The Socio-Geography of Heart Failure
Why it Matters

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Morbidty and mortality rates from heart failure are staggering and continue to pose daunting challenges to patients, providers, researchers, and the health care system. As populations age, the increasing burden of cardiovascular disease portends a humbling future, particularly for heart failure. Despite advances in medical care, heart failure prevalence, hospitalizations, and mortality rates have not declined; in 2007, more than 250,000 Americans died of heart failure, and the number of heart failure hospitalizations has tripled from about 1.3 million in 1979 to nearly 4 million in 2004. The burden of heart failure admissions and frequent readmissions are also costly to the health care system. Corresponding to the projected increase in heart failure prevalence, real medical costs for heart failure are projected to increase by ~200% over the next 20 years.

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Reports from the Agency for HealthCare Research and Quality (AHRQ) recognize geographic variation in heart failure hospitalizations. Regional variations have been associated with number of primary care physicians per population, regional income level, and the proportion of Medicare payment. The mere presence of this variation implies that some, maybe even most, heart failure rehospitalizations are avoidable. Potential contributors to admission may include barriers at the system or individual level such as difficulties accessing primary or outpatient medical care services, poor quality of this care when accessed, or lack of patient adherence. However, optimal outpatient care may reduce avoidable hospitalizations and medical expenditures and improve quality of life, suggesting a potential opportunity.

Geography Matters

In this issue of Circulation: Heart Failure, two reports highlight associations of geography with heart failure service utilization and outcomes, along with relationships of geography with socioeconomic and insurance status, as well as burden of comorbidity. Both reports demonstrate that among patients with incident heart failure, geography matters; the mediators of this association of geography with outcomes include comorbid conditions, but the full picture is unclear. Gamble et al measured differences in 1-year mortality and utilization of services among urban and rural Canadians with incident heart failure. Urban residents were older, had more comorbidities, and were more likely to receive specialist care by either a cardiologist or internal medicine specialist in the year before heart failure diagnosis. Although adjusted all-cause mortality between urban and rural dwellers at 1 year was not different, rural men had a higher mortality rate than their urban counterparts, whereas rural women did not. The authors also found striking differences in health care utilization. Urban patients had more office-based physician and specialty care visits, but they had fewer emergency department visits and hospitalizations (both all-cause and cardiovascular-related).

The report by Gamble et al highlights several key points. The authors found that comorbid disease mediated the relationship between location and mortality. Furthermore, there was a significant yet unexplained interaction between sex and location. Is there a causal relationship between location/geography and outcome, or is geography a proxy for other factors, some of which may be modifiable and may confer differences in comorbidity burden? Findings based on geography may also represent systematic differences in the organization of health care and access to services that may be directly related to severity and complexity of disease.

Although the Canadian system offers universal access, previous reports have shown that health insurance alone does not ensure access to care and appropriate services. Some investigators have found improved outcomes in heart failure patients through comanagement by both a generalist and a specialist (cardiologist). It is possible that access to specialist care is limited in rural settings. Moreover, cultural, ethnic, behavioral, and health literacy factors that affect health care access and navigation may differ systematically in rural and urban locations.

The findings of the Gamble et al report lend support to the AHRQ classification of rehospitalization for heart failure as potentially avoidable if optimal outpatient services are delivered. Urban patients were found to have a higher rate of outpatient-based physician office visits, which may offer one explanation for lower rates of emergency department visits and hospitalizations. In the complex relationship between geography and heart failure outcomes, mediators such as comorbidity, sex, and ethnicity are not easily modifiable, but some such as health care utilization may be, providing potential targets for intervention.

In the second report, Foraker et al followed outcomes among heart failure patients in the Atherosclerosis Risk in
Communities (ARIC) Study cohort and examined the association between low neighborhood socioeconomic status (represented by neighborhood median household income), comorbidities, Medicaid status, and risk of early readmission or death. The ARIC Study cohort offers investigators meticulously collected, long-term data, data that is optimal for developing and testing disease prediction models. Impressively, at 1 year, 62% of all patients were either rehospitalized or had died. By the end of follow-up (1987 to 2004), 91% of all patients died or were rehospitalized. Patients living in the poorest neighborhoods had the highest incidence of heart failure admissions, with particularly higher risks of heart failure complications among those with substantial comorbidity. In other words, the combination of living in a poor neighborhood and carrying a heavy burden of comorbidities predicted particularly bad outcomes, with markedly elevated risk for all cause rehospitalization, cardiovascular disease–related hospitalizations, and death.

Notably, irrespective of levels of comorbidity, Medicaid recipients in low-income neighborhoods were at increased risk for all-cause rehospitalization. Furthermore, Medicaid recipients with low levels of comorbidity were at higher risk for all-cause, cardiovascular, and heart failure hospitalizations. Although median neighborhood income serves as a proxy for neighborhood socioeconomic status, Medicaid coverage may be a marker of worse individual socioeconomic status. Thus, the findings for recipients of Medicaid in low-income areas may highlight those individuals with both neighborhood and individual socioeconomic burdens.

Comorbidity was much higher among residents of poorer communities and appeared to be a strong mediator of the relationship between geography/insurance status and adverse outcomes. Although these findings are intriguing, our ability to interpret them is limited. The authors did not adjust for heart failure severity and used only one measure of neighborhood socioeconomic status, namely median income. We do not know how well this one measure correlates with individual socioeconomic status or other neighborhood measures. Additionally, generalizability is limited because ARIC study participants are drawn from only 4 communities.

**Why Does It Matter That Geography Matters?**

Although it is important to focus on classic clinical components of heart failure care, it is at least as important to understand how geography modulates the effectiveness of clinical management. Heart failure is not only a clinical problem; it is also a socio-geographic one. Where a patient lives must be recognized as a potent predictor of outcome. Regardless of whether geography serves as a proxy of other socioeconomic indicators, access to care, or availability of appropriate services, it may be that geographically based approaches are warranted.

We have seen marked improvements in heart failure care, with strong evidence supporting the effectiveness of certain medications, high-technology devices, and procedures, but, equally important, we must garner knowledge on how to reach individual patients in the places where they live and successfully implement these advances. The reports by Gumble et al and Foraker et al are valuable contributions, highlighting the critical importance of geography and comorbidity. Both studies are observational, and it is important to recognize that they are limited in ability to account for many potential cofounders including health literacy, behavior, culture, language, and availability of services at an accessible distance. Additionally, these studies lack clinical details about disease severity and type and class of heart failure. Nonetheless, heart failure patients living in rural or poor neighborhoods have more comorbidity and, even beyond that, have particularly poor clinical outcomes.

Although these studies are not equipped to disentangle the web of geography, socioeconomic status, and access among patients with heart failure, they generate important hypotheses to guide the future direction of clinical trials. We should seriously consider testing specific, community-based interventions, interventions developed to address the socio-geographic complexities of heart failure.

**Disclosures**

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**References**


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