New Sources of Data for Public Health: Using Electronic Health Records to Examine Population Obesity and Smoking Prevalence and Variation

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DISCLOSURE

I have no financial relationships to disclose.

BACKGROUND:

• Estimates of obesity and tobacco use are largely from population-based telephone surveys. These are known to suffer from non-participation bias and from response bias.
• Improvements happen at the community level where little data exists.
Obesity

• Second leading cause of death in the U.S.
• Estimated annual medical cost of obesity in the U.S. was $147 billion in 2008
  —Obese patients $1,429/year higher than normal wt patient
• CDC estimates 35.7% of U.S. Adults are obese

Tobacco Use

• Leading cause of death in the U.S.
• Estimated annual medical cost of tobacco use in the U.S. was $96 billion in 2008
• CDC estimates 19% of U.S. adults are current smokers

Sources of Data

• Behavioral Risk Factor Surveillance System (BRFSS) – telephone survey (2013: 493,435)
• National Health and Nutrition Examination Survey (NHANES) – combination of physical examination and interview (2011/12: 9338 had exam) – tobacco?
• National Health Interview Survey (NHIS) – personal household interview (2013: 34,664)
Obesity Prevalence

- 29.4% BRFSS-2013
- 33.9% NHANES-2011/12
- 29% NHS-2013

Obesity - Variation

- Age
  - 40-59: 39.5%
  - 60+: 35.4%
  - 20-39: 30.3%
- Gender
  - Females: 36.5%
  - Males: 33.7%
- Race
  - Black: 47.8%
  - Hispanic: 42.5%
  - White: 32.6%
  - Asian: 10.8%
- Education
  - Male: no relationship
  - Female: college educated – lower risk

Smoking Prevalence

- 19% BRFSS-2013
- 17.8% NHS-2013
Tobacco - Variation

- **Age**
  - 18-24: 17.3%
  - 25-44: 21.6%
  - 45-64: 19.5%
  - 65+: 8.9%
- **Gender**
  - Males: 20.5%
  - Females: 15.8%
- **SES**
  - Below poverty: 27.9%
  - At or above poverty: 17.0%
- **Race**
  - Black: 18.1%
  - Hispanic: 12.5%
  - White: 19.7%
  - Asian: 10.7%
  - Multiple race: 26.1%
- **Education**
  - No HS diploma: 24.7%
  - GED: 41.9%
  - Diploma: 23.1%
  - College degree: 9.1%
  - Advance degree: 5.9%

Bias to estimates

- **Telephone survey biases**
  - Sampling bias
  - Response bias
- **Household surveys**
  - Sampling bias (recruitment, refusal)
- **Meaningfulness to those on the “front line”**

Best Estimates of Obesity and Tobacco

Local data based on data from 2009-2010; N=129 to 134 interviews
OBJECTIVE

• We used data from electronic health records (EHR) to determine the rate of obesity and tobacco use in our service area, and to examine variability from year to year.
• Use information to improve population health

Who are we?

• Integrated Delivery System
  – 6,475 Total Employees
  – Physician-led organization: 790 providers employed / 498 medical staff
  – Regional: 65 clinic locations (27-Medical, 3-Worxite, 4-ExpressCare, Podiatry, Behavioral Health, Eye, Sports Medicine, Reproductive care)
  – 325-bed Tertiary Medical Center, Level II Trauma Center + 4 Affiliated – Critical access hospitals
  – EMS ambulance service
  – Affiliated Aging units and Nursing Home Systems
  – Electronic Medical Record – shared by clinics/hospitals/EMS/labs
• Gundersen Medical Foundation
  • Residency and Medical Education Programs
  • Western Campus of the University of Wisconsin Medical and Nursing School
  • Clinical Research Program

20 county service area across 3 states
METHODS

- Height, weight, gender, age, smoking status, insurance type, appointment type and total charges were obtained from electronic health records (EHRs) for 156,744 adult patients seen in 2012-2013 (excluding deceased patients).
- Analysis examined variability by patient characteristics.

