Comments on Rate standardization
Ed Stanek

Introduction

Paragraph 1.

Try to state things as clearly as possible. Use one word that is clearly defined (i.e control auxiliary, confounder, )

Rate standardization is common.
   Question: Is it limited to rates, or could the response be continuous?
It is applicable when
   a. the rate varies between groups of subjects (i.e. male, female, young, old)
   b. there is a defined set of weights for groups

It may be used to:
   a. create a more precise estimate of a rate in a population based on a sample.
   b. compare rates from different samples from the same population
   c. compare rates from different populations based on common weights.

In epidemiology, a) and b) are called controlling for confounding.

How is this paper limited? categorical control variables? direct standardization, using probability approaches

Paragraph 2+3.

Context for rate standardization:

1. Formula approach: no probability, no statistics.
   Example: Know number of smoking students majoring in PH and their gender in 2001
   Know number of smoking students majoring in PH and their gender in 2002
   Want to compare prevalence rates for 50/50 male female ratio.

2. Probability approach:
   If this is the distinction, then I’d describe the possible approaches

Not clear- regression models? I’m not sure what the point of the paragraph is.

Other terms used: adjustment, poststratification

Direct standardization: Use common population weights multiplied by population specific rates.
(Example: Smoking prevalence compared between two towns, using Massachusetts population weights)
Indirect standardization: multiply stable rates times population to get expected (SMR)
(Example: Suicide among persons with cancer: Apply suicide rates in US to Cancer Population to compare observed vs expected suicides)

**Direct Standardization**

Paragraph 1.

settle the internal/external issue once, then don’t return to it. Go right into the definition.

Interpreting a weighted average depends on the weights. This is a characteristic of a weighted average. I think it is a fact, not a weakness. Maybe in the discussion should be some comments on the interpretation of summary measures. They aren’t gender specific- but have a purpose.

I’d state that there needs to be agreement as to what the weights are. Weights may equal the standard population. Or weights may be just some set of weights. (say 50/50 for gender).

I think the example is long-winded, and could be stated more concisely. Also, I believe that we should discuss a real example here- use real data (if possible) with two towns. Let the weight be from the Mass population. Pick J=8 (or something similar to what is done, using the reported age categories from the census.

In the end, a probability model needs to be defined for this process:

Groups in Population 1: \( s = 1, \ldots, N \)

Weight: \( w_s, s = 1, \ldots, N, \text{ where } \sum_{s=1}^{N} w_s = 1 \)

Subject in group: \( t = 1, \ldots, M_s \).

Model:
\[
Y_{sj} = \mu_s + E_{sj} = \mu + \beta_s + E_{sj}
\]

where \( \mu = \frac{1}{N} \sum_{s=1}^{N} \mu_s \).

Target Parameter: \( T = \sum_{s=1}^{N} w_s \mu_s \)

**Direct Rate Standardization and Finite Sampling**

I’d focus on estimation. (leave out null hyp)

Refrain from using multiple words for same concept.

Sampling: Consider each ‘population’ as a srs w/o replacement from the Standard population.
Consider a sample of the population. (What happens when the entire population is observed? Are we out of the probability framework?)

What are the assumptions for other frameworks/estimation approaches? (can we determine whether it is a framework or an estimation approach?)

Calibration:
- GREG estimation
- Exchangeable subjects
- Postratification
  - Do we have a model with response error? What is implied by Mukhopadhyay’s 2000 model.
- Random Permutation model

Model based Direct adjustment
- Assumptions: Distribution of response and auxiliary variable (in Superpop)
- Model?
- Pop size known?
- Results: ?? I don’t understand Rosenbaum sentence.

Model assisted estimators
- Assumptions: ??

Model assisted
- Assumptions: ??

If direct adjustment means something different in Epi, should we present it? What is it?

Are synthetic estimators relevant here?

**Design-based Prediction**

- Is the RP model the only design based prediction?
- Maybe describe this model as a sampling model- down play random permutations.

Can the settings that you’ll describe be related to the model assisted and model based approach?