

# Stat 992: Health Services Research and Network Analysis

Eva DuGoff, PhD

Department of Population Health Sciences  
School of Medicine and Public Health  
University of Wisconsin-Madison

*eva.dugoff@wisc.edu*

September 24, 2015



**WISCONSIN**  
UNIVERSITY OF WISCONSIN-MADISON

## ① Introduction

Hi, Nice to meet you

What is Public Health?

More on the Medical Care System

## ② Network Analysis and Health Services Research

Literature Review

Future Directions

# Section 1

## Introduction

## Subsection 1

Hi, Nice to meet you

# My Background

# My Background

- Johns Hopkins Bloomberg School of Public Health

# My Background

- Johns Hopkins Bloomberg School of Public Health
- Health Services Research and Policy

# My Background

- Johns Hopkins Bloomberg School of Public Health
- Health Services Research and Policy
- Former Congressional legislative staffer



## Subsection 2

### What is Public Health?

# What is Public Health?

- "Public health promotes and protects the health of people and the communities where they live, learn, work and play." –American Public Health Association

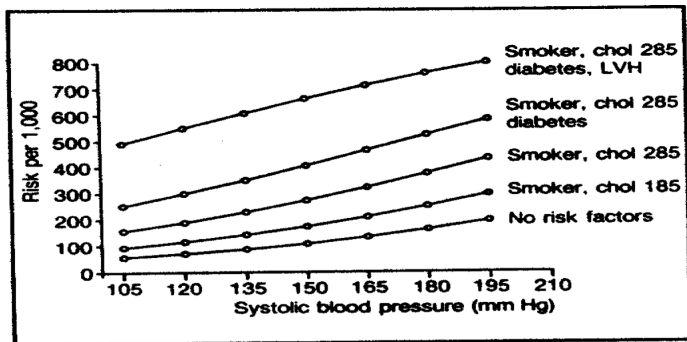
# What is Public Health?

- "Public health promotes and protects the health of people and the communities where they live, learn, work and play." –American Public Health Association
- "Saving lives, Millions at a time" – JHBSPH

# What is Public Health?

- "Public health promotes and protects the health of people and the communities where they live, learn, work and play." –American Public Health Association
- "Saving lives, Millions at a time" – JHBSPH
- Public health professionals have worked on housing, seat belts, air bags, food safety, clean water, health insurance, and medical care.

# Public health is about shifting the curve



**Fig. 6.** Probability of developing cardiovascular disease in 8 years for 55-year-old males in Framingham. At each level of systolic blood pressure the likelihood of developing cardiovascular disease increases progressively with the addition of other risk factors. Abbreviations: LVH = left ventricular hypertrophy; chol = serum cholesterol concentration (mg/dl) [after McGee 1973].

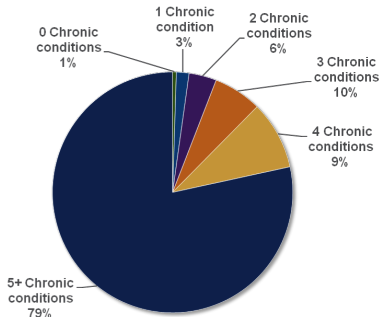
## Subsection 3

### More on the Medical Care System

# Medical Care is an Important Determinant of Health

- In 2013, the US spent \$2.9 trillion (\$9,255 per capita) on health care
- Medicare (65+ and seriously disabled) accounts for 20% of national health spending (\$585.7 billion in 2013)
- 79% of Medicare spending is on individuals with 5 or more chronic conditions

Figure : Percentage of Medicare Expenditures, 2007



Source: National Health Expenditure, Centers for Medicare and Medicaid Services, 2014; Anderson G, Chronic Care Chartbook, Robert Wood Johnson Foundation, 2010.

## Section 2

# Network Analysis and Health Services Research

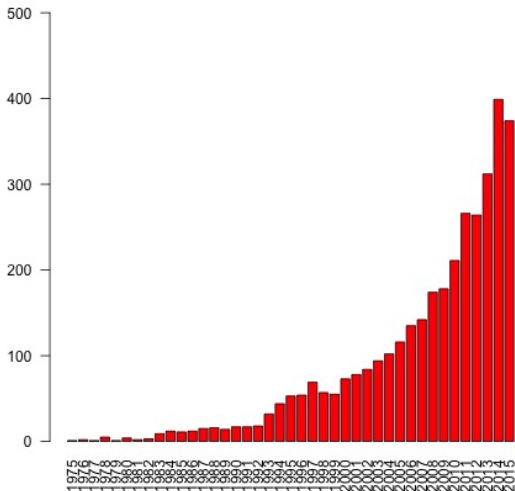


## Subsection 1

### Literature Review

# Network Analysis in Health Services Research

Number of PubMed articles related to Network Analysis



# Scoping Review

Study objectives:

- 1 Conduct a systematic search of the published literature for papers using patient sharing data to examine the health care system;
- 2 Map out the characteristics and range of methodologies used in the identified papers;
- 3 Examine reported conceptualizations, challenges, and limitations of network measures;
- 4 Propose recommendations for advancing the application of network analysis studies in health services research; and,
- 5 Develop a conceptual framework to guide measure selection and methods.

