



Diffusion of Innovations and Science-Based Practices to Address Barriers to Learning & Improve Schools:

A Series of Information Resources on Enabling System Change

As calls for addressing barriers to student learning and improving schools increase, new directions are imperative. And, this involves more than tinkering with prevailing approaches. The need is for developing major innovations (e.g., comprehensive school-level prototypes) and taking them to scale throughout a school district.

The success of all this depends on stakeholders in public education becoming more knowledgeable about the complexities and strategies related to diffusion of innovations, enabling major systemic changes, and developing a *sophisticated* understanding of the role of empirically-based practices.

To these ends, the Center is producing a series of resources, such as this one, to provide informational aids for use as tools in policy and practice analyses, research, education, and school improvement planning.

Brief Overview of a Major Review by Lawrence W. Green, Judith M. Ottoson, Cesar Garcia, and Robert A. Hiatt (2009) entitled:

Diffusion Theory and Knowledge Dissemination, Utilization, and Integration in Public Health

A 2009 chapter in the *Annual Review of Public Health* highlights “concepts that have guided or misguided public health in their attempts to bridge science and practice through dissemination and implementation.”

The review begins with diffusion theory “which inspired much of public health’s work on dissemination.” The concepts of diffusion, dissemination, and implementation are compared with related notions that have “served other fields in bridging science and practice.”

The authors conclude with suggestions about “ways to blend diffusion with other theory and evidence in guiding a more decentralized approach to dissemination and implementation in public health, including changes in the ways we produce the science itself.”

Citation: Green, L.W., Ottoson, J.M., Garcia, C., & Hiatt, R.A. (2009). Diffusion Theory and Knowledge Dissemination, Utilization, and Integration in Public Health. *Annual Review of Public Health*, 30, 151–174.

Brief Overview of Diffusion Theory and Knowledge Dissemination, Utilization, and Integration in Public Health

(Lawrence W. Green, Judith M. Ottoson, Cesar Garcia, and Robert A. Hiatt, 2009)

The authors state that the purpose of their review is to focus on concepts and issues related to the “movement of science into more extensive application.” In particular, they focus on the gap between research and practice noting that:

“Legislators and their scientific beneficiaries express growing concerns that the fruits of their investment in health research are not reaching the public, policy makers, and practitioners with evidence-based practices. Practitioners and the public lament the lack of relevance and fit of evidence that reaches them and barriers to their implementation of it.”

Key Concepts and the History of Diffusion Theory are Highlighted

The review discusses “a subset of the literature that pertains particularly to the diffusion, dissemination, and implementation aspects of research translation in public health practice and community change and the theoretical foundations or roots of that literature in diffusion theory.”

Particular attention is given dissemination and implementation “concepts that have guided or misguided public health” in bridging science and practice.

The discussion of the history of diffusion theory underscores the work of Everett M. Rogers and early contributors to work on imitation and collective behavior. The review also highlights contemporary concepts such as the “tipping point” and social network analysis and current initiatives driving dissemination and translation of research into policy and practice. The authors expand the discussion by viewing dissemination and diffusion through the “alternative lens of knowledge utilization.”

Science to Practice Gap

The authors focus on “etiology and prognoses” of the science to practice gap, emphasizing

conflicting views and concludes, “most of the remedies tried – from continuing education to evidence-based practice guidelines – have been disappointing.”

They state: “Much of the writing about knowledge translation or transfer, research dissemination, and the adoption and implementation of evidence-based guidelines assumes a pipeline in which evidence is produced by scientists, then vetted and disseminated to policy makers and practitioners.”

They present a graphic representing the pipeline as a funnel “which aligns with the accompanying assumption that much more research must be done than will be usable in practice.”

They indicate that this assumption “gives the research enterprise license to conduct a wider range of basic research than necessary for practical purposes.”

And, they caution that “narrowing, filtering, and vetting of evidence works well for strictly biomedical interventions where the pathological mechanisms, target organs, and physiology are relatively homogeneous. For many primary care and most public health interventions, however, the object of interventions is far more diverse in psychological processes, cultural contexts, and socioeconomic conditions that may mediate or moderate the relationship between the intervention and the outcomes. For these interventions, context, adaptability, and external validity become as important as experimental control, fidelity of implementation, and internal validity. Thus elimination from the dissemination pipeline of a large number of studies related to diverse populations and circumstances leaves a small pool of evidence-based best practices that are unrepresentative of the realities in which the end users live and work. These are not two distinct approaches to science, but instead a continuum of relative weight of evidence

placed on internal validity to external validity.”

They cite as results of the funnel that it takes 17 years to turn 14% of original research to the benefit of patient care and that 17% of original research never gets submitted usually because investigator assume negative results are unpublishable even though the findings are potentially helpful to practitioners. Based on their analysis of the gap, they stress:

“Most of the research qualifying as worthy of systematic reviews that lead to best practice guidelines disseminated to practitioners and policy makers is

highly controlled research under unrepresentative circumstances. This practice often makes such research of dubious relevance to many public health practitioners who would be expected to adopt and implement the guidelines. Thus, much of the effort to disseminate such guidelines to practitioners more efficiently produces disappointing increases in adoption, implementation, and maintenance of the best practices.”

