

## USING THE RESULTS OF ECONOMIC EVALUATIONS OF PUBLIC HEALTH INTERVENTIONS: CHALLENGES AND PROPOSALS

Eric Tchouaket  
Université du Québec en Outaouais  
Saint-Jérôme, Quebec

Astrid Brousselle  
Centre de recherche-Hôpital Charles-LeMoine, Université de Sherbrooke  
Longueuil, Quebec

**Abstract:** Faced with the combined pressures of economic recession and growing healthcare costs, public health administrators recognize the value of using economic arguments to justify public health interventions. Given the expense and the time involved in conducting new economic evaluations, decision-makers regularly speculate on the possibility of using results from studies done in a different context. This article analyzes the potential for using the results of economic evaluations of public health interventions in contexts other than those in which the studies were done. More specifically, it sheds light on issues of quality and transferability of analyses for public health decision-making and offers practical proposals for increasing the transferability of studies.

**Résumé :** Face au double fardeau de la récession économique et de la croissance continue des dépenses de santé, les directeurs de santé publique perçoivent l'intérêt d'introduire des argumentaires de nature économique pour soutenir les interventions de santé publique. Conscients que la réalisation de nouvelles études économiques est longue et coûteuse, les décideurs s'interrogent régulièrement sur la possibilité d'utiliser les résultats d'études réalisées dans un autre contexte pour justifier la rentabilité de l'intervention. Le présent article analyse le potentiel d'utilisation des résultats d'évaluation économique des interventions de santé publique dans un autre contexte que celui de réalisation de l'étude. Il apporte spécifiquement un éclairage sur la qualité et la transférabilité des évaluations économiques pour la

---

Corresponding author: Eric Tchouaket, Assistant Professor, Université du Québec en Outaouais (UQO), Department of Nursing, Saint-Jérôme Campus, 5 Saint-Joseph St., Room J-3204, Saint-Jérôme, QC, Canada J7Z 0B7; <eric.tchouaket@uqo.ca>

prise de décision en santé publique. Il formule en fin de compte des propositions pratiques pour accroître la transférabilité des études.

## INTRODUCTION

Faced with the combined pressures of economic recession and growing healthcare costs, public health administrators recognize the value of using economic arguments to justify public health interventions. Economic evaluation consists of identifying, measuring, valuing, and comparing the costs and consequences of two or more alternative programs or interventions. In the health field, economic evaluations are used to analyze how efficiently resources have been allocated and how resources should be allocated to maximize well-being. In public health, economic evaluation takes into account the amount of resources used by an intervention and the corresponding level of health-related outcomes (Centers for Disease Control and Prevention [CDC], 2013; Drummond, Stoddart and Torrance, 1987). Depending on whether the consequences are expressed as monetary, physical, or qualitative variables, the analysis may be cost-benefit, cost-effectiveness, or cost-utility analysis respectively (l'Institut national d'excellence en santé et en services sociaux [INESSS], 2013). Thus, economic evaluations provide data on an intervention's efficiency or profitability (Drummond et al., 1987) and appear relevant to guide decision-making in public health (Ball et al., 2009; Goldsmith, Hutchison, & Hurley, 2004).

However, to date economic evaluations in healthcare have focused mainly on drugs and technologies, as well as on interventions with determinate effects such as preventive clinical practice intervention. They have focused less on public health interventions that prevent the emergence of health problems through health promotion and prevention practices and the development of health-promoting public policies (Goldsmith et al., 2004). Goldsmith et al. pointed out that even when such evaluations exist, they generally are concerned with interventions related to preventive clinical practice.

Several problems have emerged in economic evaluations of public health interventions, and some have been highlighted in the literature (Drummond, Weatherly, & Ferguson, 2008; Shiell, Hawe, & Gold, 2008; Weatherly et al., 2009). First, there is the complexity of public health interventions. These are not simple; rather, they comprise a number of actions and programs with a common orientation, each

with its own costs and funding, leading to widespread and long-term effects with complex causalities. Developing a complete and accurate description of all activities related to a public health policy as well as their sources of funding represents a challenge in itself.

Second, there is the difficulty of attributing the effects of multi-component interventions. Public health interventions often involve multiple actors using many media and producing a wide spectrum of impacts. Compiling all the elements (costs, activities, effects) and identifying causal relations between the intervention and the chain of effects is complex (Shiell et al., 2008). This difficulty affects the understanding of intervention and the attribution of economic benefits, reinforcing the importance of thinking about new or adaptive approaches to conducting economic evaluations in public health.

Third, there is the difficulty of choosing the analysis perspective. Traditional economic evaluations recommend that the analyst choose a particular analysis perspective (for example, that of the hospital, the insurer, the patient, etc.). This has been criticized by Drummond et al. (2008), who recommend broadening the analysis perspective to include all costs and benefits for all stakeholders, although this idea has not been integrated into methodological guidelines. Because public health interventions often have an impact on various spheres—health, education, employment, health inequalities, early childhood development, and so on—the logic of adopting a single perspective is untenable. Can we justify conducting the economic evaluation of an intervention that has a wide spectrum of impacts while considering only the cost borne by one type of payer?

Finally, there is the problem of the delay between actions and effects. The time horizon is a major concern when assessing an intervention's effect. Public health interventions are rarely effective in the short term, making it difficult to distinguish effects attributable to the intervention from those due to environmental changes. Over a long period, many changes occur: diseases evolve, demographics change, as do environmental risk factors. These changes affect causal relations between the intervention and its impacts, as well as our capacity, as researchers, to formulate realistic hypotheses for attributing changes to causes.

