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Résumé

Les programmes de recherche sur les interventions multiples en santé communautaire

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Les auteures présentent un cadre organisationnel destiné aux interventions multiples en santé communautaire et à servir de fondement aux programmes de recherche sur les interventions multiples. Ce cadre soulève certaines questions critiques qui devront être examinées au cours de recherches futures. Les programmes de ce type se caractérisent par le recours à des stratégies multiples, axées vers plusieurs niveaux du système socioécologique et des publics-cibles variés. De ce fait, ils complémentent les études de plus en plus nombreuses sur les facteurs globaux influant sur la santé et la promotion de celle-ci. Les auteures décrivent un cadre en quatre étapes et cernent les lacunes et les difficultés caractérisant ce domaine de recherche. Elles cernent aussi cinq aspects déterminants exigeant une action concertée en recherche : les chercheuses et les chercheurs doivent étudier les déterminants nichés, élaborer des cadres conceptuels intégrés, étudier les moyens à prendre pour maximiser la synergie entre les interventions, décrire les retombées des programmes d'interventions multiples et étudier leur durabilité.

Mots clés : programmes de recherche sur les interventions multiples, santé communautaire

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Multiple Intervention Research Programs in Community Health

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The authors describe an organizing framework for multiple interventions in community health. The framework provides a foundation for programmatic research on multiple interventions and poses critical questions that need to be addressed in the next generation of research in this field. Multiple intervention programs are characterized by the use of multiple strategies targeted at multiple levels of the socio-ecological system and delivered to multiple target audiences. Consequently, they complement the growing literature on the broad determinants of health and health promotion. The authors describe a 4-stage framework and identify gaps and challenges in this field of research. There are 5 key research areas requiring concerted action; researchers must: examine nested determinants, develop integrated conceptual frameworks, examine ways to optimize synergies among interventions, describe spin-offs from multiple intervention programs, and monitor the sustainability of their impact.

Keywords: multiple intervention research programs, community health promotion, comprehensive programs

Introduction

The Ottawa Charter for Health Promotion (World Health Organization, 1986) marks the beginning of a significant shift in the way that health issues are conceptualized. This re-conceptualization of well-being and the causes of poor health is predicated on the knowledge that health is influenced by social, economic, political, and cultural factors, often beyond the control of the individual. Health promotion research has contributed to a better understanding of complex health determinants and examined the effectiveness of a broad range of interventions.

The realization that health has interrelated determinants has necessitated the design of more complex health promotion programs. New terminology has emerged to capture a shift in focus from single to multiple interventions, from simple to complex health programs, and from programs that focus on risk factors to those that attempt to shape contextual influences on health (Sampson & Morenoff, 2000). Variously called comprehensive programs (Alberta Health, 1994), coordinated programs (Centers for Disease Control and Prevention, 2001), contextualist paradigms (Sampson & Morenoff), macrointerventions (Green, Richard, & Potvin, 1996), and multiple intervention programs (Edwards, 1999, 2001;

Merzel & D'Afflitti, 2003; Riegelman, Verme, Rochon, & El-Mohandes, 2002), these approaches are all rooted in socio-ecological frameworks. In this paper, we use the term multiple intervention programs.

Multiple intervention programs consist of multiple components and interconnected intervention strategies. A combination of interventions is used to target multiple levels (e.g., individual, community, political) and multiple sectors (e.g., health, education, transportation, housing, business) of a socio-ecological system (Green et al., 1996). They are delivered through various channels (e.g., non-governmental organizations, professional associations, coalitions, advocacy groups, media) and settings (e.g., home, school, workplace). In addition to tackling the underlying determinants of a problem, multiple interventions are likely to have a lasting and sustained impact because they target more than one level of the system (Smedley & Syme, 2000). Congruent with the principles of health promotion, the community is often an active participant in the design and evaluation of these complex programs.

The goal of this article is to describe an organizing framework for evaluating multiple interventions in community health. The framework has been developed through a review of both existing health promotion planning models (e.g., RE-AIM PRECEDE-PROCEED, Planned Approach to Community Health) and literature critiquing multiple intervention effectiveness studies in the fields of heart health, tobacco cessation, injury prevention, and prevention of low birthweight (Bauman, Suchindran, & Murray, 1999; Eaton et al, 1999; Leupker et al., 1996; Merzel & D'Afflitti, 2003; Mittlemark, Hunt, Heath, & Schmid, 1993; Pelletier, 1997; Schooler, Farquhar, & Flora, 1997; Sorensen, Emmons, Hunt, & Johnston, 1998; Stevens-Simon & Orleans, 1999; Susser, 1995; Zanna et al., 1994). The framework provides a foundation for programmatic research in the field of multiple interventions and poses critical questions that need to be addressed by the next generation of research on multiple interventions. Stages of the framework are described, key gaps and challenges in this field of research are highlighted, and illustrative research questions are posed.