## Methods

- Extracted titles and abstracts from PubMed and Embase from database inception to July 2015. We collected titles using terms including "network", "patient sharing", "connectedness" and variations thereof
- Identified over 5000 titles and narrowed our search down to 39 full text papers.
- Three other reviews of the social network analysis but did not find another review examining the issue of measurement and patient sharing data.
- Currently in the process of finalizing the data extraction form for the full text reviews

## Other Systematic Reviews

- 1 Bae SH et al, "Health care provider social network analysis: A systematic review." 2015
  - Although considerable progress has been made in understanding health care provider networks, their structure, and their development, little has been known about their effectiveness in the health care setting and their contributions to quality of care and patient safety.
  - Up to 2013
  - 29 published articles; Current studies on the social ties of health care workforce professionals include several assessments of inefficiencies. The level of technical sophistication in these studies tended to be low. Future study using enhanced sophistication in study design, analysis, and patient outcome testing are warranted to fully leverage the potential of SNA in health care studies.

## Other Systematic Reviews

- ② Cunningham FC et al. "Health professional networks as a vector for improving healthcare quality and safety: a systematic review." 2012
  - To conduct a systematic review of studies of professionals' network structures, identifying factors associated with network effectiveness and sustainability, particularly in relation to quality of care and patient safety.
  - January 1995 to December 2009
  - A majority of the 26 unique studies identified used social network analysis to examine structural relationships in networks: structural relationships within and between networks, health professionals and their social context, health collaboratives and partnerships, and knowledge sharing networks. Key aspects of networks explored were administrative and clinical exchanges, network performance, integration, stability and influences on the quality of healthcare. More recent studies show that cohesive and collaborative health professional networks can facilitate the coordination of care and contribute to improving quality and safety of care. Structural network vulnerabilities include cliques, professional and gender homophily, and over-reliance on central agencies or individuals.

- 3 Chambers D et al. "Social network analysis in healthcare settings: a systematic scoping review." 2012
  - Aim to use SNA to inform the development and implementation of tailored behavior-change interventions to improve the uptake of evidence into practice in the English National Health Service.
  - Up to October 2010
  - We included 52 completed studies, reported in 62 publications. Almost all of the studies were limited to cross sectional descriptions of networks; only one involved using the results of the SNA as part of an intervention to change practice.
  - Found very little evidence for the potential of SNA being realised in healthcare settings. However, it seems unlikely that networks are less important in healthcare than other settings. Future research should seek to go beyond the merely descriptive to implement and evaluate SNA-based interventions.

# Scoping Review - (A few) Preliminary Results

Type	Measure	Author/Year
Provider-Centric	Degree Jaccard similarity Betweenness centrality Clustering Repeat-tie Fraction No of External Ties Personal network density Personal network size	Ong 2015, Pollack 2015, Casalino 2014 Ong 2015 Casalino 2014 Hollingsworth 2015 Hollingsworth 2015 Hollingsworth 2015 Mandl 2014 Mandl 2014
Patient-Centric	Care Density Constellation composition Constellation density	Pollack 2013, Ong 2015 Mandl 2014 Mandl 2014

Table : Exemplar Measures



# Scoping Review - (A few) Preliminary Results

## Ong 2015

- **Objective:** To elucidate the effect of provider professional relationships on multiple-provider prescribing of benzodiazepines, using social network analytics.
- **Finding:** Provider pairs who shared a greater number of patients and collaborators were less likely to co-prescribe benzodiazepines.

## Mandl 2014

- **Objective:** To indirectly measure teamwork and provider collaboration, we measure recurrence of provider constellations and cohesion among providers.
- **Finding:** Cohesion among providers is not the norm. Instead, the often ad hoc constellations of providers caring for patients are not persistent teams.

# Scoping Review - (A few) Preliminary Results

## Pollack 2015

- **Objective:** To examine if physician peer exposure was associated with the subsequent adoption of a new approach (brachytherapy) to treat of women with early-stage breast cancer.
- **Finding:** Exposure to peers who were early adopters of brachytherapy was found to be associated with a surgeon's subsequent uptake of brachytherapy

## Hollingsworth 2015

- **Objective:** To explore physician isolation in communities with high proportions of black residents as a factor contributing to racial disparities in access to high-quality hospitals for cardiac surgery.
- **Finding:** Physicians in areas with many black residents are more isolated; this isolation may negatively impact on care coordination and information sharing.

## Subsection 2

### Future Directions

# Future Directions

- What's the relationship between hospital physician network characteristics and patient health outcomes?
- Map the network relationships among hospitals treating patients for emergency general surgery and examine whether patients are transferred to better performing hospitals.
- Do current health care provider communities correspond to the standard measures in the field?
- How have recent policy changes around vertical integration of hospitals and physicians affected physician network cohesion?

Thank You!