In a difficult economic context, decision-makers in public health want to know how efficiently resources have been allocated and how resources should be allocated to maximize well-being. Because eco-

conomic evaluations are often costly and time-consuming (Goeree et al., 2007), decision-makers are increasingly interested in the possibility of using results from studies done in contexts outside of their own (Clément, Barnay, & LePen, 2011; Haute Autorité de Santé, 2011). Quebec's public health decision-makers are no exception. They have expressed both the intention and the need to analyze the quality and transferability of economic evaluations carried out in other contexts to develop arguments to defend similar public interventions in the Quebec context. It was from this standpoint that, in partnership with Quebec's Ministry of Health and Social Services (MSSS) and its Public Health Directorate, this study was developed.

The main objective of this study was to assess the potential for using the results of economic evaluation studies in contexts other than those in which they were conducted. For such potential to be viable, users should be able to have confidence in the results obtained (quality) with few biases and also to extrapolate the results to other implementation contexts (transferability). More specifically, our aim was to shed light on the quality and transferability of economic evaluations for purposes of public health decision-making.

This article presents (a) the results of our analysis of the quality and transferability of economic evaluations of public health interventions and (b) some suggestions to increase the transferability of economic evaluations: focus more on the logic model to describe the complexity of interventions, take into account all the elements that affected the results in the other implementation context, and use sensitivity analysis to define the real value of costs and benefits.

The results of this study will be useful not only for the scientific community working in public health economic evaluation, but also for public health decision-makers seeking to make the case for the economic value of their programs without having to carry out more primary studies in their own contexts.

## METHODS

### Research Strategy

For this study we analyzed in depth the quality and transferability of four economic evaluation studies that included an estimate of return on investment (dollars gained or cost savings for every dollar invested in the intervention; INESSS, 2013). These studies were a kind of

cost-benefit analysis demonstrating economic benefits that exceeded costs. These evaluations were identified and selected by the public health directors of the MSSS. They dealt with two themes of interest for public health in Quebec: early childhood care and education, and the prevention of nosocomial infections in hospitals. The four studies, two on each theme, were cost-benefit analyses conducted in different contexts in the United States and Canada: (a) the High/Scope Perry Preschool Project implemented in Michigan, in the US (Schweinhart, 1994, 2003; Schweinhart et al., 2010; Schweinhart et al., 2005); (b) the Early Childhood Education and Care (ECEC) program developed in Ontario, in Canada (Cleveland and Krashinsky, 1998, 2002, 2003, 2004; Iglesias and Shalala, 2002; McCain and Mustard 2002; Ontario Prevention Clearinghouse, 2006); (c) a program to prevent nosocomial respiratory infections in a pediatric hospital in Philadelphia, in the US (Macartney, Gorelick, Manning, Hodinka, and Bell, 2000); and (d) the program for nosocomial infection prevention in Quebec hospitals (Comité sur les infections nosocomiales du Québec [CINQ], 2004; Institut national de santé publique du Québec [INSPQ], 2008; MSSS 2004, 2006a, 2006b, 2011).

## Descriptions of the Studies

### Economic evaluation of the High/Scope Perry Preschool Project

The study by Schweinhart et al. (2005) analyzed in this article evaluated the outcomes and cost-effectiveness of the High/Scope Perry Preschool Project. This was an early childhood education and development program implemented in Ypsilanti, Michigan, USA, between 1962 and 1967. The High/Scope Perry Preschool Project was based on the philosophical premise that attention to early childhood development would have positive repercussions for those children's futures in terms of health and well-being, education, greater economic productivity, social inclusion, crime prevention, and so on. Forms of this program are currently in operation in several countries worldwide.

This study followed a group of 123 children with low intelligence quotients (IQ) from disadvantaged families, beginning at the age of three years. They were randomly distributed into an experimental group (58 children) and a control group (65 children). Data were collected annually from ages 3 to 11 years, then again at ages 14, 15, 19, 27, and 40 years; hence the study extended over a 37-year period. The most recent publication by Schweinhart et al. (2005), which is

the eighth monograph in the series on the economic evaluation of the High/Scope Perry Preschool Project, reports the results for those children at age 40. The main sources of data used in that study were (a) analyses of administrative data: public and private school fees (primary, secondary, and special schools) in the state of Michigan; teachers' salaries; costs related to arrests, charges, incarcerations, prison; and amount of taxes; and (b) family surveys to document parents' occupations (employment) over the previous five years; their level of education; and the structure of the household residence (number of rooms).

This study demonstrated the effectiveness of the High/Scope Perry Preschool Project in terms of income, employment, social inclusion, and crime reduction. It also showed that the High/Scope Perry Preschool was cost-effective (return on investment) for society, in that every dollar invested in this early childhood care and education project generated a return of more than \$16, with a total benefit per participant of around \$244,812 (USD) (Schweinhart et al., 2005; Heckman, Moon, Pinto, Savelyev, and Yavitz, 2009, 2010).

#### Economic evaluation of the Early Childhood Education and Care program

The study by Cleveland and Krashinsky (2003) analyzed here, based on their earlier study in 1998, assessed the costs and benefits of the Early Childhood Education and Care program implemented in Ontario, Canada. The aim of that program is to create an environment that is conducive to the well-being and full development of young children (0 to 5 years old). Its main strategies are to create high-quality day care, set up an early childhood learning and education program, develop prenatal care and services, support new parents, and create recreation programs to support children's full development (constructing parks, gyms, etc.). The ultimate goals of this program are to improve the future physical health of young children (obesity, diabetes, hypertension, coronary disease); to increase their level of education (IQ levels, academic levels); to facilitate their entry into the workforce; and to develop healthy attitudes and behaviours (reductions in violence, alcoholism, smoking, social stress, etc.).