Before describing the framework, it is instructive to briefly review what has been learned from prior studies examining the effectiveness of multiple interventions in community health. Two sources of information are considered here: review articles that provide insights from a retrospective analysis of multiple intervention studies that failed to demonstrate expected outcomes, and systematic reviews of the effectiveness of multiple interventions from both the Cochrane database and the Effective Public Health Practice Project.

A number of well-designed and well-funded community health studies have failed to demonstrate the expected impact of multiple inter-

vention programs on outcomes (Merzel & D'Afflitti, 2003). These include the COMMIT trial (COMMIT Research Group, 1995a, 1995b), the Minnesota Heart Health initiative (Luepker et al., 1996), and the Pawtucket Heart Health program (Eaton et al., 1999). Purported reasons for these intervention failures include: (1) intervention protocols that were not tailored to the characteristics of population subgroups; (2) the use of standardized protocols[1] that have restricted changes in interventions even when contextual realities have shifted during the study period; (3) study timelines that were too short to achieve the desired effects due to the complexity of the intervention strategies, the multiple levels of the system involved, and the time required for interventions at each level to take hold and then synergistically interact; (4) interventions that had a predominant focus on individual behaviour change with only limited attention given to the social, policy, and organizational environments; (5) use of a full arsenal of intervention strategies rather than only those with the more potent "active ingredients," thus diluting the overall effect of the multiple intervention program; and (6) the use of intervention strategies that, on a population-wide basis, were too weak or diffuse to produce systems change (Edwards, 2001; Merzel & D'Afflitti; Pelletier, 1997; Stevens-Simon & Orleans, 1999). These explanations yield an underlying theme: there has been a tendency for researchers to model the design of multiple intervention effectiveness studies on single intervention effectiveness prototypes.

The two sources of systematic reviews that were tapped for this critique offer somewhat different conclusions about the potential impact of multiple interventions. A limited number of reviews in the Cochrane database address community health or health promotion topics with multiple interventions. Reviewers generally conclude that there is either a lack of high-quality evidence on the effectiveness of multiple interventions (Ebrahim & Davey Smith, 2003; Thomas, 2003) or a lack of evidence that such interventions are effective "despite the strong theoretical rationale for their use" (Moher, Hey, & Lancaster, 2003, p. 2; Secker-Walker, Gnich, Platt, & Lancaster, 2003). In contrast, the systematic reviews of multiple intervention programs undertaken by the Effective Public Health Practice Project in Ontario generally conclude that multiple interventions are more effective than uni-component or single interventions (Dobbins & Beyers, 1999; Edwards, Aubin, & Morrison, 2000), or observe that single interventions are more effective when embedded

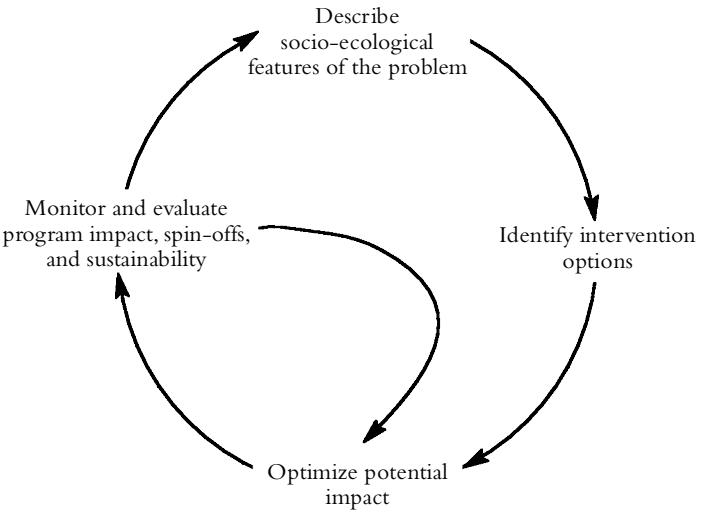
[1] Standardized protocols are intervention guides that detail all critical elements of the intervention, including their sequence and timing. In some areas of the literature, standardized protocols are referred to as "manualized treatments" (Korfmacher, Kitzman, & Olds, 1998).

