Evaluating Public Health Research: Information from the Literature

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Guijing Wang, PhD,[1] John Araujo, PhD,[*] MHSA,[1] Mona Choi, PhD,[3] Jerald O'Hara,[1] Catherine Pepper, MLIS, MPH,[2] Robin Wagner, PhD, MS,[1] Trevor Woollery, PhD[1]

[*]Presenter

[1]Office of Public Health Research, Office of the Chief Science Officer
[2]Coordinating Center for Infectious Diseases
[3]National Center for Public Health Informatics
Centers for Disease Control and Prevention
Atlanta, GA

Overview

- Background and Context

- Purpose of the Literature Review

- Literature Review Methods

- Literature Review Results

- Main Findings

- Lessons Learned

- Best Practices Applied to Public Health Research

- Summary

Background and Context

- There are increasing demands to justify investments in public sector research domestically and abroad
- A major purpose of public health research is to improve health by influencing policy, public health programs and practice, health services, and consumer behavior
- Need to optimally allocate limited research funding dollars
  - More competition for scarce funding dollars from the private and public sector
  - Continuously increasing public health research questions with fewer funding dollars
  - Must balance needs and impact of investments

Purpose of Literature Review

- Identify useful information to guide the development of a research evaluation program relevant to public health and CDC

- Enhance the knowledge base of the Office of Public Health Research (OPHR) research portfolio assessment program team

- Share lessons learned with the larger research evaluation community by publishing findings

Literature Review Methods

- Carried out by multi-disciplinary six member team
- Literature search sources
  - Bibliographic databases, e.g., MEDLINE, EconLit
  - Google and additional references citied in articles initially retrieved from Google ("cross-reference")
- Used systematic approach and criteria for relevance
- Retrieved peer-reviewed articles, books, grey-literature

Literature Review Steps

- Step 1. Searched Internet and bibliographic databases to identify evaluation literature
  - Criteria: Search terms - research portfolio evaluation, methods, metrics, health, public health impact
  - Retrieved: >1M Internet and 457 bibliographic references
- Step 2. Screened initial search results (abstracts) to identify potentially relevant articles
  - Criteria: Professional judgment (CP, GW) that abstract appeared to address research evaluation and might be applicable to public health research
  - Retrieved: 346 potentially relevant references (69 Internet, 277 bibliographic databases)

Literature Review Steps (cont'd)

- Step 3. Obtained full articles of potentially relevant articles to determine relevant articles
  - Criteria: Full article reviewed; characterized on discipline, methods, models and metrics; confirmed to address research evaluation and be applicable to public health research
  - To date, 90 articles have been reviewed
    - Of these, 48 articles were confirmed relevant, and form basis for literature review results presented here
  - Remaining 256 articles will be read in future and literature review results will be updated

Classification of Literature

- All full articles reviewed were characterized on
  - Relevance – to research evaluation and potential application to public health
  - Discipline (e.g., economics, policy and management, evaluation, health services research)
  - Method (e.g., economics, bibliometric analyses, retrospective analyses, peer-reviews, case-studies)
  - Model (e.g., logic model, payback model, qualitative, quantitative)
  - Metrics (e.g., input, process, output, outcome, impact)
- Models and methods were critiqued for main findings

Discipline of Reviewed Articles

Discipline	Number of articles	% of total
Economics	14	29%
Policy and management	12	25%
Evaluation	7	15%
Health services research	5	10%
Other	10	20%
TOTAL	48	100%

Methods Employed by Reviewed Articles

Methods	Number of articles	% of total
Economics	11	23%
Bibliometric analyses	8	17%
Retrospective analyses	6	13%
Other	23	46%
TOTAL	48	100%

Models and Metrics Employed by Reviewed Articles

Models and Metrics	Number of articles	% of total
Models		
Logic model	14	29%
Payback model	10	21%
Other	24	50%
TOTAL	48	100%
Metrics		
Impact	15	31%
Outcomes	14	29%
Outputs	9	19%
Other	10	20%
TOTAL	48	100%

Main Findings

- Disciplines:
  - Economics: Typically from agricultural economics
  - Policy and Management: Typically assessed how research programs performed by tracking them only to the knowledge generation (publications) or outputs phase
- Methods:
  - (Applied) Economics: Often used input-output analyses which assessed influence of agricultural research on improving agricultural productivity
  - Bibliometrics: Typically used in health research and assessed the productivity of research programs using citation analysis and historical tracing

Main Findings (cont'd)