The study by Cleveland and Krashinsky (2003) was based on major surveys conducted in Canada: Statistics Canada's 1996 Labour Force Survey (to document mothers' employment), Cycle 1 of the National

Longitudinal Survey of Children and Youth, 1994–95, and the Canadian National Child Care Survey (data on day care services). It dealt only with children ages 2 to 5 years. Thus, 1.3 million women with at least one child between those ages and 1.6 million children (approximately 400,000 children for each age year) were studied. The only benefits calculated were those related to educational gains for children (school performance at age 10, etc.) and to the mother's employment status. Other benefits (health, attitude and behaviour, etc.) were not measured. The dollar valuations of these benefits were based on two hypotheses: that the change in the mother's employment status was not related to the mother's age or number of children, but to the program; and that the benefit per child was \$3,600, dropping to \$1,800 if the child was placed in a day care centre thanks to the program. The study demonstrated a return on investment for the program, in 2002, of \$2 per dollar invested, resulting in a total benefit of \$10,548,000 per year.

#### Economic evaluation of a nosocomial infection prevention program in a pediatric hospital

The study by Macartney et al. (2000) analyzed here evaluated the cost-effectiveness of a nosocomial infection prevention program implemented in a 304-bed pediatric hospital in Philadelphia, Pennsylvania, USA. The aim of this program was not only to reduce the incidence of nosocomial respiratory infections (RSV-NI) in hospitalized children, but also to educate medical personnel on how to act before, during, and after an infection outbreak. It thus helped strengthen epidemiological control, monitoring, and surveillance in the hospital. The program was based on a hygiene and cleanliness awareness program and staff training.

From an institutional standpoint, the study by Macartney et al. (2000) evaluated the cost-benefit of the program by comparing the situations (incidence of RSV-NI: number of cases detected per 1,000 patient days) before and after the program's implementation in the hospital. Data were collected over eight periods (four pre-implementation, 1988–1989; and four post-implementation, 1995–1996). The survey looked at 148 at-risk hospitalized patients: 88 before the intervention and 60 after it. The costs of a hospital stay in 1996, in 2000 dollars, were used to value the hospital treatment of these infections. The benefits were valued by comparing the costs associated with treatment or care of 30 pre-intervention and 30 post-intervention cases, all of which were randomly selected. Only benefits directly

related to the treatment of RSV-NI were valued. The program's cost-benefit was calculated, in 2000, to be \$6 per dollar invested, with a benefit of \$9,419 per case detected.

### Economic evaluation of Quebec's nosocomial infection control program

A study carried out in 2010 by the Comité sur les Infections Nosocomiales du Québec (CINQ; MSSS and INSPQ, 2010) analyzed the benefits of a nosocomial infection prevention program implemented in 91 general and specialized hospitals in Quebec. The aim of that program was to reduce the incidence of nosocomial infections (*C. difficile*, methicillin-resistant *Staphylococcus aureus* [MRSA], and others) in health facilities. The program was based on (a) developing programs of nosocomial infection prevention and control (PCI), including nosocomial infection surveillance and vigilance regarding emergent problems related to infections; policies, procedures, and support measures; education and training; assessment; communication and information; and outbreak management; and (b) implementing programs for managers and all health facilities staff to raise awareness about hygiene and cleanliness in these hospitals.

Based on epidemiological surveillance data from 2004 to 2009, the CINQ demonstrated a reduction of nearly 50% in the incidence of *C. difficile*. More than 3,000 *C. difficile* infections per year had been prevented, including more than 100 deaths. Nearly \$42 million was saved (based on an estimated cost of \$14,000 CDN for treatment of a patient with *C. difficile*). In addition, the CINQ highlighted a 40% reduction in nosocomial MRSA bacteremias, such that more than 250 MRSA bacteremias, more than 2,000 MRSA infections, and more than 100 deaths had been prevented annually. This resulted in savings of more than \$40 million CDN. In the end, this program also freed up an average of 360 beds per year.

### The Quality of the Studies

The quality of a study is defined as its capacity to analyze a phenomenon using rigorous methods to provide valid estimates with few errors (Contandriopoulos, Champagne, Potvin, Denis, & Boyle, 2005). Analyzing the quality of studies therefore involves assessing whether the study has taken into account all the questions considered to be essential, so that the estimates obtained are valid (internal validity; Clément et al., 2011; Haute Autorité de Santé, 2011). In the

present study, we used the checklist for assessing economic evaluations developed by Drummond, Sculpher, Torrance, O'Brien, and Stoddart (2005) to assess the quality of the studies. This checklist is based on 10 criteria presented in Table 1.

The two authors of this article separately assessed the quality of the four studies and then discussed the results together. By consensus, the studies were classified according to whether their quality was high (+ +), medium (+ -), or low (- -) for all the criteria. A deliberative process was used to justify each assessment and to ensure the cogency of each judgement.

### The Transferability of the Studies' Results

Transferability of results is defined as the potential for using the results obtained in one study in other contexts, which may be similar or different (Brousselle, Lachaine, & Contandriopoulos, 2009). Thus, a transferable study is one that has strong external validity; in other words, its results—and even its methods—have the capacity to be generalized to other contexts, other situations, other times, and other populations (Clément et al., 2011; Haute Autorité de Santé, 2011). While transferability is often confused with the notion of generalizability, the latter also includes the notion of extending the results obtained to other units of a target population (extrapolation or inference) (Rosner, 2010).

