

# Health determinants in Canadian northern environmental impact assessment

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**ABSTRACT.** The need to address the human health implications of northern development is well founded, and the role of health determinants in environmental impact assessment is increasingly recognised; however, there is limited understanding of the nature of health determinants and current practices in northern project assessment and decision making. This paper reports on a study of the nature and use of health determinants in Canadian northern environmental impact assessment, and discusses the key challenges to, and opportunities for, improved practice. Four themes emerged from this study. First, the consideration of health is limited to physical environments and the physical determinants of health, with limited attention to broader social and cultural health determinants. Second, when health is considered in northern project impact assessments such considerations rarely carry forward to post-project approval monitoring of health determinants and evaluation of health impact management programmes. Third, while there is general consensus that health determinants should be an integral part of northern impact assessment, there exist different expectations of the role of health determinants in project evaluation and decision making due in large part to different understandings and interpretations of health. Finally, a broader conceptualisation of health and health determinants in northern environmental impact assessment is required; one that takes into consideration northern cultures and knowledge systems, and is adaptive to local context, geography and life cycles.

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## Introduction

Environmental impact assessment (EIA) is broadly defined as a formal process to predict, evaluate, and manage the potential impacts of project development on the environment. Initially conceived by the National Environmental Policy Act of 1970 of the United States, for the purpose of biophysical impact assessment, the scope of 'environment' in EIA has since broadened considerably to include, among other factors, human health and well being in the project assessment and decision making process. It would appear that the EIA process provides a logical medium in which to consider the impacts of project development on human health (Banken 1999; Laws and Sagar 1994); however, international reviews of EIA practice (for example, Steinemann 2000; British Medical Association 1998) suggest deficiencies in the consideration of health in many project assessments.

Part of the problem, arguably, is the complexity of pathways that link project development, environmental change and human health. Recent literature on health impact assessment points to the need to focus attention

not on direct causal relationships but on the linkages between project actions and the various driving forces or 'determinants' of health and well being (Banken 1999). Corvalán and others (1999), for example, suggest that health impacts are the result of a complex set of events, and attention should focus on the determinants of health, the higher levels of health assessment, and not directly on the predicted health impacts of project actions *per se*. Birley (2002) concurs, arguing the need to redirect attention in EIA to the determinants of health rather than concentrating on predicting uncertain health impacts and health outcomes. Determinants of health are not themselves 'health impacts'; rather, they are factors that influence or provide an indication of health and well being (Kahan and Goodstadt 1999) and include such factors as income, physical environments, health services, and social support networks.

Internationally, health and EIA researchers have directed considerable attention on the challenges of bridging health and environmental regulations (for example, Kemm 2004; Laws and Sagar 1994), and on the extent to which human health impacts are documented in project environmental impact statements (for example, Steinemann 2000). However, the majority of this research has evolved around health and EIA in southern regions with little attention to health in northern environments. As a result, there is limited understanding of the current state of health in northern EIA and of the nature and role of health determinants in northern project impact assessment. The purpose of this paper is to make a contribution in this regard through an examination of

the nature and extent of health determinants in Canadian northern EIA practices.

This paper is based on the results of a programme of research, from 2003 to 2006, led by the first author, and focused on health integration in Canadian northern EIA. In two previous papers we reported on the lessons learnt from health assessment across several northern EIA case studies in the mining resource sector (Noble and Bronson 2005), and on practitioner perspectives concerning the overall state of health integration in northern EIA (Noble and Bronson 2006). In this paper we focus on health determinants and report on the extent to which determinants are considered in project impact assessment practices and the scope of Canada's health determinants framework within the context of northern EIA. While this research is based on the experiences of EIA and health practitioners in the Canadian territories and northern parts of the provinces, north of the southern limit of the discontinuous permafrost zone, the observations and lessons learnt are, arguably, applicable across other northern regions and EIA jurisdictions. In the sections that follow the research methodology is described, a summary of the study results presented and a number of observations and recommendations ventured concerning the nature and consideration of health determinants in northern EIA.

### Research methods

Not all determinants of health may warrant detailed review in every project EIA, but all should be considered (Kwiatkowski and Ooi 2003). Thus, while recent reviews of project impact statements reported in the health and EIA literature are useful, such reviews may not reveal the full extent to which determinants of health are actually considered in the EIA process. Moreover, such an analysis cannot identify potentially different perceptions and understandings of the nature and role of health determinants in EIA, or the extent to which health determinants are followed-up and monitored after project approval.

