Design Considerations for Intervention Studies

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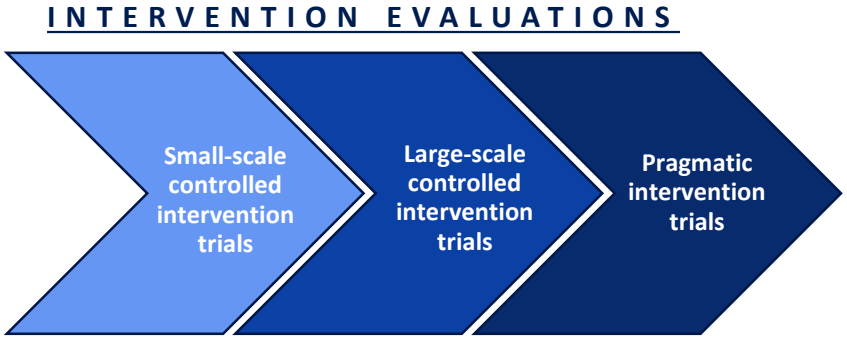
What's the objective?

Prevent people from getting sick

Intervention studies: how do they differ?



- Objectives
- Outcomes
- Approximation of “real-world”

Objectives

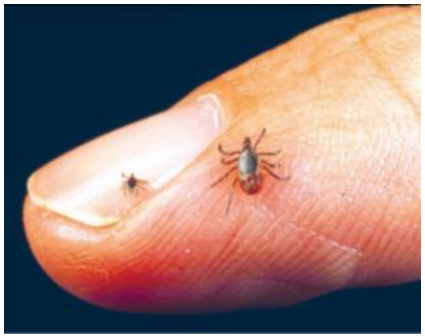
- Can it kill ticks?
- Can it protect people from tickborne disease?
- Will it protect people from tickborne disease?

Can it kill ticks?

- Ticks/Animals
  - Tick density
  - Infectivity rate
- Studies
  - Small lab/field studies
  - Implementation optimized

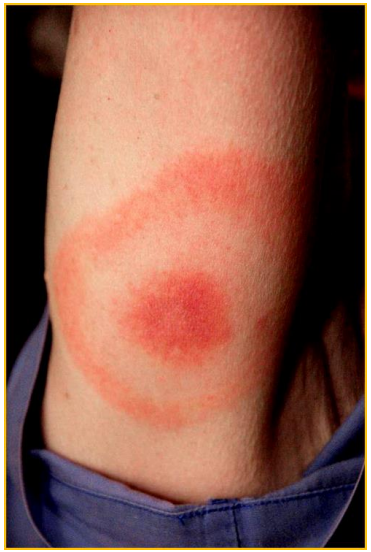
Can it protect people?

- Human
  - Ticks crawling/attached
  - Tickborne disease
  - Biomarkers (including seroconversion)
- Studies
  - Sample size larger
  - “high-risk” participants
  - Implementation less-well controlled than tick/animal studies (efficacy → effectiveness)
- Necessary to ensure relevance to public health

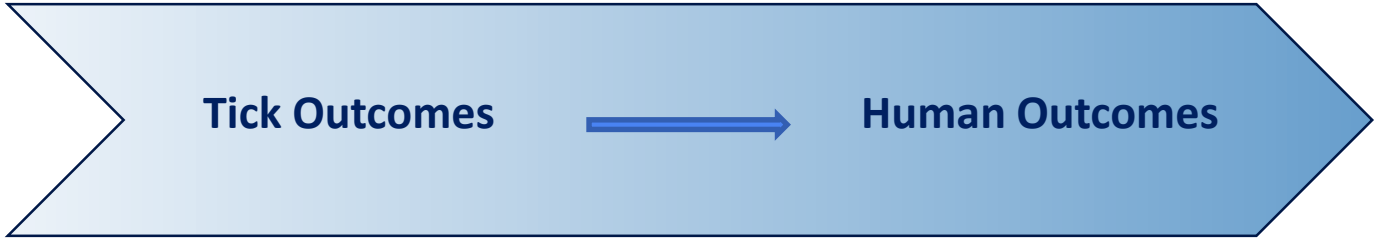


Will it protect people?

- Actions to deliver services
  - Acceptability
  - Feasibility
  - Cost/Coverage
- Studies
  - Factors affecting implementation (e.g., social, political)
  - All types of participants (no exclusions)
  - “Real-world” settings
  - Implementation in non-ideal settings