We analyzed the studies' transferability by identifying in each study the elements that made them more easily transferable to other contexts. These elements were similar to those identified by Urdhal, Manca, and Sculpher (2006) in their study assessing the variability and generalizability of published economic evaluation results related to osteoporosis (Clément et al., 2011). They highlighted, among others, the following elements:

1. a clear description of the users and decision-makers who are the probable end-users of the results of the study being analyzed;
2. the transparency of the intervention model studied, which clearly describes the research question, the structure, the data considered, and especially the methods used;
3. the relevance of the data for the decision-maker, by clearly identifying all the sources of data used, the units of analysis, the time horizon, and the relevance of the comparator used;

4. the use of sensitivity analyses to vary the different data and study the different values that might be observed within one jurisdiction or another.

As with quality, both authors of the present article analyzed each study for transferability. Working separately, we identified the strengths and weakness of each study in relation to the above elements. After discussion we reached consensus and attributed high (+ +), medium (+ -), or low (- -) scores for transferability to each of the four studies.

## RESULTS

Based on a high level of agreement between the two authors with respect to the quality and transferability of the studies analyzed, the following results emerged.

### Result 1: The Quality of the Studies

The analysis of the data showed that the four studies satisfied nearly all of the criteria set out by Drummond et al. (2005) with respect to quality. Table 1 summarizes the results of the analysis.

Ensuring the quality of the studies is the first condition, but is not sufficient to support using the results for another jurisdictions. The transferability of results must also be shown.

### Result 2: Transferability of Studies

The analysis of the data also showed that three of the four studies performed less well in terms of Urdhal et al.'s (2006) four criteria. Table 1 also summarizes the results of the analysis of the transferability of each of the studies by showing only the final score for transferability.

#### Economic evaluation of the High/Scope Perry Preschool Project (- -)

The transferability analysis of this study showed that a number of precautions would need to be taken before the results could be applied to other contexts or to similar contexts. The study was conducted on children three years of age who were from poor families and had low IQs. The results could therefore only be transferred to children in this age category. The effects were converted into dollars

**Table 1**  
**Analysis of the Quality and Transferability of the Four Economic Evaluation Studies**

Criteria	High/Scope Perry Pre-school Project, Michigan	Early Childhood Education and Care program, Ontario	Nosocomial infections in a pediatric hospital in Philadelphia	Nosocomial infections in Quebec hospitals
<i>Quality of studies (10 criteria adapted from Drummond et al., 2005)</i>				
1. Clarity of the question being asked	++	++	++	++
2. Comprehensive description of the competing alternatives	++	++	++	++
3. How the program's effectiveness was assessed	+ - ; Only the easily measurable consequences were valued	+ - ; Only the consequences on mothers' employment and children's education were valued	+ - ; Indirect consequences not valued	+ - ; Indirect consequences not valued
4. Identification of costs and consequences of each alternative being compared	++	++	++	+ - ; No indication regarding program costs
5. Accurate measurement of costs and consequences using appropriate physical units	++	+ - ; Some reductionist and questionable hypotheses	++	+ -
6. Credibility of the assessment of costs and consequences	++	++	++	++
7. Costs adjusted based on timing: discounting	++	- - ; Not done	++	- -
8. Differential analysis of costs and consequences of competing alternatives	++	+ -	++	+ -
9. Allowance made for uncertainty in estimates of costs and consequences: sensitivity analysis	++	++	++	- -
10. Clarity of the presentation and discussion of the results: comparison of results against those of other studies and in other jurisdictions	- - ; No comparison with other studies and other jurisdictions	- - ; No systematic comparison with other studies and other jurisdictions	+ - ; Good discussion of results but no comparison with other studies	- - ; No comparison with other studies and other jurisdictions
Scores assigned to the quality of studies analyzed	++	+ -	++	+ -
<i>Transferability of studies (see details in the text)</i>				
Scores assigned to the transferability of studies analyzed	- -	- -	- -	+ -

using school fees, salaries, crime prevention costs, taxes, and so on. All these factors are a function of the study's particular context and setting (Michigan). The same is true for the total costs of funding invested in the program.

#### Economic evaluation of the Early Childhood Education and Care program (- -)

The transferability analysis showed that it would be important to take certain precautions before transferring the results of this study. Since the study involved children ages 2 to 5 years, the results can only be generalized to this age group. As in the first study, the costs associated with the program are a function of the intervention's context and setting in Ontario.

#### Economic evaluation of a nosocomial infection prevention program in a pediatric hospital (- -)

The transferability analysis of the economic evaluation results of this program showed a low level of applicability to other contexts, since it was conducted only in one hospital and, especially, there is nothing to indicate this hospital is representative of other hospitals in the Philadelphia region. Finally, the cost of the program and the valuation of the benefits are a function of the hospital and of the costs, such as salaries, prevailing in the region of Philadelphia. The only potentially transferable elements would be the methods of valuing costs and consequences.

#### Economic evaluation of Quebec's nosocomial infection control program (+ -)

The transferability analysis showed potential for transferring the methodology for valuing the effects of this program to other contexts, since the study was carried out in many (91) hospitals, representing a variety of situations. However, the costs of treating a patient with a nosocomial infection are contextualized to Quebec, and this amount of \$14,000 CDN could not, or could not easily, be applied to other contexts.

## DISCUSSION

This article was developed in partnership with decision-makers to respond to their need to use published scientific information on economic evaluation of public health interventions and programs. Its

main objective was to evaluate the potential for using the results of cost-benefit studies in other contexts than those in which they were carried out. More specifically, it was intended to shed light on the quality and transferability of cost-benefit analyses for use in decision-making in public health.

In-depth analysis of four studies selected by decision-makers on two themes of interest to them (early childhood care and education, and prevention of nosocomial infections in hospitals), which showed economic benefits that exceeded their costs and were carried out in different contexts, found that the studies were of high quality but that their results were not readily transferable to other contexts.

The numbers in these studies demonstrate sufficiently substantial economic advantages to make it safe to venture the opinion that such interventions could be equally advantageous in other contexts. However, using the return-on-investment amounts as presented would be a mistake, since monetary values (for example, school costs) vary enormously from one context to another.

