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Health Impact Assessment of transportation projects, plans and policies: A scoping review

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ABSTRACT

Background: Transportation has significant direct and indirect impacts on health beyond the physical effects due to change in air quality or noise levels. Health Impact Assessment (HIA) analyzes a project or policy through a broad health lens. However, the practice of HIA varies widely with significant knowledge and data gaps.
Objectives: We aimed to summarize the current state of transportation HIAs, develop a framework of promising practices recommended for HIA practitioners within the transportation sector, and identify knowledge and data gaps in transportation HIA practice and science.
Methods: This scoping review was designed using a systematic primary and grey literature search strategy to identify 158 transportation HIAs. Data extraction of descriptive and analytic information from the HIAs was completed and descriptive analyses conducted.
Results: Although transportation HIA practice varied within and between sectors and countries, there were some core similarities. Non-Governmental Organization funding of HIAs in the United States provided a significant boost to the HIA community of practice. We noted that most transportation HIAs conduct screening and scoping, but these steps were neither methodical nor clearly defined. Most HIAs included in this review also lacked quantitative assessment methods and did not perform evaluation of the HIA process or effectiveness.
Conclusions: This scoping review demonstrated a need for greater rigour and clarity in transportation HIAs. We recommend several practice changes to improve HIA quality and credibility.

1. Introduction

The potential impact of transportation infrastructure on human health is an emerging area of public concern worldwide. According to 2010 data, transportation contributes to 14% of total Greenhouse Gas (GHG) emissions globally (IPCC, 2014). Ninety-five percent of the global GHG emissions from this sector are due to the burning of fossil fuels for road, rail, air and marine transportation. In the United States and Canada, the transportation sector is the second largest contributor to GHG emissions (US EPA, 2015; ECCC, 2016). Transportation also has significant impacts on safety related to traffic incidents, which have been shown to be significantly reduced through improved public transit planning and implementing Transit-Oriented Development (TOD) (Litman, 2013).

Numerous studies and reviews have shown that health impacts due to transportation are not limited to just physical effects (Levy et al., 2010; Litman, 2013; ECRC, 2010; Thomson et al., 2008; Aytur et al., 2008; Kavanagh et al., 2005). Potential impacts to health can be direct or indirect, and positive or negative. Depending on the mode of transport, the direct impacts of transportation on health can include: health risks (air and noise pollution, and traffic-related accidents) as well as health benefits (physical activity related to walking or cycling). Beyond these, air quality impacts alone include additional short-term (acute) and long-term (chronic) health effects on those that are directly exposed, particularly the young, elderly, pregnant women and those with compromised respiratory systems (Procyk et al., 2012). Transportation can also have indirect impacts on health linked to variable accessibility to different types of services and social interactions that can affect physical, social and mental well-being.

The most studied links between transport and health are health risks that are quantifiable, such as the air quality and economic impacts of congestion. Comparatively, health impacts linked to less-quantifiable

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factors such as, access to services, work, and social relationships, despite having demonstrated links to health, are typically qualitatively assessed (Laporte and Dubreuil, 2014). As a result, consideration of these impacts during the planning of major transportation projects, programs and policies is often (unintentionally) overlooked. Currently, for major transportation infrastructure projects, health is primarily assessed through Environmental Impact Assessments (EIAs) and Human Health Risk Assessments, which mainly consider physical impacts on health, including impacts via air pollution, exposure to chemical contaminants and noise pollution. Hence, although projects, policies and programs in non-health-related sectors, such as transportation, can impact human health significantly, the latter is generally not comprehensively assessed in the planning or project execution within these sectors.

Health Impact Assessments (HIAs) may be well placed to fill this impact assessment void. HIA is an evidence-based multi-disciplinary assessment approach that evaluates the potential impacts, whether positive or negative, that a project, policy, or program could have on community health, and the distribution of those effects within the community (WHO, 1948; WHO, 1999; Ross et al., 2014). Ideally HIAs consider broad health issues and determinants. They can provide decision-makers with an opportunity to minimize adverse health outcomes, maximize health benefits, and reduce health inequalities associated with projects and policies (Mindell et al., 2008; Ross et al., 2014). HIAs have been more popular in Europe, the Australian subcontinent, and the United States. In Canada, the use of HIA has been slow to be accepted as the practice lacks regulatory triggers both at the federal and provincial levels, with the exception of Quebec.

