



## Challenges to an integrated population health research agenda: Targets, scale, tradeoffs and timing



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“But if I ran the zoo, ... I'd make a few changes. That's just what I'd do ... .”

(Giesel, 1950)

Applied to the context of population health research, Dr. Seuss' book, “If I Ran the Zoo” provokes an important question about health care resources allocation. If given the opportunity to ‘run the zoo,’ do population health researchers have the evidence needed to make decisions that will maximize positive health outcomes for all people? The answer is, “Not yet.” Although translating the existing evidence on social and behavioral determinants of health and

health inequities into effective action could achieve large population health gains (Commission on Social Determinants of Health (2008)) – Galea et al. estimated that eliminating excess deaths associated with limited education would save 245,000 lives annually in the United States (2011) – evidence gaps hamper the development of a coherent strategy for improving population health and achieving health equity. In this commentary, we discuss challenges in the development of a unified strategy for population health research that can inform policy and practice.

This paper emerged from discussions with two interdisciplinary working groups convened to advise a new National Program of the Robert Wood Johnson Foundation (RWJF) on research priorities. *Evidence for Action: Investigator-Initiated Research to Build a Culture of Health (E4A)* is designed to develop the evidence base aligned with RWJF's vision of building a national “culture of health” (RWJF, 2015). E4A supports innovative, rigorous research on the impact of programs, policies, and partnerships on health and well-being, with a particular focus on research that advances health equity. The focus of the new national program reflects the growing relevance of individual and community-level determinants of health to multi-sectoral stakeholders in health research and an emphasis on bridging initiatives related to population health and health care.

The working groups included scholars and practitioners from health services, public health, social and behavioral determinants of health, and health policy. Participants discussed existing evidence and evidence gaps related to policies, programs, and systems with the greatest potential to advance population health and health equity, and how the evidence could be best applied and disseminated. Reflecting the diverse perspectives of the working group members, discussions coalesced around tensions and dilemmas in four areas: the relative effectiveness of interventions targeting individuals versus systems (*target debates*); whether intervention models are most useful when developed for local, state, or federal jurisdictions (*scale debates*); accounting for unintended

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consequences, spillovers and *tradeoffs*; and determining when there is sufficient evidence to inform action (*timing debates*).

### 1. Reconciling targets: individual versus system interventions

Practitioners and researchers concerned about social determinants of health (SDOH) and health inequities often invoke the metaphor of “upstream” versus “downstream” health interventions. This metaphor is used inconsistently and has been critiqued for conflating distinct concepts such as spatiotemporal scale, level, and causal strength (Krieger, 2008). The metaphor conveys a powerful intuition, however, that there are important differences in the potential impacts of interventions targeted toward systems (e.g. legal, social, environmental, health services) that influence individuals' experiences and outcomes, and those targeted towards individuals (e.g. knowledge, skills, behavioral choices, treatments). Seminal papers have argued for the importance of each level; some argue that individuals' behavioral factors are the “actual causes” of morbidity and mortality, while others conceptualize systems, culture and contextual characteristics as the “causes of the causes” of these outcomes (Braveman and Gottlieb, 2014; Galea et al., 2011; Link and Phelan, 1995; McGinnis and Foege, 2004; McGinnis et al., 2002).

Systems interventions potentially affect more people and may have a greater overall impact than individual interventions. Directly intervening on individuals, however, may be more efficient if programs target those identified as being at high risk (Campbell and Robertson, 2007; Herbst et al., 2007). As one moves towards interventions that are either more temporally or causally distal from individual health outcomes, it can be more challenging to provide rigorous evidence of causal impact. However, quasi-experiments—for example, using comparisons across places that have different policies or that have implemented policies at different points in time—can provide important effectiveness evidence (Almond et al., 2011; Avendano et al., 2015; Case, 2004; Cylus et al., 2014; Glymour et al., 2008; Hoynes et al., 2015; Rossin, 2011).

