UM-CIRHT Webinar Series

Developing a Research Protocol

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UM-CIRHT Framework: Research Life Cycle

Beza et al., 2018. The UM-CIRHT Framework
Research Process

Research Question

Study Plan

Actual Study
The way your research question is framed drives the design of your study.

Well defined research question is crucial before developing detailed study plan/protocol.

Research question drives design. Sample size determination determines feasibility (recruitment ability, adequate funding, and timeline). Then you write the research protocol.
“The question being asked determines the appropriate research architecture, strategy, and tactics to be used—not tradition, authority, experts, paradigms, or schools of thought”

Dave Sackett. BMJ 1999
Overview of Common Study Designs
# Clinical Research Designs

<table>
<thead>
<tr>
<th>Type of study</th>
<th>Alternative name</th>
<th>Unit of study</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Observational</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ecological study</td>
<td>Correlational study</td>
<td>Populations</td>
</tr>
<tr>
<td>Cross-sectional study</td>
<td>Prevalence study; survey</td>
<td>Individuals</td>
</tr>
<tr>
<td>Case-control study</td>
<td>Case-referent study</td>
<td>Individuals</td>
</tr>
<tr>
<td>Cohort study</td>
<td>Follow-up study</td>
<td>Individuals</td>
</tr>
<tr>
<td><strong>Experimental</strong></td>
<td>Intervention studies</td>
<td></td>
</tr>
<tr>
<td>Community trial</td>
<td>Community intervention study</td>
<td>Communities</td>
</tr>
<tr>
<td>Field trial</td>
<td></td>
<td>Healthy individuals</td>
</tr>
<tr>
<td>Randomized controlled trial</td>
<td>RCT</td>
<td>Individuals</td>
</tr>
<tr>
<td>Clinical trial</td>
<td>Therapeutic study&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Individual patients</td>
</tr>
</tbody>
</table>

<sup>a</sup>Clinical trials are included here since conceptually they are linked to epidemiology, although they are often not considered as epidemiological studies. Clinical trials have developed into a vast field of its own because of methodological reasons and their economic importance.

Qualitative Study Designs

• Purpose: to gain deeper understanding that is not feasible in surveys
• To help develop future tools for larger surveys
  • Example: decision making
• In-depth interviews
• Focus group discussions
• Can be used alone or along with quantitative methods in mixed-method designs
Experimental Study Designs

Hulley SB, *Designing clinical research*. LWW; 2013.
Randomized Controlled Trials – Examples

• In family planning, does an interactive computerized educational module for women in the waiting room improve LARC uptake compared to standard brochures in the waiting room?

• In abortion care, does a pre-procedure paracervical block result in lower reported pain score compared to pre-procedure acetaminophen?
Common Observational Study Designs

- Cohort studies
- Case-control
- Cross-sectional
Cohort Studies - Prospective

Hulley SB, *Designing clinical research*. LWW; 2013.
Cohort Studies—Prospective Cohort Example

- What factors in the family planning counseling visit predict which women are still on the same contraceptive method six months later?
- A prospective cohort design will help evaluate the factors
Cohort Studies - Retrospective

Hulley SB, *Designing clinical research*. LWW; 2013.
Cohort Studies-Retrospective Cohort Example

• What is the two year LARC (IUD/Implant) continuation rate among a cohort of women in Rwanda?
• A retrospective cohort design (using a national insurance database, with clearly defined inclusion/exclusion criteria) can help investigate the rate
Case-Control Studies

Hulley SB, *Designing clinical research*. LWW; 2013.
Case-control Studies-Example

• Does a history of exposure to family planning counseling in the prenatal period differ between women in the immediate postpartum period who choose a LARC method of contraception versus those who do not?
Special Case: Nested Case-Control Studies

Hulley SB, *Designing clinical research*. LWW; 2013.
Cross-Sectional Studies

Hulley SB, *Designing clinical research*. LWW; 2013.
Cross-Sectional Studies-Examples

• Do women attending a health center from urban and rural areas have different uptake of LARC?
• Does fidelity to a standardized counseling method increases LARC uptake? Monitors with a checklist
• What is the patients' perception of providers’ professionalism/empathy?
## Study Design Strengths

<table>
<thead>
<tr>
<th></th>
<th>Randomized Trials</th>
<th>Cohort Studies</th>
<th>Case-Control Studies</th>
<th>Cross-sectional Studies</th>
<th>Ecological Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Estimates:</strong></td>
<td>Incidence</td>
<td>Incidence</td>
<td></td>
<td>Prevalence</td>
<td></td>
</tr>
<tr>
<td><strong>Can assess:</strong></td>
<td>Multiple outcomes</td>
<td>Multiple outcomes</td>
<td>Multiple exposures</td>
<td></td>
<td>Group level exposures</td>
</tr>
<tr>
<td><strong>Good for:</strong></td>
<td>Modifiable exposures</td>
<td>Rare exposures</td>
<td>Rare outcomes</td>
<td></td>
<td>Aggregate information</td>
</tr>
<tr>
<td></td>
<td>Preventing against bias-especially confounding (known and unknown)</td>
<td>Exposure precedes disease</td>
<td>Delayed outcomes</td>
<td></td>
<td>Exposures that vary at group level</td>
</tr>
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Weiss review lectures. UW-SPH
## Study Design Limitations