in a multifaceted intervention (Micucci, Thomas, & Vohar, 2002; Wade et al., 1999). Features of multiple intervention programs that are described as critical include: long duration (Beyers, 2000; DiCenso, Guyatt, & Willan, 1999; Dobbins & Beyers), theory-based (Dobbins & Beyers; Edwards et al.), diverse and tailored to subgroups (Dobbins & Beyers), multi-pronged and multisectoral in scope (Dobbins & Beyers), and supported by implementing organization(s) (Beyers). The seemingly contradictory conclusions of these two sets of systematic reviews may be due to differences in inclusion criteria, differences in the types of effectiveness questions posed, and the fact that the Effective Public Health Practice Project gave more attention to features of the intervention and the implementation process. These systematic reviews highlight some of the challenges of research on multiple interventions and point to the need for a framework to guide programmatic research in this field.

The Multiple Intervention Program Framework for Researchers

The framework presented in Figure 1 has four stages: (1) describe the socio-ecological features of the problem; (2) identify intervention options; (3) optimize potential impact; and (4) monitor and evaluate program impact, spin-offs, and sustainability. Each stage is described below.

Figure 1 ***Multiple Intervention Framework***



Describe Socio-ecological Features of the Problem

The design of multiple intervention programs is grounded in a socio-ecological perspective of health. Social ecology provides a framework for understanding the diverse personal and environmental factors and the interrelationships among these factors that influence a given health problem (Stokols, 1996). Implicit in the socio-ecological perspective on health is the idea that the relationship between humans and their environment is reciprocal (Green et al., 1996; Sallis & Owen, 1997). Many concepts from systems theory are incorporated into this approach in order to elucidate the dynamic relationship between humans and their environment (Koopman & Lynch, 1999; Stokols). Systems include both negative and positive feedback loops. Negative feedback loops keep the system in balance or in equilibrium while positive feedback loops amplify change (either positive or negative). Since systems function to maintain their internal organization in relation to the environment (Flood, 2001; Maturana & Varela, 1992), an understanding of feedback loops may guide the researcher in identifying levers for change and selecting novel intervention strategies.

Another premise of an ecological perspective is that humans in environments can be described at several levels of aggregation: individual, family, organization, community, and population (Sallis & Owen, 1997). Following from this premise is the necessity of both describing the multiple levels of determinants of a problem and identifying opportunities for integrated action across these levels. The effectiveness of interventions may be increased when they are coordinated across levels of aggregation. In other words, an ecological approach integrates interventions to address "mainstream" (e.g., population-based) phenomena and "upstream" societal-level phenomena (e.g., public policies), in addition to "downstream" individual-level phenomena (Smedley & Syme, 2000).

When assessing the socio-ecological features of a health problem of interest, the researcher must consider the interconnections among determinants of health (Krieger, 2001). Determinants may be "nested," so that the strength of determinants at one level of the socio-ecological system will enhance or suppress how determinants interact at another level. Therefore, it is essential to consider not only the "layers" of determinants but also their interactions. For example, lifestyle choices are influenced by one's social environment (social norms, regulations). However, the relationship among lifestyle choices, one's social environment, and one's exposure to the mass media is nested within a larger political environment. Furthermore, individual lifestyle choices are influenced by public opinion, which also shapes political choices, and the media influences both public opinion and political choices. The way in which determi-

nants are nested provides important information regarding the links among them and hints at the possibility of a differential distribution of outcomes among selected sub-populations.

Exploring how different levels of determinants are nested and how they interact is a promising area of research. The dominant health promotion literature on determinants describes more proximal determinants. Perhaps this reflects the challenge of attribution when more distal determinants are examined. However, conceptual models that integrate proximal and distal determinants and consider potential interactions among them provide an important basis for the generation of new research questions. Similarly, hypotheses regarding potential sources of feedback (both positive and negative) and their impact on determinants at different levels would provide a basis for the generation of novel research questions (Sorensen et al., 2003).

Identify Intervention Options

The design of a multiple intervention program requires the use of appropriate theory and empirical evidence. Although a socio-ecological framework provides an overarching conceptual model, it gives limited direction for specific intervention strategies. In the design of interventions, one must integrate relevant mid-range theories and consider the interconnections among conceptual elements. For example, if one is planning to examine interventions that address behavioural, organizational, and policy change, relevant theories from each of these domains will need to be selected. Integrating mid-range theories requires an understanding of the assumptions, views, and presuppositions of the theories. In particular, the theories chosen should be compatible with a socio-ecological perspective (i.e., addressing more than one level of the system, identifying the relationships between humans and their environment, and describing feedback loops). However, the "added value" of integrating theories lies in their complementarity rather than in their similarity. For one theory the relative emphasis may be on structure (e.g., organizational theory) while for another it may be on process (e.g., community action theory). Thus, researchers need to move beyond use of a single theory as the basis for evaluating health promotion programs.