From this reading of the results, we can draw lessons related to using the results of economic evaluations and offer proposals for conducting and publishing economic evaluations.

### Facilitate the Comparison of Interventions

*Observations:* In this exercise, which consisted of analyzing existing studies with an eye toward implementing a new intervention, a key question was the extent to which the interventions were comparable. The approach we used here clearly illustrated this aspect. The decision-makers wanted to analyze the results of studies published for two types of programs: early childhood care and education and prevention of nosocomial infections in hospitals. The first issue we explored was the nature of the intervention: to what extent were the interventions in the studies we analyzed comparable to each other? How similar were they to the model that the decision-makers were contemplating implementing? This is not a trivial question, and differs from the analysis of quality and transferability. It refers to the constituent elements of the intervention itself and to the causal process that will be operating to achieve the targeted objectives. Currently, very few economic evaluations present detailed descriptions of the intervention or these action processes. Like most economic evaluations in the literature, none of these studies did so.

*Proposal:* In the field of evaluation, which is developing very much in lockstep with economic evaluation (because the latter belongs to the field of evaluation), it is strongly recommended that a logic model of the intervention be created as a first step (Brousselle & Champagne, 2011; Funnell & Rogers, 2011; Knowlton & Phillips, 2009; Rossi, Lipsey, & Freeman, 2004; Weiss, 1998). The logic model differs from a decision tree (generally used in economic evaluations), in that it presents the components of the intervention—resources, activities, and effects (proximal, intermediate, and distal)—as well as the links between these various components. A decision tree is a part, or an incomplete form, of a logic model. It presents only the causal chain of effects and is generally used to analyze the effects of clinical interventions.

Such an approach would be useful as a precursor to economic evaluation. This exercise would make it easier to assess the quality of studies, and particularly to evaluate whether all the effects were properly incorporated into the study, or to analyze more easily the impact of considering the partial effects of an intervention. Building a logic model is especially relevant for interventions whose effects are not clearly delineated and are spread over time, as is often the case in public health interventions. The presence of a logic model of the intervention in published economic evaluation studies would definitely be helpful in analyzing the extent to which an intervention being contemplated is similar to interventions analyzed in the literature, which would allow for a more accurate interpretation of the results of the published results.

### Maximize the Transferability of Studies

*Observations:* In the four studies, our analysis showed low potential for transferability to other jurisdictions. The key question in this matter is to know to what extent the factors related to the study's context affected the cost-efficiency or cost-benefit ratios obtained (Willke, Glick, Polsky, & Schulman, 1998). Several authors have addressed this question in economic evaluation (Clément et al., 2011). Willke et al. (1998) identified certain factors that could influence the results and efficiency of interventions in other contexts: differences in terms of population characteristics, epidemiological factors, and the costs of the intervention. Likewise, O'Brien (1997) highlighted other differences that could diminish the transferability of studies, that is, differences related to demographics, epidemiology, clinical practices, incentives, relative prices, and opportunity costs. Goeree

et al. (2007), in a literature review, compiled a list of factors affecting the transferability of economic evaluation studies and the use of their results: (a) the demographic characteristics of patients (age and sex, level of education, socioeconomic status, risk factors, medical history, genetic factors, environmental factors, life expectancy, income, type of insurance, etc.); (b) patients' attitudes toward treatment, their compliance, the disincentives they may face (copayments, deductibles, etc.), and the characteristics of the disease being studied (epidemiology, case-mix, severity of illness, comorbidity); (c) the characteristics of the health professionals (clinical practices, type of remuneration, incentives, regulatory mechanisms; Clément et al., 2011; O'Brien, 1997); (d) the characteristics of the healthcare system (resources available, level of technology and innovation, other available treatments, wait lists, availability of generic drugs or substitutes, etc.); and (e) methodological criteria (costs considered, perspective of the study, temporal horizon, discounting rate, opportunity costs). Barbieri et al. (2005) point out that another major source of divergence is to be found in the type of study carried out, and that the range of variability depends on the analytical decisions taken by the researcher. Two types of factors appear to play a role in determining whether results will be transferable to contexts other than those in which studies were carried out: factors related to context and those related to analytical decisions, which are a function of researchers' subjectivity and experience. Even though we know very little about the contextual characteristics within which these studies were carried out, it is possible, as Chen, Donaldson, and Mark (2011) have noted, for researchers to have an impact on the studies' potential for transferability.

*Proposals:* First, researchers and evaluators should recount the study as transparently as possible. As affirmed by the Haute Autorité de Santé (2011), the key criterion for improving transferability is transparency. In effect, it is important (a) to provide as much information as possible on the data, presenting them clearly and including their sources, the origins of the prices and quantities used, the currency, the model used, and so on; (b) to present clearly the comparators used; (c) to identify clearly the different costs and quantities used; (d) to specify the study's perspective and horizon; (e) to present sensitivity analyses when necessary, as they help increase the variability of the results; and (f) when certain information cannot be included in the presentation of the study, to indicate to the reader how it may be obtained. This proposal is, however, the same as that for fostering the evaluation of study quality (Drummond et al., 2005), which

may explain why certain authors have noted an apparent correlation between methodological quality and transferability of studies (Boulenger et al., 2005; Clément et al., 2011; Knies, Ament, Evers, & Severens, 2009). Our experience has shown that transparency is a necessary but insufficient condition for analyzing whether results can be applicable to another implementation context.