The primary instrument used in this research was a mail-out survey, supplemented by semi-structured telephone and face-to-face interviews. The survey and interviews were administered in late 2004 and leading into March of 2005. The survey sampling design was purposive and used terms of reference and impact statements from nine large scale northern mining and energy resource development projects (Table 1). An initial 177 potential study participants were identified who were involved in some capacity (for example, consultant, regulatory agency, proponent, identified interest group) in the project EIAs. These individuals were contacted and, in turn, asked to identify other potential participants whom they thought, given their knowledge and experience, might be interested in participating in the study. An additional 42 potential participants were identified. Following Salant and Dillman's (1994) survey administration process, all participants were sent a formal invitation to participate that outlined the study goals and objectives. Of the 177

Table 1. Northern project documents sampling base.

Development Project <sup>a</sup>	EIA Type <sup>b</sup>
Voisey's Bay Nickel Mine and Mill	Review Panel
Cigar Lake Uranium Mine	Review Panel
McLean Lake Uranium Mine	Review Panel
Cluff Lake Uranium Mine Project	Review Panel
Cluff Lake Decommissioning Project	Comprehensive Study
Beaufort Sea Oil Development	Comprehensive Study
Ekati Diamond Mine	Review Panel
Diavik Diamond Mine	Comprehensive Study
Cheviot Coal Mine Project	Review Panel
Mackenzie Gas Project	Review Panel

<sup>a</sup> For more information on these projects, see URL: [http://www.ceaa.gc.ca/010/index\\_e.htm](http://www.ceaa.gc.ca/010/index_e.htm)

<sup>b</sup> A Comprehensive Study EIA is used for projects which tend to be large in size, having the potential for significant adverse environmental effects. These projects are listed on the Canadian Environmental Assessment Agency's Comprehensive Study List Regulations. If it is found that the environmental impacts of a proposed project require further study, or that the project will cause significant adverse effects, or where there is public concern, the Minister of Environment refers the project to a Review Panel or Mediator for further study. A Review Panel is a group of experts selected on the basis of their knowledge and expertise and appointed by the Minister of the Environment to review and assess a project with likely adverse environmental effects. A Review Panel EIA allows the proponent to present the project to the public and explain the projected environmental effects, and provides opportunities for the public to hear the views of government experts about the project. See URL: [http://www.ceaa.gc.ca/010/basics\\_e.htm#comp](http://www.ceaa.gc.ca/010/basics_e.htm#comp).

initial potential participants, 34 (19%) agreed to participate; of the additional 42 participants recommended by the initial sample 19 (42%) agreed to participate.

A number of potential participants identified either from the project documents or by other participants declined to participate, indicating that they did not have sufficient northern EIA and/or health assessment experience or were unable to participate due to time constraints. Of those individuals that did participate in the survey, 70% reported over 15 years of EIA experience. The median number of northern EIAs in which participants had been involved is 10. The final survey sample consisted of government EIA and health authorities (n = 21 federal; n = 10 provincial/territorial); consultants and project proponents (n = 14); and Aboriginal health interests (n = 8), including participants from the Athabasca Tribal Council and Council of Yukon First Nations. Sample size and participant selection were not meant to be representative of all northern EIAs and health experiences, neither was the survey intended to provide a quantitative 'score' of health determinants; rather, the objective was to provide a sense of the current state of practice based on the



Fig. 1. Determinants of health: basic framework.  
Source: Based on Health Canada 2004, vol. 1.

experiences and perspectives of the study participants and to identify key challenges and learning opportunities.

Survey participants were provided with a list of nine health determinants as identified in Health Canada's (2004) handbook on health impact assessment (Fig. 1), and asked to rate the importance of each of those determinants in northern EIA; the performance of recent northern EIA practice in addressing health determinants, or indicators of such; and how often health determinants are considered in EIA throughout the various phases of project impact assessment and decision making. Participants were also asked to identify any additional determinants that are currently, or should be, considered in northern EIA that are not explicit in Health Canada's framework or current EIA guidelines. Survey data were analysed using descriptive and exploratory statistics, including Tukey's Hinges at the 95% confidence interval for the median (see Tukey 1977) and cosine theta ( $\theta$ ) of proportion of similarity (see Middleton 2000). For consistency in interpretation, the World Health Organization's (1987) definition of health as a state of complete physical, mental and social well being and not merely the absence of disease or infirmity was used in the survey. The implications of this within the context of northern EIA are discussed later in this paper. Prior to administration the survey was peer reviewed by members of Environment Canada and the Community-University Institute for Social Research for survey design, clarity and structure.

