Evidence-based public health: a systems perspective and its implications for generating and implementing evidence

UNC Chapel Hill, 12 April 2016

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Overview

• Introduction to evidence-based public health
• Examples from INTEGRATE-HTA, CEBHA+ and CPHE
• A systems perspective in relation to designing and evaluating interventions
• A systems perspective in relation to implementing evidence
• Conclusions
Introduction to evidence-based public health
Evidence-based medicine (EBM) ...

„... is the integration of best research evidence with clinical expertise and patient values.“

David Sackett
Evidence-based public health (EBPH) … (1)

“… is the conscientious, explicit and judicious use of current best evidence in making decisions about the care of communities and populations in the domain of health protection, disease prevention, health maintenance and improvement (health promotion).”

Jenicek (1997)

“… is the development, implementation and evaluation of effective programmes and policies in public health through application of principles of scientific reasoning, including systematic uses of data and information systems and appropriate use of programme planning models.”


“… is the process of integrating science-based interventions with community preferences to improve the health of populations.”

Kohatsu (2004)
“… integrates the best available evidence with the **knowledge and considered judgements from stakeholders and experts** to improve health and protect the population from infectious and environmental hazards.”

ECDC (2011)

“… intends to improve health at population level through scientifically established decisions. To do so, available knowledge of **medical, economic, ethical, socio-cultural and legal aspects** of diseases and interventions is assessed in a systematic, transparent and goal-oriented way and integrated with the decision-making process. All steps – from defining the problem to the implementation of interventions and programmes – must be made explicit and transparent.”

Gerhardus et al (2010)
An apple a day keeps the doctor away ...
... one or five a day? (effectiveness)

... what about apple allergies? (adverse effects)

... are apples better than oranges? (comparison)

... do people like apples? (acceptability)

... do we have enough apples? (feasibility)

... what if the guy in the grocery store is attractive? (preferences)

Adapted from Manfred Wildner
Wrong assumption that public health interventions can only do good ...

Public health interventions
• Can have positive and negative health consequences
• Affect large population groups
• Are subject to different perceptions by different groups
• Can impact diverse aspects of life and freedom of choice
• Bind limited resources
Basis of an evidence-based approach

• Evidence hierarchy for effectiveness evidence
  – Intervention study designs (e.g. RCTs, (quasi-)experimental)
  – Observational study designs (e.g. cohort, case-control)

• Need to be systematic and transparent: systematic reviews, evidence grading, guidelines
  – Avoid ad hoc selection of information
  – Make uncertainties in knowledge explicit
  – Select effective programmes and policies
Examples from INTEGRATE-HTA, CEBHA+ and CPHE
Goal:

Develop concepts and methods for a comprehensive, patient–centred, and integrated assessment of complex technologies that includes and considers

- effectiveness and economic, sociocultural, ethical, and legal issues,
- patient preferences and patient-specific moderators of treatment,
- context and implementation issues
Collaboration for Evidence-Based Healthcare and Public Health in Africa (CEBHA+) (2016 – 2020)

<table>
<thead>
<tr>
<th>University/Initiative</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Makerere University (African coordinator)</td>
<td>Uganda</td>
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<tr>
<td>University of Rwanda</td>
<td>Rwanda</td>
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<tr>
<td>Stellenbosch University</td>
<td>South Africa</td>
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<td>Cochrane South Africa</td>
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<td>Addis Ababa University</td>
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<td>Chronic Disease Initiative in Africa</td>
<td>-</td>
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<td>LMU (German coordinator)</td>
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<tr>
<td>Cochrane Germany</td>
<td>Germany</td>
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</tbody>
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Goal: Build long-term capacity and infrastructure for evidence-based healthcare and public health in sub-Saharan Africa

www.cebha.org
Cochrane Public Health Europe (CPHE) (2015 - )

Institute for Medical Informatics, Biometry and Epidemiology, Ludwig-Maximilians-University, Munich (LMU)

Health Sciences Bremen (HSB) comprising Institute for Public Health and Nursing Research, University of Bremen and Leibniz Institute for Prevention Research and Epidemiology BIPS, Bremen

Cochrane Austria (CA) and Department for Evidence-based Medicine and Clinical Epidemiology, Danube University Krems

Cochrane Switzerland (Cochrane CH) comprising Institute of Social and Preventive Medicine, Lausanne University Hospital and Epidemiology, Biostatistics & Prevention Institute, University of Zurich

http://ph.cochrane.org/cochrane-public-health-europe
A systems perspective in relation to designing and evaluating interventions
<table>
<thead>
<tr>
<th><strong>Population</strong></th>
<th>• Healthy general or at-risk population</th>
</tr>
</thead>
</table>
| **Intervention** | • Population-level intervention  
• “Proactive” prevention through educational, technology or policy intervention  
• Implementation in household, community or policy settings |
| **Comparison** | • “Business as usual” in several sectors |
| **Outcome** | • Usually indirect effects on multiple health outcomes and other societal consequences  
• Usually impact after lag period |

