

Introduction to Research Methods in Public Health

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Key concepts, steps, and tools for designing and conducting rigorous public health investigations.

1. Why Research Methods Matter in Public Health

Reason	What It Means for Practice
Evidence-based decision making	Policies, programs, and interventions are grounded in data rather than intuition.
Population focus	Methods capture health outcomes at community, regional, or national levels.
Complex determinants	Enables analysis of social, environmental, behavioral, and biological factors simultaneously.
Resource allocation	Identifies high-impact interventions, maximizing limited public health budgets.
Ethical accountability	Systematic methods protect participants and ensure transparent reporting.

2. Core Research Designs

Design Type	Primary Purpose	Typical Setting	Strengths	Limitations
Descriptive (cross-sectional, ecological)	Describe health status, distribution of risk factors	Surveys, surveillance systems	Quick, inexpensive; good for hypothesis generation	Cannot infer causality; snapshot in time
Analytical Observational	Test associations between exposure & outcome	Cohort, case-control, nested case-control	Can suggest causal links; feasible for rare outcomes (case-control)	Potential confounding; bias (selection, recall)

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Design Type	Primary Purpose	Typical Health	Strengths	Limitations
Experimental (randomized controlled trial – RCT)	Determine efficacy/effectiveness of interventions	Clinical or community trials	Highest internal validity; randomization balances confounders	Expensive; ethical constraints; limited generalizability
Quasi-experimental (controlled before/after, interrupted time series)	Evaluate interventions when randomization isn't possible	Policy changes, program roll-outs	Practical for real-world settings; stronger than simple pre/post	Threats to internal validity (history, maturation)
Qualitative	Explore meanings, experiences, context	Focus groups, in-depth interviews, ethnography	Rich, nuanced data; informs intervention design	Not statistically generalizable; subjectivity in analysis
Mixed methods	Combine quantitative rigor with qualitative depth	Sequential or concurrent designs	Comprehensive insight; triangulation of findings	Requires expertise in both paradigms; more resources

3. The Research Process (Step-by-Step)

1. Identify the Problem & Define the Research Question

- Use the **PICO** (Population, Intervention, Comparison, Outcome) or **PEO** (Population, Exposure, Outcome) framework.
- Example: “Among urban adolescents (P), does a school-based nutrition program (I) reduce obesity prevalence (O) compared with standard curriculum (C)?”

2. Literature Review

- Systematic search of PubMed, Embase, Scopus, WHO Global Health Library.
- Map existing evidence, locate gaps, refine hypothesis.

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3. Select an Appropriate Study Design

- Match the question's causal direction, feasibility, ethics, and resources.

4. Develop Protocol & Obtain Approvals

- Write a detailed protocol (objectives, methods, analysis plan).
- Submit to Institutional Review Board (IRB) / Ethics Committee.
- Register clinical trials (e.g., ClinicalTrials.gov) or observational studies (e.g., OSF).

5. Sampling Strategy

- **Probability sampling** (simple random, stratified, cluster) ? generalizable results.
- **Non?probability sampling** (convenience, purposive) ? useful for qualitative work.
- Calculate sample size using power analysis (?, ?, effect