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Mitigating Invisible Harms and Advancing Health Equity: Integrating SGBA Plus Within a Pathways of Effects Framework in Health Impact Assessment

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Abstract

Conventional impact assessment methodologies often rely on aggregate data, obscuring the disproportionate and invisible harms experienced by low-income households, Indigenous peoples and other groups experiencing inequities. This paper introduces a methodology that integrates Sex and Gender-Based Analysis Plus (SGBA Plus) within a Pathways of Effects (PoE) framework to better identify, assess and manage effects from major resource development and infrastructure projects. This framework systematically traces plausible linkages from project components and activities to specific health determinants, strengthening accountability for overlooked health effects. An SGBA Plus-informed PoE framework shifts practice from merely describing impacts to understanding them through an equity-oriented perspective that supports the mitigation of issues such as gender-based violence and cultural erosion. Ultimately, it supports sound decision-making and advances health equity in impact assessments.

1. The Need for Rigour in Assessing Differential Impacts

While impact assessments in Canada increasingly incorporate health equity considerations, conventional methodologies can often rely on population averages that obscure the heterogeneous effects of major resource development and infrastructure projects. This reliance on aggregate data may mask differential impacts and obscure the extent of health inequities .[1,2] Because health is shaped by socioeconomic position and historical marginalization, assessments that overlook gender, income, and Indigeneity, among other identity factors, may not fully capture differential effects across population groups.[3]

To address these gaps, this paper presents a methodology that integrates SGBA Plus within a PoE framework,[4] grounded in health-equity and intersectionality theories.[5,6] Mapping

pathways from a major project to health effects through this integrated approach reveals "blind spots" involving factors such as transient workforces and cultural disruption.[7,8] It not only enables the recognition of disproportionate harms across diverse population groups but also uncovers strategic entry points for upstream and targeted—rather than generic or non-targeted mitigation.

2. Methodology:

2.1 Sex and Gender-Based Analysis Plus

SGBA Plus provides a health-equity lens for assessing how diverse groups, characterized by identity factors, may be differentially affected by a major project. Using an identity-focused methodology, SGBA Plus is applied along pathways of health effects, at the level of intermediate determinants of health, where environmental, economic, social, and cultural/psychosocial conditions influence lived experience. Embedding SGBA Plus within pathway analyses can reveal localized effects—specifically those affecting disadvantaged groups—that may be obscured by population averages. Its intersectional dimension further refines this methodology by exploring how multiple identity factors may interact to worsen adverse project effects.

2.2 The Pathways of Effects Framework

The PoE framework provides an analytical structure connecting a major project to potential health impacts. Because health outcomes usually arise from complex, interacting influences beyond any given project, a pathways approach can be beneficial in showing how specific effects on "health factors," which underlie various health outcomes, can link back to project components and activities. Pathways illustrate project-related changes to the conditions of daily life—at the community or group level—that contribute to health effects at the individual level. The potential presence of unfavourable contributing factors points to increased risks of adverse health effects, informing where mitigation measures may be applied in impact assessment practice.

The PoE framework is meant to systematically outline "plausible" linkages between project characteristics and effects on physical and mental well-being. To operationalize this methodology, Health Canada's *Interim Health Impact Assessment Guidance* applies health-determinant concepts to identify relevant pathways through which a major project may generate adverse or positive effects, providing the basis for proactive mitigation and enhancement.[4] Specifically, this guidance proposes a framework that traces health impacts through three pathway segments (see Figure 1):[4]

- **Structural Determinants (Project Level)** — the starting point of effect pathways. For resource development and infrastructure projects, this includes decisions about components and activities that constitute the project design, such as site location, workforce requirements, and project duration.

- **Intermediate Determinants (Community/Group Level)** — environmental, economic, social, and cultural/psychosocial conditions that may change due to project components and activities. These include **Material Circumstances** (e.g., employment, housing, food security) and **Psychosocial Circumstances** (e.g., strenuous work, social cohesion, cultural continuity), both of which reflect community well-being (i.e., quality of life). SGBA Plus is essential here, since the same project drivers may produce markedly different effects across main identity groups specific to a given pathway, where risks of harm intensify with the intersection of more than one identity factor.

