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length of day, teacher-child ratio, teacher qualifications, and in-service teacher development. It also should investigate curricula and teaching practices, including parenting education approaches, that might yield large gains in learning and development with little impact on cost. Studies should allow time for full implementation of complex reforms, and at least some studies should follow up into primary school. Wealthier countries should consider investing in research on large-scale programs in lower-income countries that could inform all countries, keeping in mind that the value of all program components, including nutritional supplementation, depends on what is available to children without the program and is likely greatest for the poorest children globally.

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REVIEW

From Science to Policy in Early Childhood Education

William T. Gormley Jr.

This paper examines the relationship between scientific research and public policy. After explaining why the simple conversion of research into public law is unlikely, several factors are identified that can promote the use of research by public officials. Examples of use and non-use are cited from early childhood education, where empirical evidence on program effects is relatively strong. Some specific suggestions are offered for improving the connection between science and public policy.

In early childhood education, as in many other domains, scientific research informs public policy. Researchers and public officials frequently collaborate in promoting or challenging early childhood education programs. Of course, public policy also depends on public opinion, interest groups, political parties, the mass media, elected officials, judges, and bureaucrats (Fig. 1). In addition, economic conditions, social mores, and "focusing events" such as scandals and natural disasters can advance or sabotage a policy proposal (1). As a result, scientists sometimes believe that their influence is limited at best.

I discuss here the connection between scientific research and public policy, focusing on early

childhood education, an area characterized by relatively strong scientific evidence. First, I discuss reasons why scientific research may not be directly translated into public policy. Second, I identify situations and practices that facilitate the conversion of scientific research into public policy. Third, I cite examples of early childhood education research impacts on public policy. Fourth, I discuss specific cases where early childhood education policy proposals justified by scientific research were rejected by public officials. Fifth, I offer suggestions for strengthening the connection between science and policy.

Expectations

A simple view of the relationship between science and public policy holds that a well-crafted piece of policy-relevant research should convince public officials to alter their policy preferences.

They should champion the adoption and sustenance of legislation consistent with the findings of that research. They should translate good science into good public policy.

This view, which draws on the Progressives' faith in technical expertise for solving social problems (2) and scientists' own faith in their published work, has some basis in fact. Science is among the most admired professions (3). Scientists enjoy a privileged position in determining what types of analysis are perceived as valid and legitimate (4). Lawmakers often welcome scientific advice, in the hope of moving beyond "just guesses and hunches." (5)

Nevertheless, a hypodermic needle theory of scientific impact on policy, which anticipates direct, immediate, and powerful effects, is flawed for several reasons. First, scientific research is one of many inputs into the policy process. In one study of the U.S. federal policymaking process, researchers, academics, and consultants were judged to be "very important" by only 15% of knowledgeable respondents, including congressional staff members, civil servants, and others (1). In contrast, 33% of respondents viewed interest groups as very important, and legislators and executive branch officials were judged very important by even higher percentages of respondents (1). In a crowded political arena, scientists can be eclipsed by other actors, events, and trends.

Second, scientific knowledge accumulates through multiple studies, some of which reach

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different conclusions. A single study, no matter how finely crafted, is not likely to carry the day, nor should it. Astute public officials, like astute scientists, weigh the evidence from multiple studies before reaching conclusions.

Third, the applicability of a given study to a particular policy choice is a matter of judgment. Extrapolation from one program to another or from one site to another can be problematic.

Fourth, scientific research is translated, condensed, repackaged, and reinterpreted before it is used. Journalists, legislative staffers, advocates, and others participate in this process. Occasionally, something is lost in translation.

Fifth, the use of scientific information by public officials, when it occurs, is more likely to involve justification (reinforcement of a prior opinion) than persuasion (conversion to a new opinion). According to David Whiteman, who has studied Congress' use of policy information, justification (or what he calls strategic use) is much more common than persuasion (or what he calls substantive use) (6). To many observers, strategic use is a fairly feeble form of utilization, with public officials simply citing research to promote predetermined policy preferences.

When Research Gets Used

In what cases is scientific research likely to be used, either substantively or strategically? Are there factors that facilitate or inhibit use? Studies of the use of research in policymaking offer some tentative answers to these questions (Table 1).

There are some factors that researchers can control fairly well. First, public officials typically prefer relatively short, easily readable documents, such as executive summaries and policy briefs, to lengthier tomes such as books or scholarly articles. A study of the use of policy-relevant information by state legislators in three U.S. states, which asked legislators to distinguish between items in their bill files that were and were not used, found that the average length of used information was 2.91 pages (7). To make information more attractive to policymakers, policy reports that build on more technical documents should be clear and brief.