Quantitative data obtained from the survey were supplemented with results from semi-structured interviews (see Philip 1999) with northern health and environmental assessment practitioners, including community health practitioners and administrators of environmental and occupational health and regional health boards. The interviews were part of a larger study led by the authors, and only those results pertinent to health determinants and the survey objectives are presented here. The primary purpose of the interviews was to gather additional data to complement the mail-based questionnaire and to provide, where possible, additional understanding of the survey results (see Cresswell 2003). An initial list of key informants was obtained from a participant list of a 1990 northern health and EIA workshop, sponsored

by the Canadian Environmental Assessment Research Council, and, following the lead of Bryman (2001), additional interview participants were identified using a snowball sampling process by contacting environmental and regional health boards in each of Canada's northern regions and territories. In total, 44 potential participants were identified of which 13 (29.5%) agreed to participate. All interview questions were open-ended, but structured around the design of the survey described above, and sought to elicit the views of participants based on their experiences with health and northern EIA. Interview results were analysed using content analysis to categorize themes and to code characteristics emerging from the text (Bryman 2001). Initial categorisation was based on the structure of questions proposed in the mail-out survey (Weber 1990), after which an attempt was made to link responses across categories in order to uncover broader constructs in relation to the consideration of health determinants in northern EIA (LeCompte and Schensul 1999).

In the following section we report on the results of the practitioner survey and interviews. The results are structured according to the key themes addressed in the survey, around which the interviews were also structured, namely the frequency of consideration of health determinants, importance of consideration and recent EIA performance, integration of health determinants throughout each phase of the EIA process, and whether additional health determinants should be considered in Northern EIA that are not explicit in Health Canada's framework or current EIA guidelines. So as to ensure confidentiality of participants and to comply with Canadian Tri-Council ethical standards for social science research, the names of the research participants are withheld and individuals are not linked to particular northern projects or health service regions. Respondents' professions and general affiliations are provided to support data quality and reliability.

### Study results

Survey participants were first asked to identify the frequency of consideration of each of the nine health determinants as identified by Health Canada's framework (Fig. 1) in northern EIA practice. 'Physical environments' was identified as the determinant of health most frequently addressed in project EIA, considered in 60 to 79% of all project assessments, followed by income, education and working conditions, each considered in 40 to 59% of assessments (Table 2). Additional health determinants, namely physical health, health services and social support networks were reported to be considered significantly less often (20 to 39%) than physical environments in northern EIA practice, with health practices and coping skills and healthy childhood development reported to be considered least often (1 to 19%) of the nine health determinants.

The results suggest that the determinants of health are invariably considered in northern EIA, as one of our interview participants suggests: '... the main issue in EIA is always health and quality of life' (EIA authority,

Table 2. Frequency of consideration of health determinants in northern EA.

Health determinant	Frequency of consideration in recent northern EIA practice <sup>1</sup>						
	0%	1–19%	20–39%	40–59%	60–79%	80–99%	100%
Income and social status				X			
Education				X			
Physical health			X				
Personal health practices and coping skills		X					
Social support networks			X				
Working conditions				X			
Physical environments					X		
Healthy childhood development		X					
Health services			X				

<sup>1</sup> Median categorical response indicated for reported frequency of consideration of each health determinant.

federal government, no. 8); however, there is considerably more emphasis placed on physical environments than other, in particular social, determinants of health. Another interviewee goes on to explain that such an emphasis on the physical environment as a key determinant of health is not surprising since impacts on the human environment are often only required to be considered in EIA when in relation to changes in the physical environment brought about by project actions (EIA authority, territorial government, no. 3). The traditional emphasis of EIA on physical environments led one participant to argue that there is ‘... no evidence that human health issues are being incorporated very well into EIA practices in the North’ (health practitioner, northern health services unit, no. 10) and that ‘... reviewing just the physical determinants of health limits the scope of ... assessment’ (northern health policy and planning advisor, federal government, no. 4). However, another participant noted the added complexity of considering health determinants in EIA suggesting that although health is an important part of understanding

the impacts of project development on northern society ‘... there are so many things to look at in an E(I)A other than human health ... that you can’t keep adding everything that keeps arising regarding a project ...’ (EIA practitioner, no. 2).

