Denominators matter: Understanding medical encounter frequency and its impact on surveillance estimates using EMR data

Noelle M. Cocoros, DSc, MPH
Dept. of Population Medicine, Harvard Medical School & Harvard Pilgrim Health Care Institute
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Co-authors

• Aileen Ochoa, MPH
• Karen Eberhardt, BS
• Bob Zambarano, PhD
• Michael Klompas, MD
Background

- Electronic medical record (EMR) data are an increasingly common source for public health surveillance.
- EMR systems do not include definitive lists of all patients associated with the practice at any given time:
  - Patients may leave a practice without notifying the practice, they might die, or years may elapse between encounters.
  - Only those who seek and receive care on a regular basis can be identified with confidence.
- **Challenge:** selecting an appropriate denominator for incidence and prevalence estimates.
Background continued

- Our practice has been to estimate prevalences using “≥1 encounter of any kind in the last 2 years” as our default denominator.

- Canadian Primary Care Sentinel Surveillance network:
  - Estimated diabetes among patients with ≥1 primary care encounter in 2 years (Greiver et al., 2014)

- NYC Macroscope:
  - Estimated prevalence of chronic conditions among patients with ≥1 visit in 1 year (Thorpe et al., 2016)
Objectives

- Evaluate the distribution of intervals between encounters for populations of patients to inform the selection of an ideal denominator for population-level disease rates

- Explore the impact of different denominator definitions on chronic condition prevalence estimates
ESP – EMR Support for Public Health

Software and architecture to extract, analyze, and transmit electronic health information from providers to public health

- Surveys codified EMR data for patients with conditions of public health interest
- Generates secure electronic reports for the state health department
- Designed to be compatible with any EMR system – Requires ability to export data
- Open source software, PopMedNet (available via esphealth.org)

JAMIA 2009;16:18-24
MMWR 2008;57:372-375
Am J Pub Health 2012;102:S325–S332
AGGREGATED DATA*

*Also reports individual cases of notifiable diseases.
Methods

- Identified date of adult patients’ first clinical encounter for each year (2011-2016)

- Plotted distribution of days until each patient’s next encounter
Methods continued

- We defined “clinical encounters” as encounters where at least 1 of the following was recorded:
  
  - Vital sign (blood pressure, height, weight, temperature)
  - Diagnosis code
  - Immunization
  - Prescription
  - Laboratory test
Methods continued

- Estimated prevalence of asthma, hypertension, obesity, tobacco use in 2016 using different denominators
  - ≥1 clinical encounter in the past 2 yr
  - ≥1 clinical encounter in the past 1 yr
  - ≥2 clinical encounters in the past 1 yr
  - ≥2 clinical encounters in the past 2 yr
Results

- 2011-2016: 1,995,529 patients had 90,308,287 clinical encounters across all practices
No. of days from 1st annual clinical encounter to the next, adults ≥20 yrs

Among patients with an enc in 2014:

- 78%, 85%, and 91% had next within 1 yr
- 83%, 88%, and 94% had next within 2 yrs
Days to next encounter by percentile, 2016

Percentile

Days

Days

Percentile

A

B

C
Of those with an annual clinical encounter, % with no subsequent encounter, adults ≥20 yrs
Prevalence of conditions by denominator, MA adults ≥20 yrs, July 2016

ESP prevalence are adjusted for age, sex, race, ethnicity based on 2010 MA census
Conclusions

- Most ambulatory patients have >1 encounter per year
- More frequent engagement in care is associated with higher prevalence estimates of some chronic conditions
- The most appropriate denominator for surveillance estimates from EMR data will vary by condition of interest – and algorithm definition
  - e.g., a less stringent denominator likely best option for “general population” of patients
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Questions?

noelle_cocoros@harvardpilgrim.org

esphealth.org