Second, research is more likely to be used when the research is highly credible, either because the methods are highly rigorous or because the research team is perceived as being nonpartisan and objective. A study of 155 mental health decision-makers found research quality to be one of the best predictors of research use (8). To illustrate the value of research quality and organizational reputation, consider the impacts of the MDRC's welfare reform experiments on U.S. congressional policy-making in the 1980s and, to a lesser extent, the 1990s (9). More recently, the Obama Administration has assigned a privileged position to programs vindicated by the most rigorous research designs, in such areas as education, teen pregnancy, and home visitations (10).

Third, the influence of research on policy-making is typically greater when, before a policy

debate, researchers and public officials enjoy a relationship of trust and mutual respect. Public officials, like others in stressful situations, turn to people they trust when they need help with a problem. Researchers are encouraged to "conceptualize policy work not as disseminating research to policymakers, but as developing relationships with them." (11)

Fourth, issue framing (or a rhetorical emphasis on certain aspects of an issue) can facilitate research use by public officials by changing public opinion (12). Recent experiments confirm the utility of economic (e.g., long-term benefits exceed short-term costs) and scientific (e.g., a policy is consistent with scientific understandings of human behavior) issue frames in stimulating public support for early childhood programs (13, 14). This seems to be good news for scientists, because these issue frames, in contrast to less effective moralistic frames (e.g., the right thing to do), play to scientists' strengths.

Some factors that influence research use are largely beyond the researcher's control. In the United States, for example, the political system is characterized by separation of powers, federalism, multiple veto points, and other obstacles to policy change (15). To the extent that scientific research demonstrates the value of certain policy innovations, the deck is stacked against that in a Madisonian political system designed to inhibit non-incremental change.

Second, the poor quality of some legislative debates poses an obstacle to scientists who hope that the scientific approach will prevail. For example, members of the U.S. Congress seldom rebut incorrect applications of evidence in congressional debates (16). Without such direct challenges aimed at clearing up factual misrepresentations, legislative debates can lead to flawed policy decisions.

Third, harsh economic conditions and tight budgets make it less likely that research will be used. Even if research identifies a program whose long-term benefits exceed the short-term costs, budget constraints are likely to crowd out new initiatives or program expansions. Current economic conditions in the United States, in which the federal and state governments face record deficits, are exceptionally difficult for scientists whose research leads them to advocate new public expenditures. This is especially true at the state level, where constitutions prohibit deficit spending.

Fourth, research is less likely to be used when there is no scholarly consensus. If several credible studies arrive at similar conclusions, public officials are more likely to look to researchers for cues than when researchers themselves disagree. For example, dueling studies on the effects of school vouchers (17), including conflicting interpretations of Milwaukee's school voucher program, have made it difficult for elected officials to perceive a clear story line with clear policy implications (18).

Early Childhood Education Research Impacts

Early childhood education offers a good opportunity to assess research use in policy, because a

number of well-crafted studies show that certain early childhood education programs work. High-quality pre-kindergarten (pre-K) programs have been shown to improve school readiness in the short run and to reduce crime and improve earnings in the long run (19–22). Home visitation programs with a registered nurse have been shown to improve birth outcomes in the short run and reduce welfare assistance and crime in the long run (23, 24). More broadly, brain research confirms the critical importance of the early years to child development (25). The development of key neural pathways and functions early in life can put young children on a positive trajectory.

On the other hand, studies of the largest U.S. preschool program, Head Start, question the persistence of short-term learning gains (26). Studies of home visitation programs without registered nurses find evidence of both success and failure (27). Despite a rough consensus on the utility of early intervention, research has not yet pinpointed which years and which skills matter most (25).

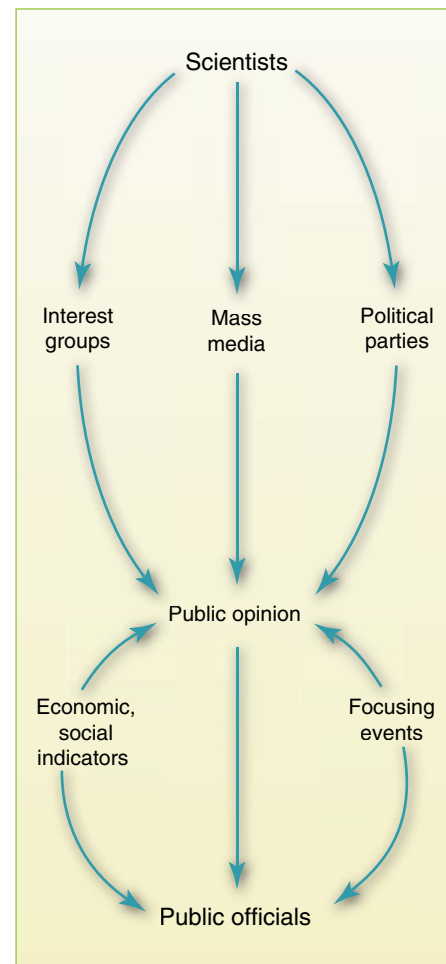


Fig. 1. A filtered view of scientific impacts on public policy.



