FAM Sampling Workshop
Westminster Catering and Conference Center
Westminster, Maryland

Wednesday, May 26, 1999

08:45 - 10:15 Data Analysis

- ➢ Framework to measure changes over time
  - · outcome and program indicators
- ➢ Statistical significance vs. programmatic significance
- ➢ Significance tests
  - · pre-post design
  - · pre-post control group design
- ➢ Multi-variate analysis

Data Analysis

- **Hierarchy of evidence of program impact:**
  - Verification of program implementation
  - Documentation of changes in program process and output indicators
  - Documentation of changes in outcome/impact indicators in project area
  - Documentation of larger changes in outcome/impact indicators in project than in control area
  - Demonstration that larger changes in outcome/impact indicators in project than in control area persist/remain after statistical controls for differences in other key determinants are introduced

Analyzing evaluation data not derived from sample surveys:

- Comparison against targets/standards
- Comparison over time (trends)

Analyzing evaluation data derived from sample surveys

Approach(es) similar to that for non-survey data, but must take into account sampling error

- Comparison against targets/standards
- Comparison over time (trends)
- Comparison against a control area

- Comparison against targets/standards

  Target = 75% of children in growth promotion program gaining weight in last three months

  Example 1:

  - Survey estimate of p (s.e.) = .70 (.04)
  - 95% C.I. = (.70 +/- 2 s.e.) = (.62, .78)
  - Since C.I. contains .75, cannot conclude that target was not reached

  Example 2:

  - Survey estimate of p (s.e.) = .85 (.04)
  - 95% C.I. = (.85 +/- 2 s.e.) = (.78, .93)
  - Since C.I. does not contain .75, can conclude with 95% confidence that target was reached

- Comparison over time (trends)

  - Null hypotheses: $p_2 = p_1$
  - Program hypotheses: $p_2 > p_1$

  - In order to reject null hypothesis, confidence intervals around estimates p_1 and p_2 can't overlap (otherwise, cannot be certain whether change was "real" or the result of random measurement error)

    - Statistically significant change

      (Non-overlapping confidence interval)

p_1 p_2

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    - Statistically non-significant change

      (Overlapping confidence intervals)

p_1 p_2

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  - Significance test (t-test):

$t = p_2 - p_1 / se_2 + se_1$

If t is GE 1.282 (one-tailed test), can conclude with 90% confidence that $p_2 > p_1$

If t is GE 1.645, can conclude with 95% confidence that $p_2 > p_1$

If t is GE 2.326, can conclude with 99% confidence that $p_2 > p_1$

- Example:

  Baseline survey estimate (se) = .35 (.025)

  Follow-up survey estimate (se) = .55 (.030)

  $t = p_2 - p_1 / se_2 + se_1$

  = (.55 - .35) / .030 + .025

  = .20 / .055 = 3.63

  Therefore, conclude with 99% confidence that $p_2 > p_1$

- Comparison against a control area

- Null hypothesis: $\Delta_{treatment} = \Delta_{control}$

  (note: $\Delta = p_2 - p_1$)

- Program hypothesis: $\Delta_{treatment} > \Delta_{control}$

- In order to reject null hypothesis, confidence intervals around estimates $\Delta_{treatment}$ and $\Delta_{control}$ can't overlap

- Significance test (t-test):
  $t = \Delta_{treatment} - \Delta_{control} / se_{\Delta treatment} + se_{\Delta control}$

- Example:

Survey estimates (se)	Baseline	Follow-up
Treatment area	.35 (.025)	.55 (.03)
Control area	.40 (.028)	.45 (.03)

$t = \Delta_{treatment} - \Delta_{control} / se_{\Delta treatment} + se_{\Delta control}$

$= .20 - .05 / .055 + .058$

$= .15 / .113 = 1.32$

Therefore, can conclude with at least 90 confidence that change in treatment area was greater than that in control area

- Comparison against a control area with multivariate controls

  - Why are multivariate controls needed?

    Because comparison of $\Delta_{treatment}$ and $\Delta_{control}$ may not capture all factors on which the treatment and control groups differ, and thus could draw faulty conclusion about program impact.

    - Note: could both under-estimate of over-estimate program impact

  - Many types of multivariate analysis techniques relevant to program evaluations – regression, categorical analysis, etc.

  - Basic idea is yield estimate of $\Delta_{treatment}$ and $\Delta_{control}$ for which the effects of differences between treatment and control areas on factors that could influence the impact indicator of interest have been taken into account.

- Example:

Survey estimates (se)	Baseline	Follow-up
Treatment area	.35 (.025)	.55 (.03)
Control area	.40 (.028)	.45 (.03)
Adjusted estimate for treatment area (same composition as control area on all factors	.35 (.025)	.66 (.031)

$t = \Delta_{treatment} - \Delta_{control} / se_{\Delta treatment} + se_{\Delta control}$

$= .31 - .05 / .056 + .058$

$= .26 / .114 = 2.28$

Can now conclude with 95 confidence that the change in treatment area was greater than that in control area when differences in other determinants of the outcomes under study were controlled statistically