Table 3 indicates responses to questions concerning the importance of considering each of the determinants of health in northern EIA, and the adequacy or performance of current EIA in addressing those determinants, or indicators. The survey results indicate ‘physical environments’, ‘working conditions,’ and ‘social support networks’ to be the most important health determinants considered in northern EIA. In terms of the adequacy of recent EIA practice in addressing those determinants, the ratings are ‘above average’, ‘satisfactory’, and ‘below average’, respectively, with the performance rating for physical environments significantly higher than social support networks at the 95% confidence interval for the median. A significant difference was found to exist between the perceived importance of each health determinant in

Table 3. Importance and adequacy of health determinants in current northern EIA practice.

Health determinant	Importance <sup>1</sup> in northern EIA practice	Adequacy <sup>2</sup> of northern EIA in addressing determinant
Income and social status	important	satisfactory
Education	important	satisfactory
Physical health	important	satisfactory
Personal health practices and coping skills	important	below average
Social support networks	very important	below average
Working conditions	very important	satisfactory
Physical environments	very important	above average
Healthy childhood development	important	below average
Health services	important	satisfactory

<sup>1</sup> The importance of considering each of the health determinants in northern EIA was rated on a scale of not important = 1; slightly important = 2; somewhat important = 3; moderately important = 4; important = 5; very important = 6; extremely important = 7. The median responses of participants are indicated.

<sup>2</sup> The performance of recent northern EA practices in addressing each of the determinants was rated on a scale of very poor = 1; poor = 2; below average = 3; satisfactory = 4; above average = 5; very good = 6; excellent = 7. The median responses of participants are indicated.

Table 4. Cosine  $\theta^1$  values (measures of similarity) between groups for (a) reported importance of considering health determinants in northern EIA, and (b) perceived performance of recent practice EIA in considering health determinants.

	Federal authorities	Provincial/Territorial	Consultants/Proponents	Aboriginal interests
Federal authorities		90.3% <sup>a</sup>	86.4% <sup>a</sup>	88.1% <sup>a</sup>
Provincial/Territorial	80.3% <sup>b</sup>		88.6% <sup>a</sup>	92.6% <sup>a</sup>
Consultants/Proponents	82.4% <sup>b</sup>	81.8% <sup>b</sup>		85.2% <sup>a</sup>
Aboriginal	65.8% <sup>b</sup>	79.1% <sup>b</sup>	78.4% <sup>b</sup>	

<sup>1</sup> Cosine  $\theta$  measure of proportionate similarity and is useful method to determine the amount of agreement (or dissent, similar to an 'index of dissimilarity') within a data set or set of group responses. Cosine  $\theta_{(ij)} = (\sum_k x_{ik} x_{jk}) / (\sqrt{\sum_k x_{ik}^2 \sum_k x_{jk}^2})$ ; where  $x_{jk}$  = score of participant  $i$  in cell  $k$ , and  $x_{jk}$  = score of participant  $j$  in cell  $k$ .

northern EIA and the adequacy of recent practice in addressing those determinants. The only exception is education, where the importance of the health determinant is believed to be reflected adequately in practice.

A cosine  $\theta$  function of proportion of similarity was derived to explore the degree of consensus (similarity) both within and between participant groups concerning the importance of considering each of the determinants and the adequacy of recent northern EIA practice in doing so. The results suggest consensus both within and between groups as to the 'importance' of addressing each of the determinants of health, with cosine  $\theta$  values indicating > 90% similarity within all groups and > 80% similarity between groups. Dissent was found to exist between groups, however, with regard to the 'performance' of recent EIA applications (Table 4). Although the sample size is not representative of all northern health interests, significant dissent was found to exist between Aboriginal health interests and all other groups concerning the performance of recent EIA, specifically with regard to 'professional health practices,' 'social support networks,' and 'healthy childhood development'. When asked to consider, on a scale from 1 = 'very poor' to 7 = 'excellent', the performance of northern EIA in addressing each of these determinants, Aboriginal health

interests identified performance as 'very poor', whereas all other groups reported 'average' to 'above average' performance. The differences in reported performance are statistically significant at the 95% confidence interval.

Next, survey participants were asked to identify, based on their knowledge and experiences, how often the determinants of health are considered in each of the different phases of the EIA process. While the specific nature and form of EIA varies from one project to the next, and across northern jurisdictions, EIA generally consists of a number of key steps including a baseline description of the project and its surrounding biophysical and socioeconomic environment, determining the significance of potential project impacts, and following-up post project approval to monitor conditions and to verify the effectiveness of impact mitigation programmes. The results are summarised in Table 5. 'Physical environments' was identified as the health determinant considered most frequently during the project baseline description, considered in 60 to 79% of all cases. The survey data further indicate, at the 95% confidence interval, that physical environments is considered significantly more often during baseline description than all other health determinants, with the exception of income and social status. Concerning the significance of project impacts,

Table 5. Frequency of consideration of health determinants northern EIA phases.