Second, factors related to transferability should be meticulously documented and analyzed. Although quality criteria for economic evaluations are well established in the literature in the form of guidelines (Drummond et al., 2005), no guidelines have yet been defined to facilitate studies' transferability, except in disparate articles in the literature that have not been integrated. Welte, Feenstra, Jager, and Leidl (2004) have developed a model to identify factors that could influence the transferability of cost-effectiveness studies. These factors include the methodological characteristics of the study, the features of the healthcare system in which the study is conducted, the characteristics of the target population, elements influencing the efficacy of the intervention being studied, and a description of the economic context in which the study was done (currency, productivity, economies of scale, employment, etc.), not to mention the presentation of other contextual elements related to the intervention. Systematic reflection by the researchers carrying out the study can help target the factors that, in their view, would be most likely to influence the results in different implementation contexts. Another option would be to introduce sensitivity analyses, not on uncertainty factors identified during the study, as is currently done, but rather on contextual characteristics, in order to test the robustness of the results when characteristics of the context are changed.

### Summary Proposal

All researchers involved in performing economic evaluations should be concerned with the issue of transferability of their research results to maximize their utilization and potential impact. Just as guidelines for evaluating the quality of economic evaluations have, to a certain extent, helped standardize the conduct and presentation of economic evaluations, it would be helpful to have a framework to guide the conduct and presentation of studies that would promote the use of economic evaluation results in contexts other than those in which the studies were conducted. Here we propose a series of steps and parameters that could foster the transferability of economic evaluation results. We have tried to integrate all the

points raised in discussions by the different authors consulted. Our proposals are:

1. Build and validate the logic model of the intervention. In cases where two interventions are compared, both logic models should be created. The logic model should depict how the intervention is operationalized, including clinical practices.
2. Conduct the study in accordance with established quality criteria (such as those of Drummond et al., 2005). The impacts of the researchers' methodological and analytical choices would generally be incorporated and declared at this stage.
3. Identify the elements that could affect the results of the study. In particular, the following items should be analyzed:
  - characteristics of the population being studied and the target population;
  - characteristics that could affect the effectiveness of the intervention: comorbidity, treatment compliance, epidemiological characteristics, and so on;
  - costs of the intervention, in line with the perspective of the study;
  - characteristics associated with the care provision model and the healthcare system.
4. Perform sensitivity analyses to vary certain parameters identified as likely to be different in other contexts and that could affect the results of the study, in order to test and determine the robustness of the results.

## CONCLUSION

Carrying out economic evaluations of public health interventions appears to be a long and costly process (Goeree et al., 2007) because it requires many resources and data are collected on effects that manifest over time. In addition, the characteristics of public health interventions, especially the fact that a large proportion of these interventions have broad-based effects that are spread out over time, render economic evaluations difficult because the methodology applies primarily to interventions whose effects are circumscribed (Drummond et al., 2005). These characteristics intensify the need to be able to use existing studies, which are more rare in public health than in clinical interventions (Goldsmith et al., 2004), to guide decision-making on resource allocation in this sector, as well as to guide the implementation of interventions. However, to be able to use

existing results, we need to be able to judge the value of their results in relation to the planned implementation context. As we have seen here, the studies were presented in such a way that we were able to assess their quality, which was found to be high overall. The main difficulty had to do with the assessment of the transferability of results. Our objectives were, first, to know to what extent the interventions evaluated were comparable to the interventions being envisioned or implemented and, second, to understand how the context in which the study was carried out affected the results obtained. That analysis led us to formulate proposals that could be incorporated into future studies to foster transferability of economic evaluation results.

We have focused on public health interventions. This choice was impelled by research opportunities, but also reflects decision-makers' need for existing research data in this field. The relative scarcity of economic evaluations in the field of public health intensifies the perceived utility of existing results for guiding decision-making. Recognition of this need could stimulate an improved economic evaluation practice that would foster transferability of results, just as, a few years ago, recommendations for the conduct of economic evaluations helped standardize economic evaluation practice, improved the quality of studies, and made them easier for readers to understand (Canadian Agency for Drugs and Technologies in Health [CADTH], 2006; Drummond et al., 2005; National Institute for Clinical Excellence [NICE], 2005). Even though economic evaluation practice is not currently oriented toward fostering transferability of results, the adjustments needed would require only marginal research effort, but could potentially have a major impact on the use of research results, not only in public health interventions, but in other types of interventions as well.

#### ACKNOWLEDGEMENTS

We would like to thank Ginette Lafontaine, Annie-Claude Voisine, and Marie-Rose Sénéchal from the Ministry of Health and Social Services in Quebec for their important involvement in this research project.

The authors are grateful to the Directorate of Public Health, Ministry of Health and Social Services, for their financial contribution to the conduct of this research project. We would also like to thank the Fonds de Recherche en Santé du Québec (FRSQ) and the Canadian Institutes of Health Research (CIHR), which fund Astrid Brousselle's

Canada Research Chair in Evaluation and Health System Improvement, and the CIHR's 4P Training Program (promotion, prevention and public policy) and Population Health Intervention Research Network program (PHIRNET), which funded Eric Tchouaket's post-doctoral award.