Advocates of upstream or systems interventions argue that social policies and conditions reducing disease incidence will have greater enduring value since they remove future populations from the risk pool needing intervention or treatment (Kaplan, 2000; Syme, 2008; Weintraub et al., 2011). Systems interventions often focus on population-wide prevention, consistent with Geoffrey Rose's “population paradox” that reducing the risk a little for everyone in the population can have greater total benefits for some outcomes than large reductions for a small fraction of people who are at very high risk (Rose, 1985, 1992). For example, removing lead from gasoline and paint dramatically reduced population exposure to lead and had larger overall impacts than identifying and treating individual children with high blood lead levels (Lin-Fu, 1982; Pirkle et al., 1994).

An individual versus systems focus has historically differentiated clinical health care from public health (Schoenbach and Rosamond, 2000). The United States health care delivery system largely has focused on individual level curative interventions. That singular focus is one reason that medical care is estimated to account for only 10–20% of health outcomes (McGovern et al., 2014). Given this limited impact, increasing access to traditional medical care alone will be insufficient to eliminate social inequities in health. Fortunately, the Affordable Care Act and other innovative policies are stimulating new approaches to health care.

The current health care system involves about \$2.7 trillion in annual expenditures (Centers for Medicare and Medicaid Services, 2014) and over 18 million workers (Centers for Disease Control and Prevention, 2014), and could be a powerful ally in addressing SDOH. The health care system's human, social, and financial infrastructure could deliver better outcomes with greater integration along the

spectrum of upstream and downstream interventions (Berwick and Hackbarth, 2012; Cantor et al., 2011; Keehan et al., 2011). Engaging the health care system in addressing SDOH may help shift more resources towards evidence-based population health interventions. While not a panacea, widespread engagement with the health care system offers unrivaled opportunities to connect people with the resources they need to stay healthy – whether those needs are primarily related to traditional medical care or extend more broadly to social services needs. Three quarters of American adults have at least one medical provider visit annually (O'Hara and Caswell, 2012). In addition, health care delivery systems can systematically collect social information. Integrated data systems that track social and clinical measures could inform and stimulate upstream intervention approaches in addition to enabling better care and providing researchers with new evidence on the impacts of relevant interventions and treatments (Adler and Stead, 2015; Gottlieb et al., 2015).

The tendency to pit systems-approaches against individual-approaches fails to recognize the value and sometimes necessity of a multi-faceted strategy – one that incorporates interventions at both the systems and individual levels. For example, tobacco use is strongly shaped by social norms, costs, and legal access; policies addressing these factors at the population level have been shown to be effective. However, individual variance persists: in the same society, with the same costs and policies, some people smoke while others do not (Leventhal et al., 1987; Wilkinson and Abraham, 2004). Effective interventions will need to address multiple levels, modes, components, and actors, and will require knowledge of factors affecting individual choice as well as those affecting the social patterning of tobacco use (Vlahov et al., 2004).

Some tensions regarding the preferred level of intervention reflect disciplinary traditions and values. One concern voiced by advocates of upstream interventions is that efforts focused on the individual may deflect attention from the role of social and governmental institutions and policies and reduce the likelihood of action at the systems level (Brownell et al., 2010; Fisher et al., 2011). A second concern is that focusing on individual behaviors may unjustly “blame the victim” if individuals responding to adverse environmental conditions with health-damaging behaviors are seen as somehow culpable for doing so.

A “behavioral justice” framework may help to reconcile these perspectives. Borrowing heavily from the environmental justice movement, behavioral justice emphasizes that health behaviors may reflect personal decisions informed by knowledge and values, but these choices are often severely constrained by available social, economic, or environmental resources (Adler and Stewart, 2009). Given the importance of behavior in determining health outcomes (McGinnis and Foege, 2004; McGinnis et al., 2002), a behavioral justice framework requires that all individuals have access to the systems or structural resources needed to be able to make healthy choices, at which point consideration of individual responsibility and choice becomes relevant. Thinking of health determinants and interventions in terms of behavioral justice may support decisions to integrate interventions at multiple levels, including individual and systems changes.

### 2. Reconciling scale: local, state and federal interventions

Issues involving place and scale are related to the tension between individual and system level interventions but have distinct characteristics. Improving population health in communities across the country will undoubtedly require local, regional, and federal efforts, but we have limited evidence regarding which level is most effective for any given problem. Federal initiatives, such as Medicare reimbursement policies or IRS community benefit laws, may have

relatively greater effects since they affect larger populations than local policies. However, federal changes may be more difficult to implement and can involve more compromise than would local and regional initiatives. The challenge of moving a federal governing body – whether elected or appointed – may limit the type and actual health impact of actions feasible at the federal level.

Efforts to integrate community health interventions into health care systems illustrate this tension. Research indicates that providing housing for homeless populations improves long term health outcomes and may offer significant health care cost savings (Jacobs and Baeder, 2009). Nonetheless, the Center for Medicaid and Medicare Services has resisted policy changes that would enable the federal government to cover housing costs for chronically ill homeless populations. Some health care systems, however, have undertaken local demonstration projects and successfully offered services addressing patients' non-medical health determinants, including housing and other social needs (Larimer et al., 2009; Sadowski et al., 2009; Shubert and Bernstine, 2007). In part because of evidence emerging from such regional work, the Centers for Medicare and Medicaid Innovation are now considering proposals that address non-medical determinants as part of reimbursable care. This example illustrates a beneficial balance between local and federal action: implementation and evaluation of new interventions at the local or state level may then influence federal policy changes that have wider influence.

Federal or state policy interventions may have limited effectiveness if they fail to account for variation across locations. Frequently, intervention success is contingent on unique local factors, including public and political will, cultural differences, and other social and environmental variables. It is nearly impossible to account fully for local factors when policies are passed at higher jurisdictions. Policies that are effective in Manhattan, Kansas may not work as well in Manhattan, New York, and vice versa. In some cases, implementation of policies passed at higher jurisdictions may even be subverted by local actors. For instance, a coalition of stakeholders in Oklahoma, including a county business coalition, city park district, and suburban school district, creatively circumvented state-level tobacco control preemption policies by implementing a multitude of voluntary policies to create smoke-free zones and smoking cessation programs (Douglas et al., 2015). In a federal policy example, in 1954, before the famous *Brown vs. the Board of Education* decision rendered racially segregated schools illegal, all states had laws mandating the age for school enrollment. In the wake of the desegregation decision, some states simply suspended those mandatory schooling laws, thus avoiding requiring white children to attend racially integrated schools (Raffel, 2002).

The above example illustrates how communities can respond to decisions made outside the local context in ways that render the policy irrelevant to the intended beneficiaries. Major public health achievements over the last century, such as improved motor vehicle safety and reductions in tobacco consumption, have resulted from the bi-directional influence across levels of policy jurisdiction. In other words, though preemption policies at the federal or state levels can limit the ability of lower jurisdictions to create local policies (Pertschuk et al., 2013), individuals and communities are active agents that can adapt to, resist, and otherwise exert influence over changes at other scales (Gielen and Green, 2015). Given this dynamic, the appropriate level at which to focus interventions is likely case-dependent, and should be informed by the evaluation of factors that may inhibit or promote success. Research on how particular communities are affected by and respond to health policy actions at local, regional, or federal levels can provide important information about applying interventions to other places and scales, and can highlight both intended and unintended outcomes.

### 3. Understanding spillovers, externalities, and tradeoffs

Health care, public health, and social services largely operate in silos with limited coordination. However, interventions and policies in one sector often involve trade-offs within and between sectors, which may result in spillover effects and unintended consequences. Such effects may also impact other parties, including family members, neighbors, or acquaintances, not just the primary targets of an intervention.

Rational priority setting would incorporate evidence on these externalities, spillovers, and tradeoffs, but there is currently insufficient information to anticipate the range of outcomes or secondary effects. Adverse effects overall or within subgroups can emerge from well-intentioned policies or programs. For example, along with discovering some of the expected benefits for families randomized to the Moving to Opportunity intervention, evaluators also found unexpected negative impacts (Gay, 2012; Goering and Feins, 2003; Jackson et al., 2009; Osypuk et al., 2012). In other cases, intervention participants actually may fare worse overall than controls. For example, in a randomized trial of CPR-skills training for family members of patients at risk of sudden cardiac death researchers expected that family members in the intervention group would have increased sense of control and efficacy. However, while family members who received CPR training with additional social support did express reductions in anxiety and hostility, those participants receiving CPR training without additional social support showed worse psychosocial adjustment at six months than controls (Dracup et al., 1997).

Unanticipated “out of target” effects may also occur at a community level. For example, new community investments intended to improve the availability of health-promoting resources in historically disadvantaged communities may lead to gentrification, which can increase the cost of living and push out long-time residents (Phillips et al., 2014). Additional income in some cases may be used in ways that promote health, but – especially for short-term, sudden infusions of cash – may also be used in ways that threaten health (Bruckner et al., 2011). Other interventions may improve average health but simultaneously exacerbate inequities (Frohlich and Potvin, 2008).

Spillovers – beneficial or adverse – can affect secondary outcomes in the target population or in other individuals beyond the primary target group. Investments in the health of one individual may have substantial benefits not just for the person but also for family or immediate contacts. Spillovers of social interventions may affect the net cost-benefit analysis. For example, a substantial fraction of the large financial benefits attributed to early childhood education interventions arise from reductions in crime, although crime reduction was likely not the intended primary target (Reynolds et al., 2011; Temple and Reynolds, 2007). Had early childhood school intervention return on investment evaluations focused exclusively on academic outcomes, the argument for early schooling would be much weaker. An even more positive cost-benefit analysis for these programs may result from adding accrued savings in health care expenditures for participants (Barnett and Masse, 2007; Belfield et al., 2006).

Tradeoffs are important considerations for decision-makers in industry and government. Improving product safety may increase product cost (Henderson Jr and Twerski, 2013) and reduce profits. However, corporations also respond to consumer perceptions and some recent corporate decisions reflect population health considerations. Examples include the CVS Pharmacy ban on cigarette sales (Abrams, 2014) and healthier nutritional guidelines for Disney-branded products (Barnes, 2012). These indicate that even corporate return-on-investment decision-making can be multi-faceted.

Individuals also make tradeoffs. Individual decisions are made

within complex social, cultural, economic, and environmental contexts. When individuals make decisions that prioritize one factor that affects their health, they may incur costs with respect to other factors. The Grossman model, for example, posits that health is a resource or type of capital that individuals may invest in (at the expense of time and money) or spend down (to pursue other goals) (Avendaño and Berkman, 2014; Currie and Madrian, 1999; Grossman, 1972, 1999). We currently lack comprehensive information that would allow an individual to make fully informed choices about these investment decisions. The illustrative exercise-sleep tradeoff may be familiar to many: there is increasing evidence on the beneficial effects of regular exercise (Williamson and Pahor, 2010) as well as on the value of adequate sleep (Buysse, 2014; Luyster et al., 2012). For an individual with limited discretionary time, would there be a greater health benefit of rising earlier to allow time for exercise or getting additional sleep?

Non-health concerns related to family and work additionally influence decision-making. Understandably, health researchers place a high priority on health and may not account for situations in which health is not the most valuable or salient outcome to the individual. Broad definitions of health that encompass physical, mental and social wellbeing may reduce but are unlikely to eliminate potential conflicts between health and other goals and values. Evaluations of health interventions that ignore spillovers, externalities and tradeoffs reduce our ability to identify the most impactful interventions or to convince stakeholders to support those interventions.

Although we have argued for comprehensive evaluations that address both direct and indirect intervention effects, we recognize that such standards may have unintended consequences of their own. For example, engaging in such analyses may inhibit or divert resources from immediate action. These issues are at the heart of the fourth theme on determining when sufficient evidence exists to warrant action.

#### 4. When do we have enough evidence to act?

There is a tension between the need to accelerate dissemination and adoption of effective programs and policies and premature adoption of those that have been inadequately tested. Advocates, funders, practitioners and affected individuals may feel a sense of urgency to act, and can become frustrated with the time and process required to build the evidence base (Ockene et al., 2007; Sweet and Moynihan, 2007). They are acutely aware that delays in intervention incur additional human suffering. At the same time, there is equally reasonable cause for concern that adoption of interventions prior to rigorous evaluation can result in adverse health outcomes (Chalkidou et al., 2008), or may cause spillover or unintended consequences discussed earlier.

Medical practice, guided in part by the dictum, *primum non nocere* (first, do not harm) tends to take a conservative approach toward introducing new treatments, preferring to withhold a new treatment for an adverse condition until ample evidence indicates little likelihood of negative outcomes. This approach has been institutionalized in criteria for safety and efficacy evidence required for FDA drugs and devices approvals. As a result, however, drug and device development is costly and slow. Recent efforts to enable different review processes – fast track, breakthrough therapy, accelerated approval, and priority review – aim to make new treatments available sooner.

A number of expert bodies make recommendations using explicit criteria for assessing public or community health interventions. In contrast to the FDA, which has regulatory power, these expert bodies have less direct influence over the implementation of new health-related programs or practices. Rather,

their recommendations primarily provide guidance to policy-makers, administrators, providers, and consumers. Lack of formal oversight or enforcement regarding population health interventions allows for greater variance in deciding when an evidence-base is sufficient for action.

Other forces also slow adoption of new practices and policies. Innovation may be stymied by mismatched incentives by government and private insurer reimbursement policies as well as by slow and sectoral dissemination of results. Even when evidence exists regarding the utility of a new treatment or intervention, there is a substantial lag – estimated to be almost 17 years – between the emergence of evidence of effectiveness and widespread adoption in practice (Morris et al., 2011). Several factors contribute to this lag. There is little incentive for researchers to engage in efforts to disseminate their findings outside the usual academic channels. The largest public funder of health research, the National Institutes of Health (NIH), primarily supports basic research with less emphasis on moving findings along the path from discovery to use. The National Center for Advancing Translational Sciences provides Clinical and Translational Science Awards (CTSAs) to accelerate the adoption of successful treatments. While CTSAs have raised the visibility and importance of implementation and dissemination research, they remain a relatively small focus of the overall NIH portfolio. Major translational research initiatives in Europe face similar challenges (Homer-Vanniasinkam and Tsui, 2012).

One factor contributing to inadequate evidence to guide policy and practice is that evaluation has largely been an underfunded component of policy and programmatic implementation. Foundations and other funders often want to see their funds go directly to services; and neither funders nor grantees may be motivated to subject an intervention to a rigorous test if they have already invested in it. However, evaluation is necessary even when one has great faith in a program or policy.

Once enough evidence exists to warrant initial implementation, ongoing evaluation can provide useful feedback if looped tightly into the intervention's evolution. It may shed light on why seemingly promising interventions sometimes flop, identify subgroups most likely to be responsive to a particular intervention, and indicate whether variations of prototype interventions hold promise. Interventions that elicit desirable outcomes in initial implementation locations may not be as effective or equitable in new settings or at larger scales. Conversely, interventions that produce limited results upon initial implementation may still provide valuable lessons to inform other work. Adequately evaluating creative strategies can help build strong evidence not only about what works (or does not work), but also about when, where and for whom – providing an enhanced understanding of the conditions or populations in which a strategy is most effective. Ultimately, evidence gained from evaluation can inform more efficient allocation of resources, improve the odds of successful replication and scaling, and help ensure poor or inequitable health outcomes are not perpetuated.

Investments in evaluation may be particularly challenging when the issue involves “closely-held beliefs” based on the intuitive appeal of an approach. For example, funding of community coalitions has been motivated by the assumed superiority of multi-sectoral partnerships over single party actions to improve population health. It seems logical that partnerships are needed to achieve key outcomes and/or are more effective, but there is limited empirical evidence on whether partnerships actually do lead to sustained, cost-effective improvements in population health outcomes (Institute of Medicine (2012); Prybil et al., 2014).

Evidence-based policy requires rigorous evaluation before enacting change. Conversely, Green has argued for the value of practice-based evidence, which takes advantage of innovations happening on the ground and can build the evidence to inform and

prioritize action (2006). In this, as in any type of research, there are necessary trade-offs in the choice of research approach. There is often a tension between “rigor” and “vigor” (Adler et al., 2012; Tilford, 2000); some methods maximize confidence in inferences about causal direction at the expense of generalizability. We believe that use of multiple designs and evidence sources will provide a more complete and detailed understanding of complex systems (Braveman et al., 2011; Concato et al., 2000; Vandenbroucke, 2008), but admit that this belief has not been subjected to empirical testing.

Finally, understanding when to take action is at times unrelated to the availability of evidence and may be instead related to competing social values. One such value is personal choice. Finding balance between individual and organizational rights and public health interests continues to be a major dilemma (Bayer, 2007; Krebs, 2008). Advancing this conversation will depend on improving tradeoffs research, as described previously, and recognizing the salience of values not directly related to health. Although values are often invoked to explain policy disagreements, some disagreements that may appear to be about values are actually disagreements about rigorous evidence. Distinguishing disagreements about values versus those arising from evidence gaps is further muddled because public health evidence can be perceived as partisan (McGarity and Wagner, 2008). The influence of population health scientists on public health decision-making may increase as evidence amasses that is not cast as value-laden.

## 5. Conclusions

This paper has focused on the opportunities and barriers to providing the needed inputs to “evidence-based policy-making.” At times, however, popular opinion, political considerations, special interest lobbying, media sensationalism, and conflicting values may have a greater impact on policy making than does empirical evidence. Nonetheless, we believe that the availability of empirical evidence, clearly presented, can sway popular opinion, balance claims of lobbyists, and affect political choices. Although perhaps insufficient to ensure that effective policies and programs are enacted, evidence of impact is a necessary condition for wise decision-making; generating this evidence is a vital and worthy undertaking. However, several obstacles to providing the needed evidence must be overcome. Research in population health science is occurring in the context of funding stream siloes and limited interdisciplinary collaboration. Together these foster research fragmentation and a patchwork of evidence to guide action; this makes it more difficult for policymakers and advocates to make decisions based on potential health impacts.

A coherent framework for strategic development of research along the full continuum from discovery to implementation will need to grapple with the integration of individual and systems strategies, the appropriate level (e.g., local to federal) at which to focus specific interventions, how to identify unanticipated consequences and when to act on existing evidence. The four themes raised in this US-focused commentary are likely to be relevant to international audiences, though the core issues will be contextualized based on each country’s policy environment and stage of research translation. International lessons also should continue to influence the US dialogue (Marmot and Wilkinson, 2006). An international population health agenda focused on developing nations has been discussed elsewhere (Ostlin et al., 2011; World Bank, 2015); at times, this agenda has been highly valued in other countries (Friedman and Starfield, 2003).

Despite the challenges described in this paper, we note that US life expectancy increased by nearly three decades over the course of the past century, and the black-white life expectancy gap shrank

from about 16 years to less than four years (Arias, 2014). Still, we are not where we could be (Olshansky et al., 2012). We know that longer, healthier lives and health equity – regardless of race or social background – are achievable. Pursuing a research agenda that links discovery and dissemination, bridges levels of intervention, guides policymakers at every level, and incorporates a comprehensive vision of well-being should accelerate our progress.

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