Although HIAs are increasingly being conducted on transportation-related projects and policies, a clear picture of the state-of-practice of these HIAs at an international level is not available. According to a recent review that evaluated five HIAs on transportation planning (in the United States) as case studies, HIA was found to be a useful tool that has the potential to enhance collaboration and communication between officials in the transportation and public health sectors (Dannenberg et al., 2014). However, the authors suggested “more work is needed to identify best practices for conducting HIAs”.

Hence, in order to discern the state-of-practice of HIAs conducted within the transportation sector and inform practice, this scoping review was undertaken. A systematic peer-reviewed and grey literature search strategy was employed to uncover relevant transportation HIAs. These HIAs were reviewed to identify strengths, limitations, data gaps and areas for improvement.

2. Methods

Our review strategy was developed by adapting and extending the Cochrane Handbook for Systematic Reviews of Interventions (Cochrane Collaboration, 2009), to account for the particularities of the HIA field. Various methods were also incorporated from complementary fields when formulating the search strategy and screening of results (MacLellan, 2008; Hewitt et al., 2011).

2.1. Search databases and terms used

Systematic literature search in both primary and grey literature was conducted with assistance from two research librarians. MEDLINE, PubMed, EMBASE, Scopus, Web of Science, Ovid's Transport Database (TRID/TRIS), and ProQuest databases were all searched using a combination of “health impact assessment*” AND a set of transport related terms separated with “OR” (See supplemental file 1). Since many HIAs are conducted by public service and health agencies, an extensive ‘grey’ literature search was conducted using similar terms in Google.com as well as HIA repositories that were identified through the first 300 (by relevance) Google search results.

Quantitative HIAs assessing a modal shift to active transportation that primarily used a risk assessment or cost-benefit analysis type of approach were not included as part of this scoping review as these specific types of HIAs have already been evaluated in an excellent review by Mueller et al. (2015). These quantitative HIAs evaluated specific epidemiological health outcomes, such as DALYs, mortality, etc., of a modal shift to active transportation.

2.2. Screening

Inclusion criteria for articles/reports were: (1) an HIA conducted on a specific transportation-related project, policy, program or plan; (2) transportation is the major focus of the HIA; (3) not be a review or commentary; (4) in English; (5) not a quantitative HIA of active transportation; (6) self-identification as a health impact assessment; and (7) published between Jan 1st 2000 to Mar 31st 2016 (as the vast majority of HIAs were published since 2000). It is acknowledged that many HIAs (especially in the grey literature) are written in the authors' native language and that by limiting this review to English-only articles/reports, we may not have captured all (non-English) HIAs in the transportation field. An article had to meet all seven criteria in order to be included. Screening was performed initially on titles and abstracts (Tier I), followed by full text (Tier II).

2.3. Data extraction, analysis and synthesis

The data extraction tool (See Supplementary file 2) included: category (HIAs on Airports, Public Transit, etc.), country of assessment, type (length) of HIA, methodology, funding source, presence of different HIA steps, level of stakeholder involvement, baseline profile generation, consideration of equity and vulnerable populations, type of data sources used, main findings of the assessment, recommendations made, whether evaluation was conducted, and results of evaluation (i.e. whether HIA had an impact on decision-making process). These criteria are further described below.

HIA typology analysis included categorizing as broad types of HIAs according to the resources used, stakeholder engagement, data collection and data used (Ross et al., 2014; Table 1). When resources allow and data are available, quantitative characterization of health effects can add value and defensibility to the overall HIA process (O'Connell and Hurley, 2009), providing a fuller basis for evidence-informed discussion. In this review, HIAs that primarily used peer-reviewed literature and findings from previous related HIAs and other relevant jurisdictional reports were categorized as ‘mostly qualitative’. The HIAs that included calculation of risk and benefits to health in which the primary outcome measures were all-cause mortality, morbidity and/or change in life expectancy, were classified as ‘quantitative’.

As stakeholder involvement varied greatly across HIAs, an attempt was made to assign a level (high, medium or low) to the overall stakeholder engagement involved in an HIA (see Table 2). It is important to note that ‘high’ level of engagement within a Rapid HIA may not necessarily be the same as a ‘high’ level of engagement within a

Table 1
Criteria used to categorize overall types of HIAs.

	Rapid	Intermediate	Comprehensive
Time	Few days to few months	Four weeks to several months	Several months to years
Resources	Minimal	Moderate	Extensive
Stakeholder engagement	Minimal to none	Moderate	Extensive
New data collection	None	Moderate	Extensive
Type of data used	Mostly qualitative	Mostly qualitative and some quantitative	Both