## REFERENCES

- Ball, J., DesMeules, M., Kwan, A., Jacobsen, L., Luo, W., & Jackson, B. (2009). *Investing in prevention: The economic perspective. Key findings from a survey of the recent evidence*. Ottawa, ON: Public Health Agency of Canada.
- Barbieri, M., Drummond, M., Willke, R., Chancellor, J., Jolain, B., & Towse, A. (2005). Variability of cost-effectiveness estimates for pharmaceuticals in Western Europe: Lessons for inferring generalizability, *Value Health*, 8(1), 10–23.
- Boulenger, S., Nixon, J., Drummond, M., Ulmann, P., Rise, S., & de Pouvourville, G. (2005). Can economic evaluations be made more transferable? *European Journal of Health Economics*, 6, 334–346.
- Brousselle, A., & Champagne, F. (2011). Program theory evaluation: Logic analysis. *Evaluation and Program Planning*, 34, 69–78.
- Brousselle, A., Lachaine, J., & Contandriopoulos, A. P. (2009). L'évaluation économique. In A. Brousselle, F. Champagne, A. P. Contandriopoulos, & Z. Hartz (Eds.), *L'évaluation: concepts et méthodes* (pp. 187–224). Montreal, QC: Presses de l'Université de Montréal.
- Canadian Agency for Drugs and Technologies in Health (CADTH). (2006). *Guidelines for economic evaluation of health technologies*, Canada (3rd ed.). Ottawa, ON: Author.
- Centers for Disease Control and Prevention, U.S. Department of Health & Human Services. (2013). *Economic evaluation tutorials*. Atlanta, GA: Author. Retrieved from <http://www.cdc.gov/owcd/eet/SeriesIntroduction/TOC.html>
- Chen, H. T., Donaldson, S. I., & Mark, M. M. (Eds.). (2011). *Advancing validity in outcome evaluation: Theory and practice* (New Directions for Evaluation No. 130). San Francisco, CA: Jossey-Bass.

- Clément, O., Barnay, T., & LePen, C. (2011). *Actualisation partielle du Guide méthodologique pour l'évaluation économique des stratégies de santé*. Paris, France: Collège des Économistes de la Santé.
- Cleveland, G., & Krashinsky, M. (1998). *The benefits and costs of good child care: The economic rationale for public investment in young children. A policy study*. Toronto, ON: University of Toronto at Scarborough.
- Cleveland, G., & Krashinsky, M. (2002). *Financing ECEC services in OECD countries*. Toronto, ON: University of Toronto at Scarborough.
- Cleveland, G., & Krashinsky, M. (2003). *Fact and fantasy: Eight myths about early childhood education and care*. Toronto, ON: University of Toronto at Scarborough.
- Cleveland, G., & Krashinsky, M. (2004, November). *Financing early learning and child care in Canada*. Discussion paper presented at the conference of the Canadian Council on Social Development, Winnipeg, MB.
- Comité sur les infections nosocomiales du Québec (CINQ). (2004). *Normes en ressources humaines pour la prévention des infections au Québec*. Québec, QC: Santé et services sociaux Québec; Association des médecins microbiologistes infectiologues du Québec, Comité sur les infections nosocomiales du Québec.
- Contandriopoulos, A. P., Champagne, F., Potvin, L., Denis, J. L., & Boyle, P. (2005). *Savoir préparer une recherche: la définir, la structurer et la financer*. Montreal, QC: Les presses de l'Université de Montréal.
- Drummond, M. F., Sculpher, M. J., Torrance, G. W., O'Brien, B. J., & Stoddart, G. L. (2005). *Methods for the economic evaluation of health care programmes* (3rd ed.). New York, NY: Oxford University Press.
- Drummond, M. F., Stoddart, G. L., & Torrance, G. W. (1987). *Methods for the economic evaluation of health care programmes*. London, UK: Oxford University Press.
- Drummond, M., Weatherly, H., & Ferguson, B. (2008). Economic evaluation of health interventions. *British Medical Journal (Clinical Research Ed.)*, 337, a1204.
- Funnell, S. C., & Rogers, P. (2011). *Purposeful program theory: Effective use of theories of change and logic models*. Indianapolis, IN: Jossey Bass.

- Goeree, R., Burke, N., O'Reilly, D., Manca, A., Blackhouse, G., & Tarride, J. E. (2007). Transferability of economic evaluations: Approaches and factors to consider when using results from one geographic area for another. *Current Medical Research and Opinion*, 23, 671–682.
- Goldsmith, L. J., Hutchison, B., & Hurley, J. (2004). *Economic evaluation across the four faces of prevention: A Canadian perspective*. Hamilton, ON: McMaster University, Centre for Health Economics and Policy Analysis.
- Haute Autorité de Santé. (2011). *Guide méthodologique : choix méthodologiques pour l'évaluation économique à la HAS*. Paris, France: Author.
- Heckman, J., Moon, S. H., Pinto, R., Savelyev, P., & Yavitz, A. (2009). *The rate of return to the High/Scope Perry Preschool Program* (Discussion paper 4533). Bonn, Germany: Institute for the Study of Labor (IZA).
- Heckman, J., Moon, S. H., Pinto, R., Savelyev, P., & Yavitz, A. (2010). *Analyzing social experiments as implemented: A reexamination of the evidence from the HighScope Perry Preschool Program* (Discussion paper 5095). Bonn, Germany: Institute for the Study of Labor (IZA).
- Iglesias, E. V., & Shalala, D. E. (2002). Narrowing the gap for poor children. In M. E. Young (Ed.), *From early child development to human development* (pp. 363–374). Washington, DC: World Bank.
- Institut national d'excellence en santé et en services sociaux (INESSS). (2013). *HTA glossary*. Retrieved from <http://htaglossary.net/Guide+d%27utilisation>
- Institut national de santé publique du Québec (INSPQ). (2008). *Rapport d'activités 2007–2008 du Laboratoire de santé publique du Québec*. Québec, QC: Author.
- Knies, S., Ament, A. J., Evers, S. M., & Severens, J. L. (2009). The transferability of economic evaluations: Testing the model of Welte. *Value Health*, 12, 730–738.
- Knowlton, L. W., & Philips, C. C. (2009). *The logic model guidebook: Better strategies for great results*. Los Angeles, CA: Sage.
- Macartney, K. K., Gorelick, M. H., Manning, M. L., Hodinka, R. L., & Bell, L. M. (2000). Nosocomial respiratory syncytial virus infections: The cost-effectiveness and cost-benefit of infection control, *Pediatrics*, 106, 520–526.