FROM THE AUTHORS' CONCLUSIONS

“The prevailing disappointment with the flow of scientific information and guidelines into policy, professional practice, and public response has much to do with the misguided expectation ... that the truths discovered by science ... should automatically influence behavior. This review of diffusion theory and dissemination and implementation research [indicates] that people – whether policy makers, program planners, practitioners, or the public—will filter the information and advice they receive to consider, try, adopt, and maintain selectively that information that fits with their perceived needs, priorities, and circumstances. ...Applied health sciences research would have a much enhanced probability of influencing policy, professional practice, and public responses if it turned the question around from how can we make practice more science based to how can we make science more practice-based? ... This would happen if applied health research (not just research on diffusion, dissemination, or implementation) were directed by five broad principles:

- 1. The needs of patients and populations should dictate the health research agenda;**
- 2. The research agenda should address contextual and implementation issues including the development of implementation and accountability systems;**
- 3. The research agenda should dictate the research methodologies rather than methodologies dictating the research agenda. With principles 1 and 2, this will drive a more balanced consideration of internal and external validity;**
- 4. Researchers and practitioners and other users should collaborate to define the research agenda, allocate resources, and implement the findings;**
- 5. The level of funding for dissemination and implementation research should be proportionate to the magnitude of the task.**

In the traditions of the pipeline of science to practice, governmental and other program funding agencies and insurance companies have insisted that practitioners and program planners adhere to protocols or guidelines defined by efficacy studies in highly controlled research. When the results are not what the studies implied they should have been, the funders assume that the program planners or practitioners did not adhere to the protocol ‘with fidelity.’ Similarly, when the public is given guidance in public health programs or mass media campaigns, the assumption is that we did

not reach them or they did not comply with the recommended regimen. In both instances of diffusion failure, we assume the failure was in the dissemination and implementation of science into practice, without sufficient consideration of how well the evidence fit the practice circumstances, context, culture, and perceived needs.

This model of evidence-based practice has served medicine and other clinical professions well in clearing away some ill-conceived clinical practices and in gaining wider adoption and more assiduous implementation of procedures, vaccines, and pharmaceuticals that have greater efficacy and effectiveness. But when transplanted without consideration of some fundamental differences in the nature of the interventions and the objects on which we are intervening in public health, the methodological and ethical limitations of applying the same experimental controls to produce EBPH practices present some challenging trade-offs between internal and external validity of designs and the reporting, interpretation, generalization, and exportation of the evidence to other settings, populations, and circumstances. In biomedical interventions, the subject is usually a discrete entity, and the human object is pathology in a biological organism with relative homogeneity across the species. With public health, the 'intervention' usually becomes increasingly a program made up of multiple interventions, and the object is a diverse population or a community with heterogeneity across geographies, cultures, social structures, and histories. These differences could make both the production of the science of public health and the dissemination and implementation of scientific evidence more varied than the tasks in evidence-based medicine.

Another approach to these differences suggested by Hawe et al. is to theorize interventions differently in the experimental testing of them, allowing their form to vary with settings, but testing their function rather than their form using cluster (group) randomized trials. They argue that overcontrolled interventions have resulted from faulty fidelity to the form of the interventions, whereas what the research needs to do is to specify the function served by the intervention, allowing its form to vary with the diversity of contexts and populations.

A third approach to enhancing our translational tasks of putting research to better use is to depend less on building the dissemination and implementation of evidence from efficacy trials within every subject area, but rather depend more on generalizing strategies across topical areas, such as the effects from the successes of tobacco control on the emerging issues in physical activity and obesity control.

These differences call for more of the evidence to be produced in practice-based settings, in collaboration with community members and other representatives of the intended end users of the products of the research, and with flexibility of form but with fidelity to the function of interventions. Surveillance and program evaluation, as mainstays of public health evidence, epitomize the more distinct traditions of science upon which public health has been developed, and probably deserve more attention as the issues of dissemination, implementation, applicability, and generalization are appreciated and debated. In that debate, the dissemination task can be framed less as a pipeline push strategy and more as a social marketing or participatory pull strategy of determining what people need and want to know or do and should package the scientific knowledge to address those needs and wants. Finally, the evidence from scientific studies, whether by investigator-initiated research with cluster randomized trials or by practice-based evaluation, will never be a perfect match with the time \times population \times circumstances combination faced by a practitioner, program planner, or policy maker. Therefore, there will always be a need for best processes to complement best evidence with theory, professional judgment, and the indigenous wisdom of those who live with the health problem locally."

THE AUTHORS' SUMMARY POINTS

“1. Dissemination strategy in medicine and public health has been influenced by diffusion theory and by an assumption that closing the gap between science and practice or policy or public use is largely a process of vetting fragments of the research more rigorously, summing their strength of evidence, and pushing them more efficiently as best practice interventions through a pipeline to intended users.

2. Diffusion theory has deep roots in imitation and social influence theories, which emphasized first a somewhat mindless tendency to adopt ideas and practices that were fashionable and later emphasized mass media to disseminate evidence-based health innovations that could be taken on faith to be best practices.

3. Dissemination is not an end in itself; its intended benefits depend on integration and implementation by the end users, who will also determine the relevance and usability of whatever is disseminated. Therefore, they need to be considered early in the process of generating the research they might use.

4. Most of the research that qualifies for inclusion in systematic reviews and that receives the greatest weight in recommending evidence-based practices in guidelines to be disseminated is research that has been conducted in highly controlled circumstances, which maximizes its internal validity but limits its external validity and perceived relevance and fit in practice. To implement more evidence-based practice, we need more practice-based evidence.

5. The rebirth of social network, systems thinking, and interpersonal influence thinking in diffusion, dissemination, and implementation research, and the reformulation of these bodies of literature in umbrella concepts of knowledge utilization and knowledge integration, has given greater attention to the receptor end of the research pipeline.”