- **Proximal Determinants (Individual Level)** — health-related behavioural and biological factors that may be affected by project-related changes to conditions of daily life. These include immediate contributors to physical well-being—from dietary intake (nutrition) and substance use to biological exposures involving environmental contaminants, infectious agents, and psychosocial stressors (chronic stress). As primary risk factors for physical diseases that may take time to manifest, they represent the critical project links preceding health outcomes at the end of effect pathways. This pathway segment also includes effects on mental well-being, linked to the biological stress response and to behavioural coping tendencies (e.g., drug and alcohol use), with potential social consequences.

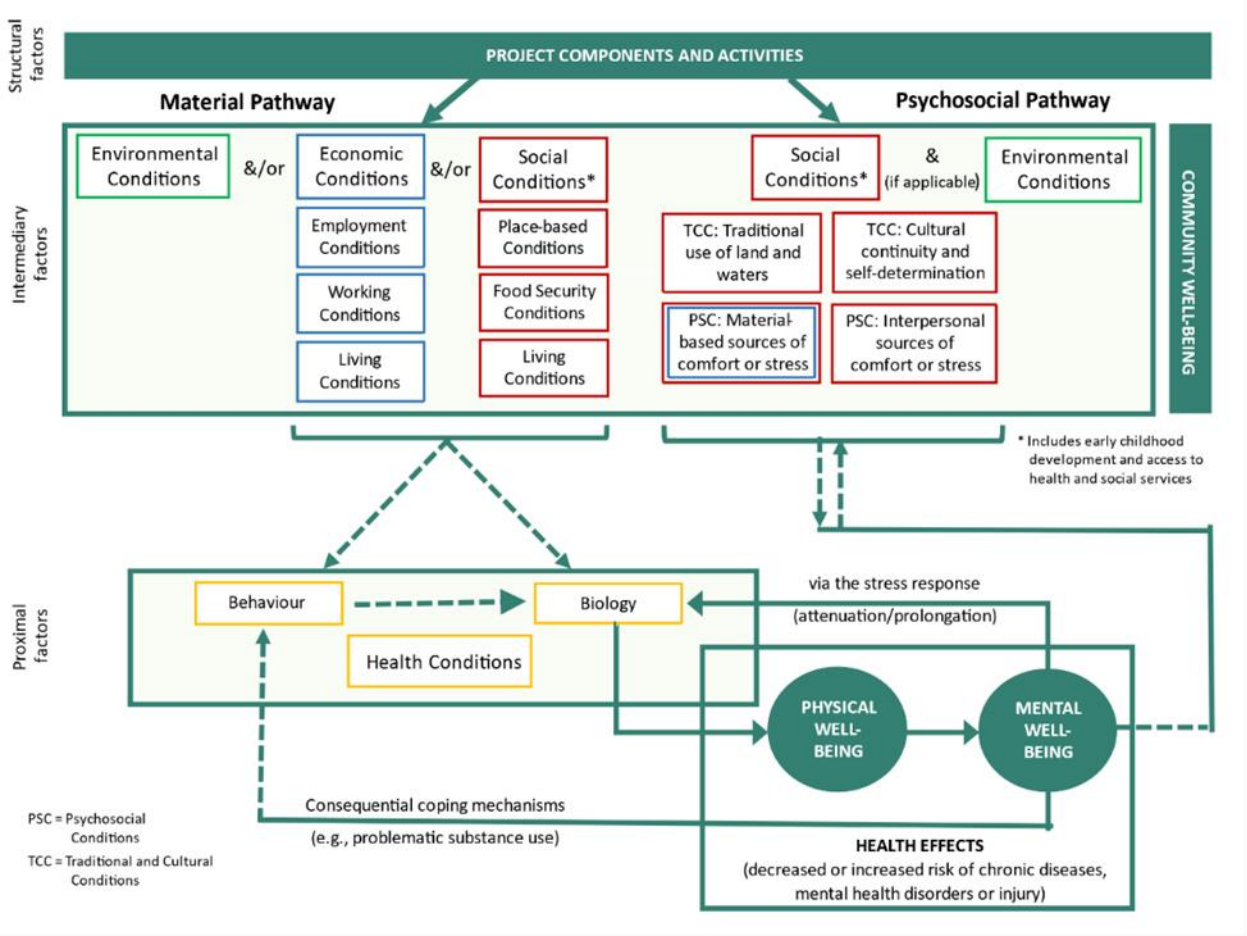

Figure 1. Generic Pathways of Health Effects [4]

3. Revealing "Invisible" Harms Through Pathways of Effects

Adopting a PoE framework, informed by SGBA Plus, reveals blind spots in conventional impact assessments. It is supported by the literature synthesized in *Foundational Health Effect Pathways for Health Impact Assessments,* which identifies the main categories of health effect pathways through which major projects may influence surrounding communities and population groups.[9] This report demonstrates how a pathways approach can bring differential project impacts to light. The following provides some key examples.