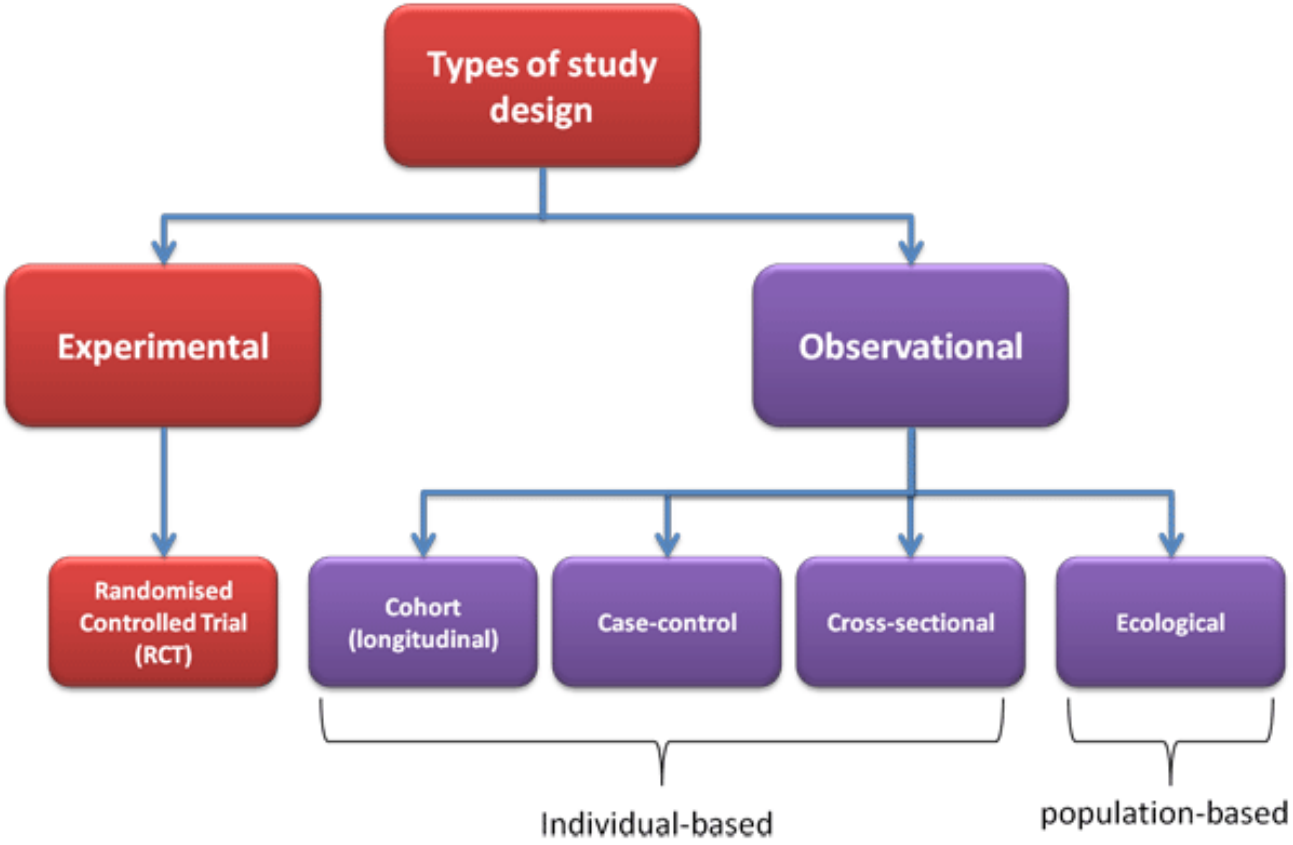


The Intervention “Pipeline”



Design Considerations

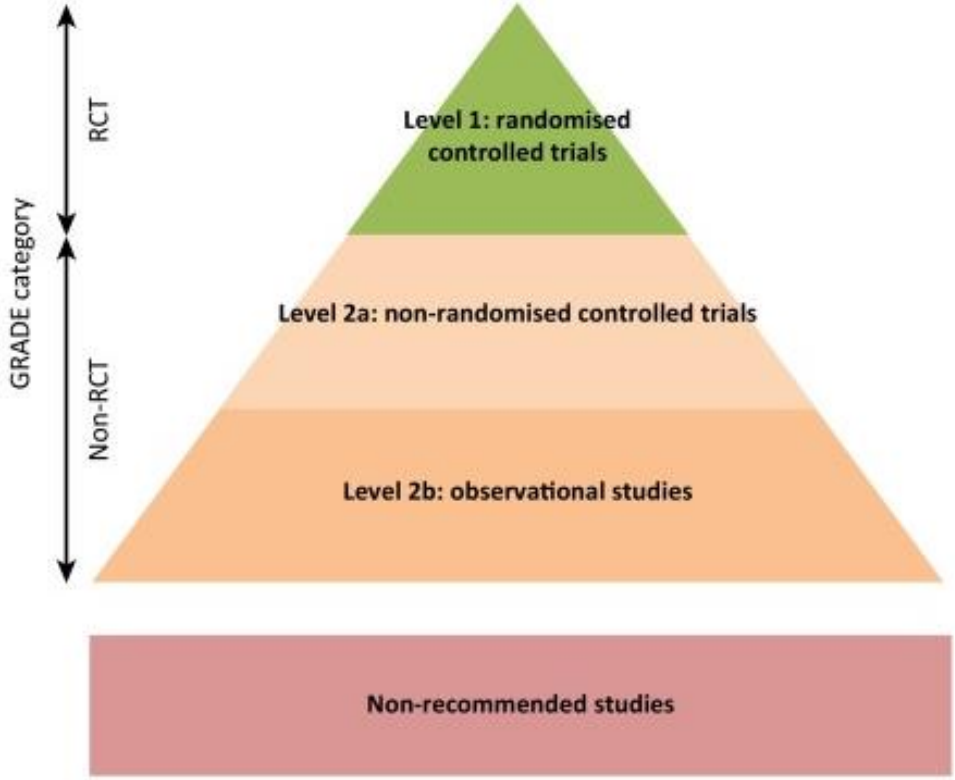
- Experimental vs. observational
- Control groups
- Single vs. multiple interventions
- Group (cluster) vs. individual
- Sample size and power
- Approximation of “real-world”