- <u>Methods (cont'd)</u>:
  - Main Types of Bibliometrics
    - <u>Literature bibliometrics</u>: Count of publications, citations
    - <u>Patent bibliometrics</u>: Citations
    - <u>Linkage bibliometrics</u>: Link citations from patent to scientific papers
  - Methods Strengths and Weaknesses
    - <u>Economic approaches</u> are great at quantifying changes in output and productivity of inputs, but provide limited evidence on measures of downstream impact
    - <u>Bibliometric approaches</u> can suggest if an agency is producing or supporting highly cited papers, but can't speak to longer term impacts of research investments; however, they are useful in assessing if knowledge outputs influence policy decisions and practice

Main Findings (cont'd)

- Models:
  - Logic Model: Core organizing framework for most research evaluation programs and studies
    - Used by National Academies of Science; US Dept. of Agriculture; National Health Service, UK; Health Economics Research Group, UK; and others
  - Payback Model: Combines qualitative and quantitative assessments in case studies to evaluate research benefits
    - Current state of the art in research evaluation
    - Built upon economics and logic model
    - Pioneered by Health Economics Research Group, UK
    - Used by Canadian Health Services Research Foundation

Main Findings (cont'd)

- <u>Metrics</u>:
  - Metrics should be defined over several phases which can be shown in a Logic Model
  - Metrics[*] commonly used in research evaluation
    - <u>Inputs</u> measure tangible quantitative resources put into a process to achieve a goal
    - <u>Processes</u> measure a course of action taken to achieve a goal
    - <u>Outputs</u> measure the products and services delivered
    - <u>Outcomes</u> measure results that stem from use of the outputs and influence stakeholders outside the program
    - <u>Impacts</u> measure the long-term societal, economic, or environmental consequences of an outcome

[*] Committee on Metrics for Global Change Research, Climate Research Committee, & National Research Council. (2005). *Thinking strategically: The appropriate use of metrics for the climate change science program*. Washington, DC: National Academies Press.

Main Findings (cont'd)

- Metrics (cont'd):
  - Input-Output Models
    - Evaluate how productivity of inputs affect the generation of outputs
    - Do not capture the impacts phase of research
    - Serve as an organizing framework for the Payback model
  - Challenges in Developing Metrics
    - There is a long time span from research initiation to realized benefits, resulting in reliance on intermediate indicators
    - Attribution or relative contribution of research to a benefit may be difficult to determine
    - Scale and aggregation across research projects pose challenges - single research project versus research portfolio

Lessons Learned

- There is *minimal* scholarship on health or public research evaluation methods so need to rely on lessons learned from other disciplines
- Research evaluation methods have changed slowly over time
  - Historically relied on bibliometric approaches to quantify performance of research programs
  - Currently recognize that new evaluation methods are needed that can better measure research's multiple attributes and benefits
- Program peer-review is important to maintain quality of science
- Case studies are essential to elicit full benefit and value of research

Lessons Learned (cont'd)

- Knowledge generation is insufficient to influence policy, programs, practice, and consumer health behavior

- For any research to produce change, its findings should relate to one or more of the key areas of interest to the agency and its the decision makers

- Researchers should engage and share responsibility with managers and policy makers for translating their research into policy and practice

- Optimal research resource allocation depends on the market for research results - it should be clear who the customers are

Best Practices Applied to Public Health Research

- Adopt the logic model as the organizing framework
- Study, adopt and adapt the Payback model to evaluate research investments
- Employ program peer-review to evaluate and maintain scientific quality
- Employ case study approach to elicit unique views of programs and scientists
- Evaluate intermediate outcomes of research while working to improve measures of longer term impact, e.g.,
  - Weave bibliometric analyses into evaluations to assess outputs and productivity of scientists and agency
- Engage stakeholders to maintain relevance of research and accountability for results

Summary

- Research evaluation has been conducted by many disciplines using different methods, models, and metrics
- Economic and bibliometric methods have historical influence on evaluation
  - Each has strengths and limitations
  - Still useful methods
- The logic model is the organizing framework for most research evaluations
  - Public health research evaluation program would benefit from adopting the organizing framework

Summary (cont'd)

- Payback model is the current state-of-the-art method
  - Has quantitative and qualitative characteristics
  - Contains aspects of logic model and input-output models
- Multiple metrics, covering quantitative and qualitative attributes, are needed for research evaluation
- Investigators' involvement in research translation is important to enhancing the impact of research
- The literature review was instrumental in guiding our analytical approaches for evaluating the impact of research and research

Contact Information

Guijing Wang, PhD

Strategy and Evaluation Team

Office of Public Health Research

Office of the Chief Science Officer, Office of the Director

Centers for Disease Control and Prevention

Phone: (404) 639 – 4666

Address: 1600 Clifton Road NE

Mail Stop D-72

Atlanta, GA 30333

E-mail: GWang@cdc.gov