Cross-sectional studies

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Cross-sectional (XS) studies

- Where comparative XS studies fit in the spectrum of research designs
- Present a XS study on Somali IOP
- Examine weaknesses of XS studies in general and the Somali study in particular (interactive session)
The Time Dimension

- Most studies observe what happens over time (often too short a time)
  - RCTs and NRCTs
  - Prospective cohort studies
  - Case-control studies
- But some study a single point in time
  - Cross-sectional studies
  - Some observational reports/series

Frozen in time: XS studies

- Usually not a specified moment, e.g. 2/26/05 at 11:00 a.m.
- Usually defined as a time point for data collection
  - Time of first exam
  - Time of diagnosis
  - Time of treatment, e.g. surgery

What’s confusing

- Time can be a feature in XS studies
  - Data is collected over time
    - Baltimore eye survey or LALES
  - A past historical even can be a variable, including how long ago it was
    - History of trauma or smoking history
  - The study group may be stratified with a time variable
    - Freshman vs. senior medical students
XS study uses

- Status of something at a point in time
- Correlations among things at a point in time
- Inferences about time (usually weak)

Correlated items may have no causal relationship to each other
Confounders are common and often hidden from view

Hidden confounders

Study: attitudes about honesty with patients
Survey: 1st and 4th year medical students
Finding: 4th year students are less honest
Conclusion: 4th year students are less idealistic, and more pragmatic
Hidden from view: New ‘honesty’ module in first year curriculum started last year

XS studies—two flavors

- Population-based
  - Provides prevalence data
  - Identifies risk factors
  - Easier to generalize results
- Non-population-based, e.g. clinic patients
Advantages of non-population-based XS studies

- Practical
  - Can do it NOW
- Economic
  - Very cost-efficient
- Easy to manage
  - Fellows/residents can do them

Intraocular Pressure in a Somali Population Living in the United States

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How the study was conceived

- A resident noticed that he was seeing a large number of Somali immigrants in clinic
  - Because of readily available interpreters, patients knew to come there
  - The resident thought their IOPs were lower than average because he kept getting single digit values
- A literature search found 4 studies with higher IOPs in people of African descent and one with no difference, but none with lower IOPs in ethnic Africans
Methods

Selection of study group of Somalis

- Searched eye clinic appointment records from July 1996-March 1998 (21 month period)
- Names identified by clinic staff as typical of Somali descent
- Clinic records reviewed
  - Documented complete eye exam visit
  - Self-identification of being of Somali origin
  - 30 years of age or older
Methods

Selection of a comparison group of Caucasians
- Searched eye clinic appointment records from same day as a Somali clinic visit
- Names identified as typical Caucasian
- Age and gender matched to the chosen Somali
- Clinic records reviewed to verify complete eye exam was done, self identification as Caucasian, and 30 years or older

Exclusion criteria (patients)
- Failure to complete a comprehensive eye exam
- Documentation of difficult tonometry
- Use of systemic medications affecting IOP
- Glaucoma diagnosis
- Known positive HIV status

Exclusion criteria (eyes)
- History of ocular trauma or surgery
- Use of topical medication affecting IOP
- Active uveitis at time of examination
Methods

Data extracted from each patient’s chart
- Age and gender at time of exam
- Ocular and systemic diagnoses
- Medications taken
- Intraocular pressure (IOP)
  - Mean of all clinic visits during 21 month period, for each qualifying eye
  - Mean of both eyes, or IOP of qualifying eye
- No corneal thickness data available

Methods

Statistical analysis (p < .05 significance level)
- Independent sample 2-tailed t test for differences in IOP and age (continuous variables)
- Fisher exact test for differences in gender and presence of diabetes (categorical variables)
  - chosen over chi-square because of possible small cell numbers in diabetes
  - probability of getting our results among all the permutations of 2x2 tables with the same totals

Results

Somalis
- 172 had appointments
- 114 actually came to the clinic
- 63 met the inclusion criteria
  - 6 excluded
    - 2 had glaucoma
    - 3 had difficult tonometry
    - 1 had intraocular surgery
- 57 comprised the Somali group
Results

- **Caucasians**
  - 57 age and gender matched to Somalis
  - Seen on same day as the paired Somali
  - Age match was good (p = .84)
    - Somalis: 48.5 +/- 12.2 years
    - Caucasians: 48.1 +/- 11.3 years
  - Gender match imperfect (p = .09)
    - 39 female Somalis; 29 female Caucasians

Power calculation

- The sample size had 90% power to detect a 1.8 mmHg difference in IOP
- Power dropped to 60% to detect a 1.2 mmHg difference in IOP
- 2-tailed alpha level = .05
**Bias in XS studies**

- Selection (including self-selection)
- Detection (including measurement)
- Attrition (lost by inclusion/exclusion)
- Others?

**Selection bias: Somali study**

- Patients made appointments because they had a complaint, so abnormal eyes are over-represented
  - Excluded if dx or tx affected IOP
- Not all Somali or Caucasians have names that sound Somalian or Caucasian
- Matching routine for Caucasian sample
  - Not random
  - Re-matching required if not eligible
- Others?

**Detection bias: Somali study**

- Non-standardized IOP measurement
- Multiple untrained examiners
  - Considerable variation in precision
  - But two groups examined on same day
- Examiners had no knowledge of hypothesis (hurray!—an advantage of retrospective studies)
Attrition bias: Somali study

- Did inclusion and exclusion criteria differentially affect the Somalis and the Caucasians?
  - Data were kept only on the Somalis
  - Could this have somehow confounded the IOP distributions?
- Others?