Thus, there are reasons to believe that early childhood education research will shape public policy, but imperfectly. Is that in fact the case?

Despite many obstacles, and a lack of consensus on the efficacy of certain programs, there is evidence linking scientific research on early childhood education to public policy decisions. Discouraging research on Head Start's long-term effects (e.g., the Westinghouse Learning Corporation report) nearly ended the program in the late 1960s, whereas later encouraging research on Head Start and the Perry Preschool Program helped to protect Head Start from budget cuts in the early 1980s (28). These ups and downs reflected improvements in both Head Start and the early childhood education research that evaluated it. When the New Jersey State Supreme Court mandated high-quality preschool for 3- and 4-year-olds in poor school districts in 1998, it cited the Abecedarian Project (an early intervention program that provided services from infant care through preschool), the Perry Preschool Program, and testimony by researchers in support of that decision (29). When the U.S. Congressional Budget Office (CBO) assessed President Obama's proposal to fund nurse home visitation programs to poor families with young children in 2009, it used numbers from existing randomized experiments to sharpen its estimates of expected savings (30).

Case studies of political leadership in early childhood education note a connection between early childhood research and public policy. Governor Zell Miller knew about brain research and research on the social and educational benefits of preschool when he proposed the nation's first universal preschool program in Georgia (31). Representative Joe Eddins, who sponsored Oklahoma's universal preschool legislation, learned about early childhood education from a prominent Oklahoma businessman, Bob Harbison, who in turn learned about it from Yale University psychologist and preschool researcher Edward Zigler (32). In Illinois, West Virginia, and elsewhere, policy entrepreneurs who championed preschool legislation were motivated in part by brain research and other scientific evidence on the effectiveness of early childhood education (32).

It can be difficult to distinguish between persuasion and justification in these situations. For example, did brain research persuade Zell Miller to promote universal preschool, or did it help him to justify universal preschool to skeptical state legislators? Although it would be instructive to answer this question definitively, given the common criticism that public officials simply use research as ammunition for predetermined policy preferences, the fact is that in either case use has occurred. If researchers supply the ammunition and legislators do the shooting, researchers have nevertheless made a contribution. If one person's strategic use leads to another person's substantive use, then persuasion has occurred. To appreciate the impact of science on public policy, it is im-

portant to recognize that a scientific report is usually filtered by various intermediaries before it reaches public officials. Despite these complexities, impact through intermediaries is still impact.

Trials and Tribulations

Even in well-researched areas such as early childhood education, public policies that seem justified by research sometimes are slow to take root.

Why have all 50 U.S. states not adopted state-funded pre-K programs, when many well-crafted studies have shown positive impacts on school readiness? Some states that have declined to fund pre-K are deeply conservative socially or politically. In Utah, for example, many citizens, especially Mormons, believe that mothers should care for their children at home (33). State-funded pre-K is arguably inconsistent with that vision. Studies show that politically conservative states are less likely to fund preschool (34) and less likely to adopt strong child care regulations (35), even though research suggests that both strategies can be beneficial to children and to society (19, 36).

Table 1. Factors that influence research use.

| Variable | Description | Controllability |
|-------------------------------|---|------------------|
| Comprehensibility | Policy reports should be clear, crisp, brief | High |
| Credibility | Research methods should be rigorous | Moderate to high |
| Trust | Researchers should cultivate trust | Moderate to high |
| Framing | Economic and scientific frames work best | Moderate |
| Fragmented government | Multiple veto points are challenging | Low |
| Quality of legislative debate | Failure to rebut false evidence is damaging | Low |
| Economic conditions | A weak economy and high budget deficits are impediments | Low |
| Scholarly consensus | The absence of consensus limits use | Low to moderate |

Why have all 50 states not adopted a nurse-family partnership program, which has been shown to improve outcomes for mothers and children alike? In some states, such as Georgia and Massachusetts, the Healthy Families program and the Parents as Teachers program, with weaker track records (37, 38), are firmly entrenched and enjoy considerable political support. In many states, officials have expressed concerns about the higher short-term costs of hiring registered nurses, as opposed to other less credentialed (but also less expensive) professionals. Although a study suggests that registered nurses are more successful than other professionals as home visitors (39), additional studies are needed to confirm this and to show whether less frequent visits

might reduce costs without adversely affecting program impact.