<table>
<thead>
<tr>
<th></th>
<th>Randomized Trials</th>
<th>Cohort Studies</th>
<th>Case-Control Studies</th>
<th>Cross-sectional Studies</th>
<th>Ecological Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inefficient for:</strong></td>
<td>Rare outcomes</td>
<td>Rare outcomes</td>
<td>Rare exposures</td>
<td></td>
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<tr>
<td><strong>Vulnerable to:</strong></td>
<td></td>
<td>Confounding</td>
<td>Confounding</td>
<td>Confounding</td>
<td>Confounding</td>
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<td></td>
<td></td>
<td></td>
<td>Recall bias</td>
<td>Reverse causality</td>
<td>Ecological fallacy</td>
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<td></td>
<td></td>
<td></td>
<td>Selection bias</td>
<td></td>
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<tr>
<td><strong>Difficulties:</strong></td>
<td>Expensive</td>
<td>Expensive</td>
<td>Finding suitable</td>
<td>Exposure NOT known to</td>
<td>No individual</td>
</tr>
<tr>
<td></td>
<td>May not be ethical</td>
<td>May need long follow-up</td>
<td>controls</td>
<td>precede outcome</td>
<td>level data</td>
</tr>
<tr>
<td></td>
<td>Need modifiable exposure</td>
<td></td>
<td>Can’t estimate incidence or prevalence</td>
<td></td>
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</table>

Weiss review lectures. UW-SPH
Components of a Research Protocol

<table>
<thead>
<tr>
<th>DESIGN COMPONENTS</th>
<th>PURPOSE</th>
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</thead>
<tbody>
<tr>
<td>Research questions</td>
<td>What questions will the study address?</td>
</tr>
<tr>
<td>Background and significance</td>
<td>Why are these questions important?</td>
</tr>
<tr>
<td>Design</td>
<td>How is the study structured?</td>
</tr>
<tr>
<td>Time frame</td>
<td></td>
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<tr>
<td>Epidemiologic design</td>
<td></td>
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<tr>
<td>Subjects</td>
<td>Who are the subjects and how will they be selected?</td>
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<tr>
<td>Selection criteria</td>
<td></td>
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<tr>
<td>Sampling design</td>
<td></td>
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<tr>
<td>Variables</td>
<td>What measurements will be made?</td>
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<tr>
<td>Predictor variables</td>
<td></td>
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<tr>
<td>Confounding variables</td>
<td></td>
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<tr>
<td>Outcome variables</td>
<td></td>
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<tr>
<td>Statistical issues</td>
<td>How large is the study and how will it be analyzed?</td>
</tr>
<tr>
<td>Hypotheses</td>
<td></td>
</tr>
<tr>
<td>Sample size</td>
<td></td>
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<tr>
<td>Analytic approach</td>
<td></td>
</tr>
</tbody>
</table>

Hulley SB, *Designing clinical research*. LWW; 2013.
Pay Attention!

• Read sponsor instructions!
  • Page numbers, word limit, margins, font, etc.
  • Sections
Abstract of a Research Protocol

• This is the first page of the protocol but written last
• Summary of the protocol
• One paragraph
  • Background – 2 sentences on the importance and gap you are addressing
  • Objectives/Aims
  • Design
Research Question

• Often in the form of specific aims and hypotheses
  • Often a paragraph first to state rationale
  • State one overall goal
  • Not more than three specific aims for a large study for 1-2 a pilot study
  • Some also call these “objectives”
  • Any hypotheses should be placed under the corresponding aim/objective
Background and Significance

• This section should be written after you have done all your background work and finessed your research question
  • One or two pages
• No separate literature review needed
Background and Significance

• Focused to the research question
• Build the story of why it is important, what is known, and where the gap in knowledge is, and how your study is addressing it
• Demonstrate how your study will advance the area/field (impact)
Research Design

• This is part of the approach section in NIH-type grants
• A schematic diagram is always helpful
• Include brief justification for the selected study needed
• Subject information
Research Design

• Visit numbers, how often measurements are collected
• Details of each measurement (outcome, exposure, and associated factors)
• Details of surveys/questionnaires, focus group discussions
Research Design - Study Subjects

- Recruitment
- Feasibility
- Inclusion Criteria
- Exclusion Criteria
- Screening, (if there is any intervention)
- Randomization (for RCTs)
Variables

Which variables to measure?
  - An important decision in study design consideration

For most analytic design types, broadly classified into:
  - Outcome variable(s)
  - Predictor variable(s)
  - Confounding variable(s)
Measurements

Confounder

Exposure

Outcome
Research Design - Measurement

• **Outcome variables**
  - Drives the kind of statistical analysis
  - Part of PICO(T)

• **Predictor/independent variables**

• **Confounders**
Statistical Analysis

• Best statistical analyses sections are stated for each specific hypothesis
• Do not make this a general section that can be applied to any research question of similar design
  • Tailor it to your specific aims
• Includes sample size/power determination
Additional Items in Research Protocol

• Timeline
• Limitations and alternative plans
• References
Concluding Remarks

• Keep everything focused on your well developed research question
• Convince the reader of the importance of filling the gap in knowledge that you are addressing – not just the importance of the topic in general
• The design and analysis should closely align with your stated question
Thank You

Questions?