesthetics), but all of the interventions involved issues related to access, aesthetics, and safety.	continuity, introduce or enhance traffic calming such as center islands or raised crosswalks, or enhance the aesthetics of the street area, such as landscaping.
				x	Two studies of limited quality were excluded. One fair study on mode of choice for walking to school, however, effectiveness was not established.	Transportation and travel policies and practices (that strive to improve pedestrian, transit and light rail access, increase pedestrian and cyclist activity and safety, reduce car use, and improve air quality), such as creating and/or enhancing bike lanes, requiring sidewalks, subsidizing transit passes, providing incentives to car or van pool, increasing the cost of parking, and adding bicycle racks on buses.
Hosking (2010)			x		10 of 17 studies reported less car use. Five studies reported no significant effect, and in two studies effects were mixed. However, many studies were judged to be at high risk of bias.	Secondary outcome measured
Ogilvie (2008)			x		Six studies on advice given face to face in the workplace or by clinicians or an exercise specialist in primary care. A significant net	Effects of interventions on walking in general - Brief advice to individuals

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					increase in self-reported walking was found in both studies with follow-up periods of up to six weeks but in only two of the four studies with longer follow-up.	Narrative summary
	x				Three studies evaluated interventions delivered by telephone or internet; all found a significant net increase in self-reported walking.	Effects of interventions on walking in general - Remote support to individuals Narrative summary
	x				Six studies evaluated interventions involving various approaches (such as lay mentored meetings, led walks, or educational sessions) delivered in groups. The three randomised studies were more lkely to find a significant net increase in self reported walking than the non-randomised studies.	Effects of interventions on walking in general - Group based approaches Narrative summary
	x				Seven studies on pedometers. Three studies, all with follow-up periods of up to three months, found a significant net increase in self reported walking or in step counts; the three studies with longer follow-up all found that a significant net increase in step counts after 4-16 weeks was not sustained at 24 weeks or 12	Effects of interventions on walking in general - Pedometers Narrative summary

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					months.	
			x		Five non-randomised studies. Three studies found a significant net increase in self reported walking, but one was reported only briefly and another had significant methodological limitations; the most robust evidence of effectiveness was for an intervention with a substantial mass media component.	Effects of interventions on walking in general - Community level approaches Narrative summary
	x				One RCT found a significant net increase in self reported walking. Thirteen non-randomised studies reported a net increase in the proportion of trips made on foot and an increase in time spent walking. However, the non-randomised studies methods were often not clearly described, and only one reported the statistical significance of the observed increase in walking.	Effects of interventions on walking as a mode of transport - Targeted or individualised promotion of active travel Narrative summary
				x	One of three studies (a small nonrandomized trial) found a significant net increase in self reported walking on the school journey.	Effects of interventions on walking as a mode of transport - School travel initiatives Narrative summary
			x		Four other non-randomized studies. A directive that employers	Effects of interventions on walking as a mode of transport - Miscellaneous transport

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					should subsidize employees who chose not to commute by car was associated with a significant increase in the proportion walking to work, and a three year multifaceted initiative to promote walking in a city was associated with a net increase in walking after adjustment for trends in control areas and other confounders. Two less robust studies of a sustainable transport campaign and a car sharing club found no significant effect on walking.	interventions Narrative summary
Soler (2010)	x				Baseline rates of stair use: 1.7% to 39.7% of potential users (median=8.2, IQI=5.2, 21.2). Stair use during intervention: 4.0% to 41.9% of potential users. The median change was an increase in stair use of 2.4 percentage points (IQI=0.83, 6.7). Eleven studies that included 21 study arms found statistically significant increases in stair use in 15 of 21 studies, while two study arms (from the same study) reported a significant decrease in stair use.	Point-of-decision prompts, such as motivational signs, placed at or near stairwells or at the base of elevators and escalators, encouraging people to use the stairs

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					Eleven studies. The majority of studies reported a low level of baseline stair use (<20%). The median relative improvement in stair use was 50 percentage points (IQI=5.4%, 90.6%) from baseline.	Relative change in stair use compared to baseline
				x	Measured in units of absolute change, varied with baseline stair use and found no significant relationship between baseline stair use and absolute change (Spearman's rho = -0.39, n=21 data points, p=0.77).	Effectiveness of point-of-decision prompts
				x	For nine studies there was no significant relationship between the period of observation and relative change in stair use (Spearman's rho = -0.12, *n*=18 data points, *p*=0.65).	Effectiveness of point-of-decision prompts by the period of observation (ie. leaving point-of-decision prompts in place and observed passersby for different lengths of time, ranging from 1 week to 12 weeks).
Yang (2010)	x				6 studies. OR 7.8, 95% CI 4.0 to 15.0; P<0.001 The difference between groups significant if cycling more than 4 km/day (P<0.001). P=0.68 but significantly increased	Effects of interventions to promote cycling Active commuting in women found the intervention was more likely than the control to cycle 2km/day after 18 months. Combination of educational and promotional activities by teachers

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					the prevalence of recreational cycling after one semester (+2.54 days/week, P=0.02; follow-up rate 90%).	to motivate 4 to 6 grade students and parents to walk and cycle to school.
	x				The proportion of household trips made by bicycle rose from 40% to 43% in the intervention area over a three year period and from 38% to 39% in a control area.	Improving the connectivity of the cycle route network in one area of the city
	x				Increase in the proportion of all trips made by bicycle from 22.5% to 24.6% (an estimated net increase of 3.4 percentage points after adjustment for regional trends) and a net increase in distance cycled of 100 metres per person per day.	Promotional campaigns and infrastructural measures
				x	Net increases in the proportions of residents cycling for at least 30 minutes once per month (+2.78% or +1.89%, depending on the choice of control areas) or 12 or more times per month (+0.97% or +1.65%).	Combinations of town-wide media campaigns, personalized travel planning, cycle repair and cycle training services, and improvements to infrastructure for cycling.
	x				Residents of the intervention area were significantly more	Community based social marketing programme involving information provision, cycle training, free bike hire, and a Ride

Review (Author (Year))	Positive Effect	Negative Effect	Mixed Effect	No Effect	Main Results (e.g. effect size)	Comments
					likely to report use of the cycle paths than residents of the control area at two year follow-up (absolute net change in prevalence +5.1%; P<0.01; follow-up rate 72%). Showed an increased use of the paths in both areas, with a significantly greater increase in the intervention area (net increase +7.9%), but no overall increase in the population prevalence of cycling.	To Work Day campaign aimed to promote the use of existing cycle paths