- McCain, M. N., & Mustard, J. F. (2002). *From early child development to human development: Enabling communities. The early years study three years later*. Toronto, ON: The Founders' Network of the Canadian Institute for Advanced Research (CIAR).
- Ministry of Health and Social Services, Québec (MSSS). (2004). *Portrait sur les mesures appliquées dans les centres de soins généraux et spécialisés du Québec (CHSGS) pour la prévention et le contrôle des infections à Clostridium Difficile*. Québec, QC: Direction générale de la santé publique, Ministère de la santé et des services sociaux.
- Ministry of Health and Social Services, Québec (MSSS). (2006a). *Lignes directrices en hygiène et salubrité: analyse et concertation*. Québec, QC: Direction générale de la coordination, du financement et de l'équipement, Ministère de la Santé et des Services sociaux.
- Ministry of Health and Social Services, Québec (MSSS). (2006b). *Plan d'action sur la prévention et le contrôle des infections nosocomiales 2006-2009*. Québec, QC: Direction générale de la santé publique, Ministère de la santé et des services sociaux.
- Ministry of Health and Social Services, Québec (MSSS). (2011). *Prévention et contrôle des infections nosocomiales: plan d'action 2010-2015*. Québec, QC: Gouvernement du Québec.
- Ministry of Health and Social Services, Québec (MSSS) and Institut national de santé publique du Québec (INSPQ). (2010). *Surveillance épidémiologique rehaussée des infections invasives à streptocoque du groupe A dans la province de Québec: Bilan du 18 janvier 2009 au 17 janvier 2010*. Québec, QC : Institut National de la Santé Publique du Québec, Ministère de la Santé et des Services Sociaux.
- National Institute for Clinical Excellence (NICE). (2005). Incorporating health economics in guidelines and assessing resource impact. In *The guideline developments methods: Information for National Collaborating Centres and guideline developers* (pp. 8-1-8-6). London, UK: Author.
- O'Brien, B. J. (1997). A tale of two (or more) cities: Geographic transferability of pharmaco-economic data. *American Journal of Managed Care*, 3Suppl., S33-S39.
- Ontario Prevention Clearinghouse. (2006). *The case for prevention: Moving upstream to improve health for all Ontarians*. Toronto, ON: Author.

- Rosner, B. (2010). *Fundamentals of biostatistics* (7th ed.). Boston, MA: Brooks/Cole.
- Rossi, P. H., Lipsey, M. W., & Freeman, H. E. (2004). *Evaluation: A systematic approach*. Thousand Oaks, CA: Sage.
- Schweinhart, L. J. (1994). *Lasting benefits of preschool programs*. Urbana, IL: ERIC Clearinghouse on Elementary and Early Childhood Education. ERIC Digest.
- Schweinhart, L. J. (2003, April). *Benefits, costs, and explanation of the High/Scope Perry Preschool Program*. Discussion paper presented at the meeting of the Society for Research in Child Development, Tampa, FL.
- Schweinhart, L. J., Malofeeva, L., Heckman, J. J., Pinto, R., Moon, S. H., & Yavitz, A. (2010). *The cost-benefit analysis of the Preschool Curriculum Comparison Study*. Ypsilanti, MI: HighScope Educational Research Foundation.
- Schweinhart, L. J., Montie, J., Xiang, Z., Barnett, W. S., Belfield, C. R., & Nores, M. (2005) *Lifetime effects: The High/Scope Perry Preschool Study through age 40*. Ypsilanti, MI: HighScope Educational Research Foundation.
- Shiell, A., Hawe, P., & Gold, L. (2008). Complex interventions or complex systems? Implications for health economic evaluation. *British Medical Journal*, 336, 1281–1283.
- Urdahl, H., Manca, A., & Sculpher, M. J. (2006). Assessing generalisability in model-based economic evaluation studies: A structured review in osteoporosis. *Pharmacoeconomics*, 24, 1181–1197.
- Weatherly, H., Drummond, M., Claxton, K., Cookson, R., Ferguson, B., Godfrey, C. ... Sowden, A. (2009). Methods for assessing the cost-effectiveness of public health interventions: Key challenges and recommendations. *Health Policy*, 93, 85–92.
- Weiss, C. (1998). *Evaluation* (2nd ed.). Upper Saddle River, NJ: Prentice Hall.
- Welte, R., Feenstra, T., Jager, H., & Leidl, R. (2004). A decision chart for assessing and improving the transferability of economic evaluation results between countries. *Pharmacoeconomics*, 22(13), 857–876.

Willke, R. J., Glick, H. A., Polsky, D., & Schulman, K. (1998). Estimating country-specific cost-effectiveness from multinational clinical trials, *Health Economics*, 7(6), 481–493.

**Eric Tchouaket** is an assistant professor in the Department of Nursing at the Université du Québec en Outaouais. He completed a PhD in Public Health (healthcare organization) at the University of Montreal, and a postdoctoral fellowship at the Charles LeMoine Hospital Research Centre, University of Sherbrooke. His main research interests are economic evaluation of public health interventions, nursing healthcare organization, quality and safety of healthcare, and quantitative methods.

**Astrid Brousselle** is an associate professor in the Department of Community Health Sciences at the Centre de recherche–Hôpital Charles LeMoine, Université de Sherbrooke. She holds a Canada Research Chair in Evaluation and Health System Improvement–EASY (CIHR-FRQS). Dr. Brousselle contributes to the development of innovative evaluation approaches, where her objective is to use evaluation as a lever for health system improvement. She applies innovative methods to various areas of research in public health and health system organization.