Integrating complementary theories into an overarching conceptual framework for an intervention can provide a clearer picture of the pathways (i.e., relationships between concepts or the means by which program inputs can be expected to achieve program outputs) that need to be targeted in intervention and evaluation design. Studies are required to explore the complex pathways that influence relationships between program inputs and outputs (Sorensen et al., 2003).

The effectiveness of each intervention strategy should be supported by previous empirical work. Ideally, there will be adequate information about the necessary "reach" of the intervention for a target population (e.g., the proportion of targeted recipients who must have access to and/or receive the intervention in order for the effectiveness of the intervention to be achieved).

Following identification of the most appropriate interventions, and the targets for the intervention, the researcher must consider the issue of specification. The dose or intensity of the intervention required to achieve the desired health outcome must be assessed (Glasgow, Vogt, & Boles, 1999; Green et al., 1996). In other words, what are the minimum frequency and duration and critical timing of the intervention strategies required to produce an initial change and sustain the desired outcomes? Given the dose and intensity of other competing interventions, what is the likelihood that the proposed dose and intensity of the strategy of interest will "take hold" and penetrate to harder-to-reach groups? Is a uniform dose of the intervention required, or would certain population subgroups benefit from different levels of intensity? While practical issues such as the level of funding available for the research may ultimately guide decisions regarding dose and intensity, initial estimates of the required dose should not be constrained by them.

Optimize Potential Impact

Multiple intervention programs represent more than a basket of effective interventions. The use of multiple interventions across levels suggests that recipients might benefit from the way in which interventions are combined. In other words, there is the potential for synergies to occur, making the combination of interventions more effective than individual interventions (e.g., the whole is greater than the sum of its parts). From an effectiveness point of view, the interventions can be optimized if synergies between interventions at different levels of the system, or synergies between the interventions and the contextual influences, can be enhanced. Optimization may also be achieved by reducing antagonistic interactions among interventions or between interventions and the context. Examples of research questions that emerge from a consideration of synergistic effects include the following: Does the presence of a lively and prolonged provincial political debate on environmental tobacco-smoking policies increase the effectiveness of public health nurses' advice to new parents regarding household tobacco smoke? What sequence of public service announcements, messages from health-care providers, and workplace reminders has the greatest impact on the uptake of flu immunization?

The contextual environment is a changing entity. Therefore, it is important to track the impact of the contextual environment during a multiple intervention study to assist with interpretation of findings. Theory can provide direction in this regard. Multiple intervention research requires theory that offers a longitudinal and iterative view rather than a cross-sectional view of the change process. Life-course theory and diffusion theory are examples of theories that provide explicit guidance on the process of change (one following developmental trajectories, the other following behaviour and societal change trajectories). Systematic reviews may offer useful, albeit limited, insights into ways of optimizing synergies among multiple intervention strategies. In particular, reviews may provide observations regarding what types of contextual factors enhanced the potency of intervention strategies, thus producing differential effects across population subgroups or study settings. Systematic reviews may also describe synergies among intervention strategies, particularly when contrasting the findings of studies examining the impact of single versus multiple intervention strategies.

For researchers who are conducting systematic reviews, the challenges of multiple intervention program design point to a number of factors that need to be emphasized at the outset. First, the dose and intensity of intervention strategies that are necessary to achieve the desired effects require more thorough documentation. Second, differential effects of interventions across studies (and contexts) warrant careful analysis. Third, reviewers should attend to evidence of interactions among intervention strategies and provide conclusions regarding the optimal sequencing of these strategies. In summary, optimization strategies may be identified in a number of ways. Integrated conceptual frameworks (as described previously) may provide direction for the selection of an optimal combination of strategies. Evidence from previous studies (e.g., systematic reviews) may also provide guidance on optimal combinations of interventions. Finally, analyses of the differential impact of intervention strategies across settings and populations may highlight contextual factors that determine readiness or create conditions for an intervention to take hold with population subgroups.

Monitor and Evaluate Program Impact, Spin-offs, and Sustainability

The nature of effective multiple intervention programs dictates that managers use an iterative approach to program implementation, adapting to unanticipated changes in the contextual environment. These contextual changes could include a shift in public opinion, a crisis that creates a new "window of opportunity," or a major change in governance structures among implementing organizations. They may provide opportunities for the researcher to modify the intervention proactively. Thus, multiple

intervention research needs to be constantly informed by "on-the-ground" program insights, and vice versa. The feedback loop in Figure 1 illustrates the need for an iterative approach to intervention design in this field of research.