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3.1 Effects of Social Disruption on Disadvantaged Residents

In resource-dependent regions—often remote or rural—major projects can trigger significant in-migration of people and/or an increased circulation of money through direct, indirect and induced job creation and local investments. This economic growth may lead to sharp increases in the cost of living due to heightened demand for housing, goods and services, potentially accompanied by additional context-specific social disruptions captured under the Economic Upturn and Social Change Pathway.[9]

A large and rapid population influx may increase pressure on limited affordable housing stock and contribute to rising rents. These effects may disproportionately affect low-income and marginalized populations, including low-wage workers, single parent households, seniors on a fixed income, people with disabilities, and Indigenous residents. As housing and other living costs increase, households may allocate fewer resources to essential needs, including nutrition, recreation and health-related supports. Financial constraints may also be associated with increased reliance on substandard or overcrowded housing. Such conditions are linked to greater exposure to indoor environmental hazards(e.g., lead, pests, and mould), and increased risk of respiratory and infectious diseases, as well as psychosocial stressors that may affect family dynamics and child health outcomes [10] Financial hardship has also been associated with increased household stress, substance use, relationship conflict, and family violence.[11]

Such effects may exceed available municipal service capacity, create tensions between newcomers and long-term residents, and may affect community cohesion, depending on the local context.[9] Rising living costs thus function as a key mechanism through which resource booms may result in uneven distribution of project-related impacts, often amplifying health inequities.

3.2 Social Spillover Effects on Families from Demanding Working Conditions

The Employment and Social Spillover Pathway focuses mainly on project workers' on-the-job experiences and the positive and negative spillover effects these work-related experiences generate for families and community members not employed by the

project.[9] Regarding potential adverse effects from industry-specific employment, family relationships may be strained by project workers' demanding working conditions and extended absences from the home—whether due to long workdays on local projects or Fly-In/Fly-Out and Drive-In/Drive-Out work rotations.

Partners at home, especially with young children, may experience isolation and increased household and childcare responsibilities, while returning workers—often fatigued or under stress—may experience difficulty reintegrating into family routines, potentially limiting capacity for domestic tasks, child rearing, or shared family activities during their off-duty periods. Exacerbating these challenges, long absences often reduce opportunities for communication, weakening partners' ability to stay connected or manage family issues.

In addition, reduced parental supervision and emotional support can contribute to behavioural challenges in children and youth, which may affect child development—an outcome with long-term health implications. Financial mismanagement adds a further layer of relationship conflict: high earnings, low financial literacy, and overspending, despite the uncertain duration of employment, can lead to debt accumulation and financial stress.

Over time, relationship breakdown may occur, affecting overall well-being. Furthermore, this situation may be compounded by workplace cultures characterized by hypermasculine norms and/or coping behaviours involving substance use, which heighten the risk of harm from family violence. Persistent gender inequalities in resource-dependent communities further increase vulnerability, as women—often in lower-paid jobs or primary caregiving roles—may become financially dependent on male partners to the extent that they cannot easily leave an unsafe household.

3.3 Social Spillover Effects on Nearby Communities from Transient Workforces

As noted earlier, the Employment and Social Spillover Pathway extends beyond the household. The presence of large, predominantly male transient workforces may create conditions associated with increased risk. Research in Canada and internationally has

documented a relationship between industrial camps under Fly-In/Fly-Out/Drive-In/Drive-Out arrangements and community safety issues, such as gender-based violence. [9,12,13]

Within a PoE framework, the risk of gender-based violence can be linked to several contributing factors: the transient nature of the workforce, demanding working conditions, high disposable income, and easy access to alcohol and drugs; a hypermasculine workplace culture that normalizes heavy substance use and aggressive behaviour; and a camp environment or other short-term accommodation marked by limited recreational options and social isolation. This isolation removes the informal social controls and social responsibility typically present in hometowns.

Young women in nearby communities—especially those experiencing poverty, unstable housing, or mental health challenges—are particularly vulnerable to sexual exploitation and may become involved in higher-risk social environments, including survival-based economic work, involving greater access to drugs and increased risks of reduced agency and poor health outcomes (e.g., unintended pregnancy, sexually transmitted infections). In addition, women and girls across diverse socioeconomic backgrounds may face increased severity of gender-based violence, with Indigenous women and girls living in disadvantaged conditions at especially elevated risk of physical harm.