Health Determinant	Reported frequency of consideration <sup>1</sup>		
	Baseline	Impact significance	Follow-up and monitoring
Income and social status	40–59%	40–59%	1–19%
Education	40–59%	20–39%	1–19%
Physical health	20–39%	20–39%	1–19%
Personal health practices and coping skills	1–19%	1–19%	1–19%
Social support networks	20–39%	20–39%	1–19%
Working conditions	20–39%	20–39%	1–19%
Physical environments	60–79%	60–79%	40–59%
Healthy child development	1–19%	1–19%	1–19%
Health services	20–39%	20–39%	1–19%

<sup>1</sup> Median categorical response indicated for reported frequency of consideration of each health determinant for each phase of the EIA process.



physical environments is again the most frequently addressed health determinant and considered more often in the assessment process than all other determinants. Amongst the least considered determinants of health reported being used in assessing the significance of project impacts is healthy childhood development. With respect to follow-up and post project approval monitoring, physical environments is once again the most frequently considered health determinant, reported as addressed in 40 to 59% of northern EIAs. One of the study interview participants notes, '... it makes sense to me to identify baseline human health conditions and assess effects and propose mitigation...' (EIA consultant, no. 6). The survey results, however, suggest limited consideration of health determinants in monitoring programmes post project approval, the stage at which time the actual health impacts of the project are realised and mitigated, identified by participants as considered in fewer than 20% of EIAs.

The final section of the survey asked participants to identify any additional determinants of health or health indicators that, based on their experience, are typically included or should be included in northern EIA and that are not explicitly identified in either Health Canada's determinants framework or current EIA guidelines. Participants identified 'traditional land use and consumption of country foods' (n = 18), 'Aboriginal culture and cultural activities' (n = 12); 'gender equality' (n = 9) 'substance abuse and domestic violence' (n = 7); and 'access to health services' (n = 6). Interview participants similarly suggested that the scope of health determinants in northern EIA needs to be broadened and '... a holistic approach to health needs to be taken... new determinants... need to be included' (international health unit, no. 5). One interviewee suggested that 'protecting the rights and lifestyle... should be considered in northern development projects' (northern community health department, no. 11), as '... the impacts to spiritual, cultural, economic and social infrastructure are large compared to environmental impacts' (EIA practitioner, no. 13). In a similar context other participants noted the need to '... take on an Aboriginal worldview, which is important to the health of the people of the North' (northern health services unit, no. 10). Other participants identified history as an important factor in understanding northern health, suggesting '... when you look at how the North has developed, you see people are living differently now' (northern health services unit, no. 7). Another emphasised local geography, noting '... huge distances and bad weather conditions make it much more difficult to maintain the same level of health delivery system for the northern communities' (health administrator, federal government, no. 12).

## Discussion

### Challenges and opportunities

Based on the survey and interview results, we now venture a number of observations concerning the state of health determinants in northern EIA and the challenges to better integration. It is important to keep in mind the

limited nature of the survey and interviews, and that regional variation in health assessment across projects and northern EIA jurisdictions may exist that are beyond the scope of this paper. That being said, a number of key observations do emerge from the study results concerning the challenges and opportunities to the consideration of health determinants in northern EIA.

### Emphasis on physical environments

The first observation concerns the limited scope of health determinants in northern EIA. 'Physical environments' was identified by survey participants as the determinant most frequently addressed in northern EIA, considered in 60 to 79% of all assessments. This is perhaps not surprising given the traditional biophysical emphasis of project impact assessment. 'Physical environments' was similarly identified as one of the most important determinants to consider in northern EIA, along with working conditions and social support networks. Concerning the actual practice of northern EIA, however, social determinants, specifically social support networks, were identified as very poorly considered in recent project assessments. These findings are consistent with those of recent health and EIA research in that a narrow view of health is often adopted in northern EIA (for example, Noble and Bronson 2006; Kwiatkowski and Ooi 2003), and those health determinants over which the project proponent has little direct control, such as substance abuse, cultural practices, or family violence often receive considerably less attention (Noble and Bronson 2005). Burdge (2002) and Joffe and Sutcliffe (1997), for example, argue that EIA often fails to address the implications of project development for human communities and culture; rather, most reviews of health in EIA are restricted to worker health and safety and narrow epidemiological summaries of risks associated with mortality, morbidity, and toxicological effects of environmental contaminants (O'Neil and Solway 1990). Arguably, health determinants regarding northern development go beyond the physical environment and include such matters as access to health services, socio-cultural stress, racism, personal development, self-esteem, mental health, and assistance to families left with one or no parents as a result of employment opportunities outside the community (Kwiatkowski and Ooi 2003).