For the researcher, this iterative approach presents an interesting dilemma. Should standardized intervention protocols be used to evaluate the impact of multiple intervention programs? Standardized protocols are widely accepted as a means of ensuring comparable interventions. However, rigid adherence to protocols eliminates the possibility of tailoring interventions to fit contextual realities. Since standardized intervention protocols may "lock" one into a particular sequence and combination of intervention strategies that do not take into account changes in the contextual environment, alternatives should be considered. For example, different levels of standardization might be an option. Intervention protocols could be standardized (from less rigid to more rigid) on the basis of the integrated conceptual framework, the process for implementation (e.g., working with community partners), or the specific content (e.g., of training modules, assessment tools). Researchers should carefully consider the rationale for standardizing various aspects of their intervention protocol. The pros and cons of using a rigidly standardized intervention approach should be weighed with respect to both methodological rigour and the quality of the intervention. It is essential that procedures be established for documenting both the implementation of intervention processes and the rationale for changing the initial intervention protocol. This type of documentation can be a source of fruitful learning about multiple intervention design.

Although it is important for research teams to establish a priori hypotheses concerning both the intended effects of a multiple intervention program and potential synergistic effects, they should adopt documentation procedures that make it easy for frontline staff and managers to describe unintended spin-offs, unexpected synergistic effects due to the combination of intervention strategies, and unanticipated contextual influences on the program arising from the policy, social, or economic environment. With this in mind, it is not surprising that diverse research methodologies, including qualitative and quantitative approaches, are required when evaluating the impact of multiple intervention programs (Stokols, 1996).

Systematic documentation of spin-offs needs to be planned in advance, with study timelines allowing for a longer follow-up period to capture both spin-offs and the sustainability of intervention implementation. Interviews with those both directly and peripherally involved in the implementation of a multiple intervention program may yield insights concerning spin-offs from a core program (e.g., development of

similar programs in other agencies, wider uptake as evidenced by change at other levels of the system, or a shift in organizational approaches to delivering related services).

The question of how multiple intervention programs can sustain healthy behaviours and environments is a critical one with many facets: Does one need the entire multiple intervention program to bring about sustained change? Are "booster" doses of the multiple intervention program required, and, if so, at what time intervals and for which population subgroups? What is required to ratchet change up to the systems level (Edwards, 2003)? Researchers integrating a socio-ecological perspective within their programs of research should consider these questions.

Unfortunately, funding levels for community health often do not allow for the mounting and evaluation of complex programs. Current funding mechanisms for research and training grants frequently reinforce an individual focus on health and disease (Syme, 2003). Identifying and describing spin-offs that arise from an intervention often require more time than that allotted within current research funding mechanisms. While attributing spin-offs to the original intervention may be tenuous, there is much to be learned from the "ripples," both positive and negative, following an intervention. Unfortunately, few research projects address these longer-term results. Furthermore, the current climate of restructuring and regionalization in the health sector hinders the maintenance of the external partnerships necessary for longer-term intersectoral programmatic approaches to the problem.

Summary

This framework highlights a number of issues that researchers must consider when designing multiple intervention projects. The combination of interventions requires explicit attention to both the levels of intervention and the intervention strategies. The multilevel combination, however, must make overall "sense," reflecting a type of face validity. Therefore, the researcher might have to combine effectiveness studies from several areas (e.g., social marketing approaches, advocacy and policy change, continuing education strategies) with conceptual frameworks from various disciplines (e.g., diffusion, behaviour change, organizational change and community action theories). Combinations of active (e.g., behaviour change) and passive (e.g., policy change) interventions are emphasized with this approach (Stokols, 1996). As well, the interaction between levels of interventions must be considered, measured, and incorporated into the research design (Sallis & Owen, 1997). Not to be forgotten are spin-offs and sustainability issues, which must be given time to surface.

Concluding Remarks

A programmatic approach is essential as we tackle the next generation of research on multiple interventions. The framework described in this article highlights five key issues that require the concerted attention of researchers: (1) examining nested determinants, (2) developing integrated conceptual frameworks that guide the development of intervention strategies with a socio-ecological orientation, (3) examining ways to optimize synergies among interventions, (4) describing spin-offs from multiple intervention programs, and (5) monitoring the sustainability of their impact. Taking on these issues presents some important challenges. Those delivering health promotion programs are embracing the complexity of multiple intervention program design. It is time for researchers to do the same.

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