Obesity

- BMI calculated as weight (kg)/height (m²)
- A height and weight were measured and available in 2012 on 83.71% of patients
- Of the 20,600 patients without height and weight, an additional 47.8% (9,848 patients) had a weight measurement.
- The average height for their age and gender was used to calculate an imputed BMI.
- Thus, only 8.5% of patients had no estimate of obesity risk

Obesity Risk Results: 2012

- Obese II (35.0–39.9)
- Obese I (30–34.9)
- Normal weight 18.5–24.9
- Overweight 25.0–29.9
- Underweight <18.5
**Obesity Risk Results: 2013**

- Obese III (40+): 29.2%
- Obese II (35.0–39.9): 26.7%
- Obese I (30–34.9): 26.2%
- Overweight: 25.7%
- Normal weight: 23.6%
- Underweight: 1.2%

**Obesity by Gender and Age**

- 80.7% of males overweight/obese, 68.2% of females

**Obesity by Appointment Type**

- Family Medicine (n=55,348): 42.8%
- Internal Medicine (n=21,482): 40.8%
- Obstetrics (n=7,690): 38.7%
- Combination of primary care (n=7,651): 23.6%
- No Primary Care (n=34,282): 2.6%
**Obesity by Insurance Status**

- **Private Insurance** (n=75,892):
  - Unknown: 2.2%
  - Obese: 10.2%
- **Government** (n=39,215):
  - Unknown: 6.4%
  - Obese: 19.8%
- **Self-pay** (n=11,346):
  - Unknown: 15.8%
  - Obese: 33%

**Obesity and Health Care Expenditures**

Mean Total Charge by BMI
2012 (N=116,075)

**Obesity by clinic presentation**

- **2012 only**: 37.2%
- **2013 only**: 37.2%
- **both years**: 43.2%
RESULTS – Smoking Status

• Smoking status was available for 94.8% in 2012; and 97% in 2013.

Smoking Status Results: 2012

- Never: 58.2%
- Current: 13.7%
- Former: 24.9%
- Unknown: 3.2%
Smoking Status Results: 2013

Smoking Status by Gender and Age

Smoking status by Appointment Type
Smoking Status by Insurance Status

Private Insurance: 4%
Government: 5.9%
Self-pay: 9.3%
Unknown: 31.8%

Smoking Status by clinic presentation

2012 only: 22.1%
2013 only: 21%
both years: 12.9%

Smoking Status and Health Care Expenditures

Total charge adjusted by age, gender, payment method, department seen and BMI

Unknown status (n=6535): $0
Non Smoker (n=68762): $3,999
Former Smoker (n=31466): $12,667
Current Smoker (n=19860): $17,410
Unknown status (n=6535): $14,166

2012 only: $12,667
2013 only: $17,410
both years: $14,166

Total charge adjusted by age, gender, payment method, department seen and BMI
Obesity Summary

- Varies by patient demographics
  - Age, gender, insurance status, type of appointment (provider)
- Varies by frequency of visit
  - Higher rate of obesity in those seen yearly
    - Managing conditions?
      - Worried well?
- Population change in weight from one year to next is stable
  - Change in weight favors the high risk

Tobacco Summary

- Varies by patient demographics
  - Age, gender, insurance status, type of appointment (provider)
- Varies by frequency of visit
  - Lower rate of tobacco use in those seen yearly
    - Tobacco users avoiding care

Does it matter?
Smoking Cessation Rates

- 25,293 patients identified as a smoker at some time within 1/1/10-5/1/13 with at least one subsequent visit
- 4,026 of these patients were a “former smoker” at last appointment
- 15.9% Cessation Rate
DISCUSSION

- Data from an EHR can provide more accurate observations. While understanding biases from national surveys of health behavior, it is important to understand variation in patient data, as well.
- Obesity may be overestimated from EHR, while tobacco use may be underestimated.
- This information can be helpful in developing effective clinical quality improvement and community health improvement plans.
Thank You & Questions?