Rehfuess & Akl (2013)
Embedding the PICO within a system

INTERVENTION
- Theory
- Components
- Execution

COMPARISON
- Business as usual

OUTCOME
- Health
- Non-health

IMPLEMENTATION
- Organisation/structure
- Financing
- Policy

SYSTEM
- Multiple interactions
- Feedback mechanisms
- Phase changes
- Emergent properties

POPULATION
- Biological, social
- Organisational

CONTEXT
- Geographical
- Epidemiological
- Socio-cultural
- Socio-economic
- Ethical
- Legal
- Political
Conceptualising interventions through logic models

**Participants**

**Intervention (and comparison)**

*Intervention theory*

*Intervention design:*
  Components:
  - Technology and infrastructure
  - Education
  - Policy and regulations

*Execution:*
  - Timing and duration
  - Dose and intensity

*Intervention delivery*
  Delivery mechanisms:
  Delivery agents:
  Setting:

**Outcomes**

*Intermediate outcomes*
  Process outcomes
  Behaviour outcomes
  Surrogate outcomes

*Health outcomes*
  Individual-level health outcomes
  Population-level health outcomes

*Non-health outcomes*

**Implementation**
  Policy
  Financing
  Organisation and structure

**Context**
  Geographical
  Epidemiological
  Socio-cultural
  Socio-economic
  Ethical
  Legal
  Political

Pfadenhauer et al, 2015; Rohwer et al, in press
Choosing study designs for evaluation

• Intervention studies
  – RCTs and cluster RCTs
  – Range of „neglected“ designs
    • Interrupted time series
    • Controlled before-after studies
    • Natural experiment studies

• Mixed-method approaches
  – Process evaluation
  – Qualitative research

• Modelling
  – Dynamic systems modelling

Synthesising evidence

- **Household and community level**
  - Household and setting characteristics
  - Knowledge and perceptions

- **Programme and societal level**
  - Financial, tax and subsidy aspects
  - Market development
  - Regulation, legislation and standards
  - Programmatic and policy mechanisms

- Adoption at scale ➔ Sustained use at scale ➔ Equity in adoption and sustained use

Rehfuesse et al (2014)
A systems perspective in relation to implementing evidence
A. Sequential, dissemination-based model of EBPH

Evidence production and synthesis \[\rightarrow\] Evidence dissemination \[\rightarrow\] Policy-making

B. Political theory-informed model of EBPH

Evidence production and synthesis

\[\downarrow\downarrow\downarrow\downarrow\downarrow\downarrow\] Policy-making

C. Research co-production model of EBPH

Evidence production and synthesis

\[\uparrow\uparrow\uparrow\uparrow\uparrow\uparrow\] Policy-making
Primary research, evidence synthesis and policy-and-practice within the research and health system

CEBHA+ research and implementation framework
Developing evidence-based and stakeholder-informed research priorities

Three-step CEBHA+ approach:
- online survey and face-to-face consultations
- evidence maps
- development of study protocols

Evidence mapping
1. Developing a framework
2. Formulating a question
3. Defining inclusion criteria
4. Conducting searches
5. Selecting studies
6. Extracting data
7. Presenting results

Rehfuess et al (2016)
Employing a research co-production approach in CEBHA+

• Stakeholders are involved throughout the research process
• Means of ensuring that
  – Policy-relevant studies are conducted
  – Findings are applicable in given context
  – Findings are rapidly implemented
• Caveat: Need for careful evaluation of effectiveness
Using „push and pull“ strategies in Cochrane Public Health Europe

Munich communication project

- Standardised summary format for systematic reviews
- Testing with public health stakeholders in Germany, Austria and Switzerland
- Starting point for long-term engagement strategy

Wirken sich Größe von Portionen, Packungen und Geschirr auf Auswahl und Konsum von Nahrungsmitteln, Alkohol oder Zigaretten aus?

* Die angenommenen Werte der Kontrollen (Mittelwerte und Standardabweichungen der Kalorienzufuhr) beruhen auf Daten repräsentativer Umfragen zur Nahrungsaufnahme in Großbritannien.
1 durchschnittliche tägliche Energiezufuhr bei Kindern in Großbritannien
2 durchschnittliche tägliche Energiezufuhr bei Erwachsenen in Großbritannien
3 durchschnittliche tägliche Energiezufuhr bei Erwachsenen in Großbritannien
Conclusions
„Data collection is not the solution – question formulation and research design is.“

Jim McCambridge
Thank you