Banken (1999: S28) notes that today's accumulating knowledge of the overall importance of the social determinants of health makes it increasingly important to integrate these aspects into environmental assessments. The challenge facing health and EIA practitioners is to determine how the social determinants of health can be combined with the physical aspects of EIA without one element being overemphasised at the expense of the other (Kemmer 2004). It has already been demonstrated in practice that proponents of northern development projects are capable of going beyond the traditional, limited, physical environmental scope of health determinants in northern EIA to address effectively such broader determinants as social health and health services. In the case of the Ekati

diamond mine project in Canada's Northwest Territories, for example, the proponent, BHP Billiton, implemented, as part of the project's impact management plan, a number of community-based social support programmes for residents and local mine employees to assist with stress, family, and financial management (Kwiatkowski and Ooi 2003). Experiences such as the Ekati project demonstrate that proponents do have the capacity to address broader social and health concerns in EIA beyond the immediate physical determinants and biophysical environment.

### Following-up

Secondly, the study results emphasise the importance of considering health determinants at each stage of the northern EIA process from project description to post approval follow-up and impact mitigation monitoring. However, recent literature (for example, Kwiatkowski and Ooi 2003; Noble and Bronson 2005; Noble and Storey 2005) suggests that while northern project assessments have given considerable attention to health determinants in impact prediction and in the development of health and social impact preventative programmes, such considerations rarely seem to carry over to impact monitoring and follow-up stages. This was confirmed by the study results in that, with the exception of physical environments, when health determinants are considered in northern EIA they are limited to the pre-decision stages of baseline assessment and impact analysis. Participants reported that health determinants are followed-up and monitored in fewer than 20% of recent northern project assessments.

Follow-up is that part of the EIA process that transforms it from a being a static project permit granting exercise to becoming a dynamic impact management process through continuing data collection, compliance monitoring, and the verification of the effectiveness of health impact management measures. In this regard Birley (2002) notes that there may be substantial time lags, limited feedback and an overall absence of known cause-effect relationships when dealing with health impacts and health outcomes. The response is thus to focus on the determinants of health in project monitoring rather than on health outcomes themselves, thereby providing early warning indicators of the actual, as opposed to the predicted, project impacts on human health. While the consideration of health determinants during the pre-decision stages of EIA is necessary, it alone is not a sufficient condition for the early identification and successful mitigation of health and project impact outcomes (see Arts and others 2001). Assessing the real implications of northern development on human health will require that follow-up and monitoring attention be directed to the determinants of health, the underlying factors that contribute to health impacts, and to the desired as opposed to the most likely effects of project actions on those determinants. In other words, a more 'objectives-driven' approach to health assessment in northern EIA is required. Only then can EIA hope to be successful in minimising or

eliminating the adverse health effects of project actions before they occur, and refocus its attention on creating and enhancing health benefits through proactive project management (O'Neil and Solway 1990).

### Different perspectives and expectations

Thirdly, there was consensus amongst participants concerning the importance of addressing health determinants in northern EIA, with an average cosine  $\theta$  value indicating 88.5% consensus on the importance ratings for all determinants. However, when asked to evaluate the performance of recent EIA practices in considering health determinants, cosine  $\theta$  values for the survey responses indicated, on average, 78% consensus between groups across all criteria. The dissent that did exist was primarily due to different perspectives and expectations of health in northern EIA. In particular Aboriginal health participants expressed concern over the performance of EIA in addressing a number of social determinants of health, namely social support networks. This is, perhaps, not surprising as northern definitions of health often include an understanding that health forms a balance between humans and their environment (Indian and Northern Affairs Canada 2003), and places a much stronger emphasis on 'community' health as opposed to individual health (Davies 1992).