Why has Congress not invested more resources in the 0- to 8-years-old age range that brain research shows to be so important? A key obstacle that all early childhood intervention programs face is the absence of a strong, politically powerful constituency. Children cannot vote, cannot lobby, and cannot donate to political campaigns. Parents can do all these things, of course, but parents of young children face shortages of time, money, and energy. It is hard to change a diaper and lobby a politician at the same time.

How to Strengthen the Connection

Scientists and public officials inhabit different professional worlds, with different pressures, norms, motivations, and timetables. Nevertheless, if both sides wish to strengthen the connection between science and public policy, some simple steps may help.

First, scientists should not only evaluate program successes and failures but also offer credible explanations for what they find. If a program

with dozens of component parts is successful, which of those component parts must be retained for adaptations to other contexts to be successful? Scientists need to look inside the black box of organizations more and they need to do so in a rigorous way.

Second, scientists should develop or support institutions that facilitate connections between citizens and scientists and between scientists and public officials. The former could be done by adapting the Dutch concept of science shops to a U.S. setting (40). Under this arrangement, university-based centers or other nonpartisan organizations would provide free or cheap information to nonprofit organizations that seek to harvest scientific information in pursuit of better

public policies. A willingness to work with a wide variety of nonprofit groups would help to avoid partisanship and politicization.

Third, in the United States, Congress should alter norms for processing information that limit its ability to use valuable scientific information. The CBO's scoring process, which estimates the costs of proposed legislation, is a case in point. Because Congress limits CBO analysts to, at most, a 10-year time frame, under the Statutory Pay-As-You-Go-Act (41), the CBO must overlook consequences that don't kick in until after a decade or more. This is regrettable generally, but especially for early childhood education programs, whose cost savings, such as reductions in crime, tend to be most striking for teenagers and adults.

Fourth, state legislatures should establish or strengthen legislative support agencies that are capable of performing rigorous program evaluations and cost/benefit analyses. A good template is the Washington State Institute for Public Policy (WSIPP), which advises the Washington state legislature on pending policy choices. WSIPP has conducted numerous cost/benefit analyses of social programs, including early childhood education programs (42). These studies have helped state legislators make tough choices based on the best available evidence. Other states should follow suit.

Conclusion

Scientists who expect to see their latest research findings transformed intact into public policy are likely to be disappointed. In contrast, scientists who adjust their expectations may be surprised to discover how powerful science can be. The same study that found academics and researchers to be "very important" in policy-making to only 15% of respondents, determined them to be "somewhat important" to 51% of respondents (1). The same study that found evidence to be misrepresented in congressional debates found it to be used more accurately when issues were low or moderate in salience or visibility to the general public (16). The same study that cited evidence of systemic inertia in Washington, DC, found that after 4 years, "significant" policy change (or change with large impacts on the targeted population) occurred in 27% of 136 cases (15). With more modest expectations, there may be reason for optimism among researchers hoping to influence policy.

When an idea from early childhood education research, such as the critical importance of early intervention, enters the public domain, that is a victory for science. When a program supported

by strong empirical research, such as home visits by nurses, gets adopted by multiple states, that is a victory for science. When scientists with conflicting findings do battle and reach a draw, and public officials vacillate in the face of ambiguous evidence, even that is a victory for science. In thinking about the impact of early childhood education research, we need to shift our focus from a single study to multiple studies, from a single site to multiple sites, from a single legislative debate to multiple legislative debates. If we do so, we are likely to detect a good deal of influence.

“If researchers supply the ammunition and legislators do the shooting, researchers have nevertheless made a contribution. If one person's strategic use leads to another person's substantive use, then persuasion has occurred.”

At the same time, we can take steps to improve the likelihood of research use in general and in specific cases. Institutional reforms of legislative bodies, at the state and federal levels, could facilitate the analysis of costs and benefits and encourage the use of evidence on long-term effects. At the individual level, scientists can promote the use of research by producing digestible policy briefs, by reaching out to practitioners on a regular basis, and by framing issues so that public officials can understand and appreciate their significance. Finally, scientists must be creative in designing rigorous tests to answer difficult questions and scrupulous in interpreting the evidence they produce. All of these steps will strengthen the connection between science and public policy.

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