These potential harms reflect not only immediate circumstances but also broader structural drivers, including systemic racism, gendered power dynamics, and hypermasculine norms that devalue women. The combined effects of racism, sexism, and economic marginalization further heighten risks for young Indigenous women.

3.4 Psychosocial Effects on Indigenous Peoples from Land Disturbances

The Land Use and Culture Pathway encompasses the linkages between resource development projects and the land-based practices, food systems, and cultural relationships that sustain well-being, especially for Indigenous Peoples.[9] It highlights how changes to environmental conditions, land access, and culturally significant places affect harvesting traditions, cultural activities, and the intergenerational transfer of knowledge that supports cultural identity—a key health protective factor. These effects intersect with

the psychosocial dimensions described under the Environmental Degradation and Consequences Pathway, where land disturbances can diminish land-user experience and generate unease or deeper emotional strain.[9]

Psychosocial effects from industrial development are often overlooked in impact assessments, despite their link to physical health risks. For instance, even when access to harvesting areas remains open, the sensory presence of industrial activity—including altered landscapes, noise, and odours—can create apprehension about the safety of country foods. When contamination status is uncertain, concerns regarding perceived contamination of country foods tends to disrupt harvesting patterns and limit participation in other land-based practices.[7] Such concerns may prompt shifts toward nutritionally inferior store-bought foods. Furthermore, a reduction in active land use may affect food-sharing networks and land-based learning, may reduce community cohesion and may disrupt the intergenerational transfer of Indigenous knowledge.

Additionally, environmental disturbances can alter Indigenous Peoples' relationships to the land and restrict land access, which may also impede knowledge transfer and diminish cultural identity. These disturbances—particularly those affecting ecosystem health—can induce distress and powerlessness, eroding overall well-being and increasing the risk of harmful coping responses.

All of these consequences can be just as serious as actual contaminant exposure, yet they often receive far less attention in impact assessments. Failure to recognize these pathway elements in scenarios involving environmental degradation may lead to underestimation of adverse effects on physical, mental, emotional, and spiritual well-being.[14] Ultimately, environmental disruptions can affect the land-based cultural and spiritual anchors that support Indigenous resilience.[15]

4. From Awareness to Mitigation

Based on the pathways presented above, mitigation measures can be tailored to the specific mechanisms through which major projects contribute to adverse effects on disadvantaged population groups: rising costs of living, work environments, and sensory

and physical land disturbances. While temporary work camps can reduce social disruptions (e.g., inflationary pressures) for host communities, including residents with intersecting identity factors, these work settings may be associated with off-site coping behaviours (e.g., substance use) among a subset of the workforce, elevating the risks of gender-based and family violence. Regarding these risks, the PoE framework pinpoints the common upstream contributing factors to inform mitigation strategies, such as fostering workforce resilience within a psychologically healthy workplace culture. This approach supports both healthy coping with demanding working conditions and greater job productivity, while simultaneously enhancing the safety and well-being of families and nearby communities.

For Indigenous communities, in particular, mitigation can also address the psychosocial effects of perceived contamination and environmental disruptions. This includes best practices for the co-development and joint implementation of monitoring programs that can validate food safety and provide adaptive management guidance when contamination is detected. Grounding mitigation in this way facilitates clear and reliable communication. Additionally, investments in community-led cultural revitalization can help counteract the adverse effects of industrial nuisances on mental well-being and may have additional benefits for enabling participation in cultural and land-based activities that promote intergenerational healing and build resilience.[15] Regarding ecosystem disturbances and their health consequences, mitigation efforts may benefit from Indigenous leadership, collaborative spaces for knowledge exchanges, and the long-term vision of Indigenous Knowledge. This orientation is consistent with the public health model proposed for climate change action.[14]

In conclusion, identifying differential project impacts provides the analytical basis for effective mitigation. Through the PoE framework, SGBA Plus incorporates equity into the assessment by centering relevant lived experience and by enabling consideration of localized adverse effects that may not be evident in aggregate or net-benefit analyses. This integrated framework transforms equity from a guiding principle into a practical application for developing targeted mitigation. Such an approach promotes positive project outcomes, more broadly, and helps prevent placing undue burden on disadvantaged groups.

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