The study results suggest that the approach to health determinants in recent northern EIA and its focus on physical environments is considerably narrower than the World Health Organization's interpretation of health adopted for this research. Moreover, even this interpretation was found to fall short of northern Aboriginal and First Nations expectations and understanding of health in EIA. For example, the First Nations of British Columbia view health as 'obtaining and maintaining a balance of all aspects of the self — mental, emotional, spiritual and physical — with and through the help and involvement of the family and the community' (First Nations of British Columbia, cited in Health Canada 2004, 1: 80). The First Nations Inuit Health Branch (2001) suggests that determinants of health currently do not take into consideration the nature of northern communities and the understandings and beliefs of the people who live there. Ensuring the integrity of traditional or country foods, free from contamination, as well as the psychological, social, cultural and spiritual values are critical components of northern EIA practice (Kwiatkowski and Ooi 2003; O'Neil and Solway 1990). These perspectives, together with the study results, raise an important issue concerning different understandings of health, which may result in different perceptions of EIA performance and effectiveness in addressing health concerns.

### Scope of health determinants

Finally, notwithstanding Health Canada's recognition of Aboriginal people's holistic interpretation of health (Health Canada 2004, 1: 80, 87, 88), study participants identified a number of additional determinants that are, or should be, addressed in northern EIA that they felt are

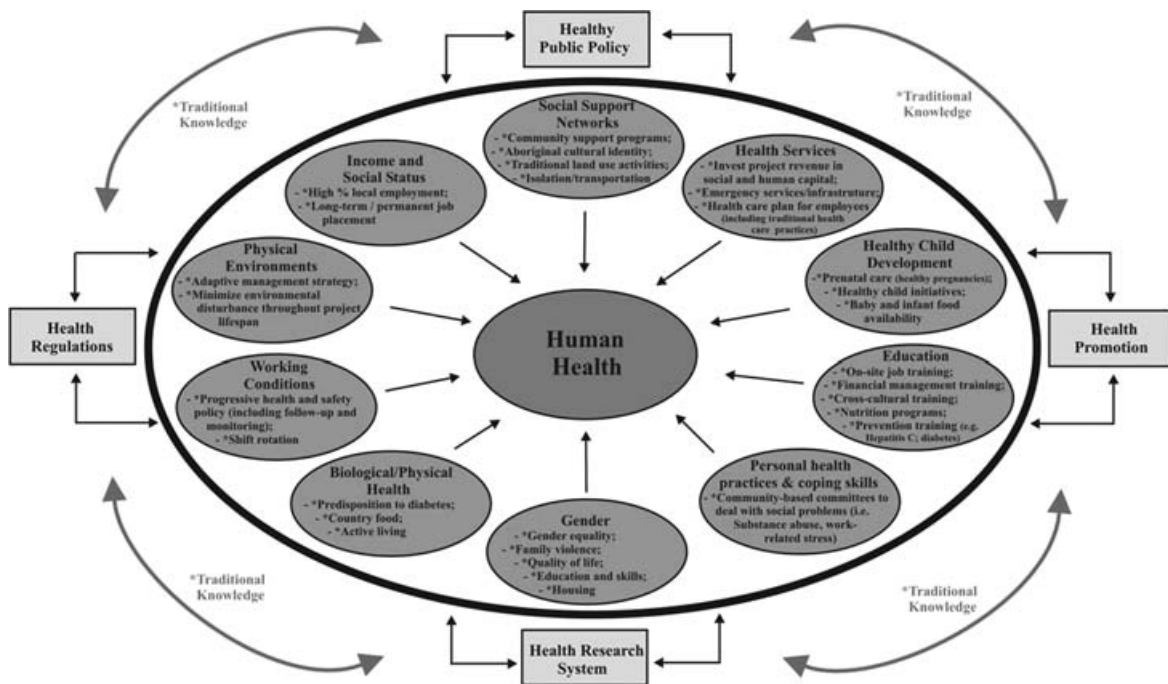


Fig. 2. Modified determinants of northern health: toward an open and adaptive framework. Source: Based on health Canada 2004 and adapted from Kwiatowski and Ooi 2003.

not explicitly considered in Canada's health determinants framework. This view is shared by numerous EIA and health researchers and administrators (for example, Noble and Bronson 2005; Mackenzie Valley Environmental Impact Review Board 2004; First Nations Inuit Health Branch 2001; Kemm, 2004; Davies 1992; O'Neil and Solway 1990), arguing the need to consider local geography and history, sustaining cultural identity, the link to the environment through the teachings of traditional values, maintaining the integrity of hunting, land use, and obtaining traditional native foods, as well as psychological, social, cultural, and spiritual values as part of northern health determinants and project impact assessment. The 2003 Canadian Arctic Contaminants Assessment Report on Human Health further suggests that determinants such as lifestyle (alcohol consumption, smoking, and substance abuse) and genetic predisposition should be considered when assessing the health of northern residents.