Types of study design
Experimental
Observational
Randomised Controlled Trial (RCT)
Cohort (longitudinal)
Case-control
Cross-sectional
Ecological
Individual-based
population-based

Experimental vs. Observational Studies	
Participants randomly assigned to treatments	Participants NOT randomly assigned to treatments
Treatment is the only factor varied	
Causal claim can be made	Causal claim CANNOT be made
	Claim can ONLY be made about study participants or similar groups
Good experiments include: random allocation to treatments, control groups, placebos, and use blinding	Good observational studies: acknowledge and account for all potential problems/biases

Wilson et al., 2015 Trends in Parasitology

Hierarchy of Study Designs for Assessing the Efficacy of Interventions

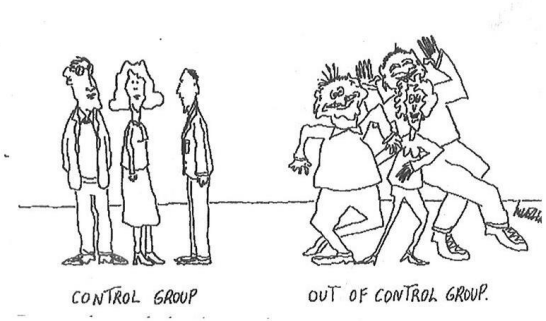


- **Randomised controlled** trial (individual or cluster randomised)
- **Randomised** cross-over study, step-wedge design, controlled before-and-after study, controlled time series or controlled interrupted time series
- **Non-randomised** cross-over study, step-wedge design, controlled before-and-after study or controlled interrupted time series
- **Case-control, cohort** or **cross-sectional** study
- **Non-randomised controlled trial** or **non-randomised controlled time series**
- Studies **without a control group** or **using a historical control group**

TRENDS in Parasitology

Control Groups

- Considerations
  - Strive for comparable
  - Make them concurrent
  - Collect data on factors relevant to disease occurrence
  - Recognize potential for selection bias/confounding
- Alternative designs
  - Crossover
  - Randomization



Single vs. Multiple Interventions

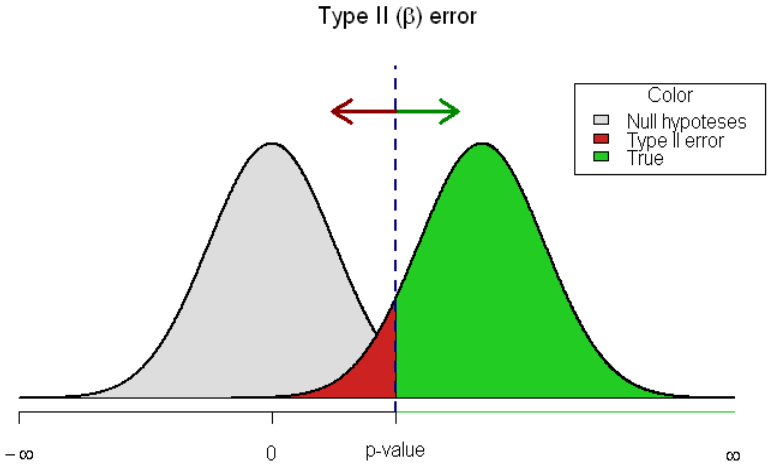
Multiple interventions typically viewed as better, but…

- Environmentally conscious
- Evidence of synergy
- Cost-effective
- Practical

Cluster vs. Individual

Sample Size and Power

- Be clear about expected effect size (e.g., 50% reduction)
- Small samples will affect the standard error
- Sample must be large enough to minimize probability of Type II error
- Larger samples for cluster studies due to between-cluster variation



Approximation of “Real-World”

- Participant selection
- Location
- Timing
- Cost
- Selection of monitoring sites

Other considerations

- Blinding (sometimes not possible)
- Adherence to the intervention
- Follow-up periods
- Spillover effects
- Limited resources

Summary

- Common problems/deterrents exist with tickborne disease intervention studies
  - Surrogate endpoints
  - Resource limited
  - Implementation (large-scale) is difficult
- Methodologically stronger study designs exist
- Human outcomes need to match interventions
- Entomologists and epidemiologists need to partner…

Thank you!

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov