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Analyzing the Distribution of Cardiac Rehabilitation Programs in the United States Using Geographical Information Systems (GIS)

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Introduction

• Heart Disease is the main cause of mortality in the United States.
  • Myocardial infarctions (MIs) or heart attacks occur every 43 seconds in the US.

• Each year:
  • 610,000 deaths due to heart disease, of which 370,000 are attributed to CHD
  • Of 735,000 heart attacks
    • 525,000 (are first heart attacks)
    • 210,000 (already had one heart attack)
  • Annual expenditure for CHD is estimated at $177.1 billion

(Centers for Disease Control and Prevention [CDC], 2015; Mozaffarian et al., 2015; American Stroke Association, n.d.)
Heart Attack Death Rates, 2011-2013
Adults, Ages 35+, by County

Figure 1: Map showing the geographical distribution of heart disease prevalence across the United States. Source: Centers for Disease Control and Prevention (CDC)
Cardiac Rehabilitation (CR) Programs

- Professional programs to aid with management of heart diseases, recovery from heart attacks, heart surgeries and heart related procedures.
  - Medical evaluations
  - Education
  - Counseling services
  - Physical activity programs
  - Support and training
- CR programs reduce probability of:
  - All-cause hospital admissions by 25%
  - Using medical resources
  - Mortality by more than 50% in those who participate (American Stroke Association [ASA], n.d.)
Utilization of CR Programs

• Cardiac rehab facilities are unfortunately underutilized.
  • About 80% of should-be users do not use CR programs
  • Utilization is even lower in Medicare beneficiaries
    • Approximately 88% of should-be users are not using CR programs

• Barriers to utilization:
  • Lack of physician referrals or encouragement
  • Limited follow-up after enrollment into CR program
  • Insurance coverage
  • Conflict with work or home responsibilities
  • Scarcity of programs in rural areas
  • Distance to facility from patient’s home
  • Access to public transportation or parking issues
  • Lack of perceived need for rehabilitation
  • Lack of diversity among CR staff in terms of race and gender
  • Language problems and cultural beliefs

(Dunlay et al., 2009; Balady et al., 2011)
Geographic Variation

• According to Suaya et al. (2007):
• The highest CR use rates are clustered in the north central states of the US (Nebraska, Iowa, North and South Dakota, Minnesota, and Wisconsin),
• Shorter distance was an important predictor of CR use.
Geographic Accessibility

- Using Geographical Information Systems (GIS) and network analysis to investigate disparities based on travel time in emergency stroke and MI care in East Tennessee.

- GIS used to identify areas with quality stroke treatment centers (30 identified) within 30 minute and 60 minute drive time in Wisconsin.

- GIS used to understand whether the stroke system in Iowa is providing adequate service to most of its residents, looking at 30 minute drive time to a primary stroke center or a hospital that offers such services.

(Pedigo and Odoi, 2010; Children’s Environmental Health Initiative at the School of Natural Resources and Environment, 2013)
Study Purpose

- To examine the distribution of CR programs in the US and to describe the density of programs per myocardial infarction (MI).

Do patients have access and do programs have capacity?
Methodology

• A cross sectional study

• Combined data:
  • Medicare data of Beneficiaries with MI in 2008
  • Address data from the American Hospital Directory of the 2,551 CR programs across the US and its territories.

• Two Geographical Information Systems (GIS) techniques utilized:
  • Spatial data analysis
  • Density point mapping
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References


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