Based on responses received from survey and interview participants, and in an attempt to expand upon the basic health determinants framework presented earlier in this paper, we propose a modified framework (Fig. 2). This modified framework is based on integrating culture and community health indicators as part of the health determinants framework throughout the lifecycle of a project's impacts and, thus, the lifecycle of affected communities and individuals. The framework is grounded in the notion that health determinants must be adaptive over both space and time based on the knowledge of the communities affected (Health Canada 2004). The framework is not intended to provide a standardised approach because the choice of health determinants in EIA must be a function of culture, geography, lifecycle

and history (Kahan and Goodstadt 1999). The intent is to provide a broader conceptualisation of health determinants in northern EIA, adaptive to traditional and western knowledge systems, and to serve as a foundation on which additional determinants could be added as EIA practices unfold.

Every northern community and culture has its own perspective and understanding of environment and health linkages. More important than a static framework that attempts to capture a comprehensive set of 'best practice' determinants, is a flexible framework from which those determinants of health that are most important to consider are identified on a project-by-project basis through local knowledge and the EIA scoping process. The objective is to ensure that the selection of health determinants is sensitive to northern communities (First Nations Inuit Health Branch 2001), and to the understandings and beliefs of the people who live there. People experience the environment in which they live as a combination of physical, chemical, biological, social, cultural, and economic conditions (Corvalán and others 1999: 656–657). Incorporating the determinants that are best suited to the environment within which the project is situated will allow practitioners to focus on the most relevant health impact issues and to develop management plans that are both effective from a health management perspective and are contextually relevant.

## Conclusions

There is growing recognition of the need to integrate health in EIA practices in general and in northern EIA in particular. The Canadian Handbook on Health Impact Assessment, Vol. 1, (Health Canada 2004) suggests the



need to consider health in EIA in order to address public concerns; to minimise the need for separate health and EIAs; to demonstrate cost effectiveness; to minimise the adverse and to maximise the beneficial effects of projects on health; and to support the concept of sustainable development. However, the link between health outcomes and project impacts is complex and multi-factorial; thus the need to focus attention not on health impact predictions in EIA but rather on health determinants, the underlying drivers of health and well being, and the desired effects of project actions. While there are individual northern development projects that are considering health from broader environmental, social and cultural perspectives (see Noble and Bronson 2005), this study has demonstrated that, in practice, the consideration of health determinants in EIA falls short of what might be considered necessary, both in scope and performance, given the close relationship between environment, development and the health of northern societies and cultures.

Based on the study results, a number of conclusions can be offered. Firstly, Wilson and Rosenberg (2002) highlighted a dichotomy between the physical determinants of health and consideration of traditional activities and differing cultural practices as they relate to the health and well being of Aboriginal populations across Canada's north. This bias toward the consideration of physical environments as the principal determinant of human health continues to exist in Canadian northern EIA. Secondly, while invariably considered as part of EIA, health determinants are not well integrated throughout the EIA process, providing little follow-up and monitoring of actual health outcomes and the effectiveness of health impact management programmes. Thirdly, while there is agreement that health is an important factor to consider in northern EIA, there exist different understandings and expectations as to the nature and role of health determinants, particularly within the Aboriginal context. Finally, while a more inclusive view of health in northern EIA is required and there is no one-size-fits-all framework of health determinants that is appropriate to all project assessments and local geographic contexts, the determinants of health adopted in any EIA should be sensitive to local understandings of health and health needs, and should reflect an awareness of the differential distribution of impacts across different population segments.

In conclusion, this study attempts to shed some light on the nature of health determinants and performance of EIA in Canada's north. While the study is limited to the knowledge and experiences of the participants, and it is likely that considerable variation exists from one project to the next, we believe that the integration of health determinants in northern EIA is currently at a critical point. The need for, and benefits of using, health determinants in northern EIA have been well argued, and new frameworks to facilitate such integration are starting to emerge. Decisions concerning current larger scale northern development projects, such as the proposed

Mackenzie Gas Project, involving a 1220 km natural gas pipeline system extending from Taglu in Canada's Northwest Territories to Zama City in northern Alberta, will probably play an important role in shaping the future of health determinants in Canadian northern EIA. Further research is thus needed to document and learn from such cases, to identify mechanisms to improve upon past practices, and to provide guidance to practitioners on the selection and scope of health determinants. Only then can the way be paved to advance northern health impact assessment to the strategic levels of assessment and decision making, before irreversible project actions and decisions are taken.

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