



Assessing the impact of the heart of New Ulm Project on cardiovascular disease risk factors: A population-based program to reduce cardiovascular disease

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ABSTRACT

The Heart of New Ulm Project (HONU), is a population-based project designed to reduce modifiable cardiovascular disease (CVD) risk factors in the rural community of New Ulm, MN. HONU interventions address multiple levels of the social-ecological model. The community is served by one health system, enabling the use of electronic health record (EHR) data for surveillance. The purpose of this study was to assess if trends in CVD risk factors and healthcare utilization differed between a cohort of New Ulm residents age 40–79 and matched controls selected from a similar community, using EHR data from baseline (2008–2009) through three follow up time periods (2010–2011, 2012–2013, 2014–2015). Matching, using covariate balance sparse technique, yielded a sample of 4077 New Ulm residents and 4077 controls. We used mixed effects longitudinal models to examine trends over time between the two groups. Blood pressure, total cholesterol, low-density lipoprotein-cholesterol, and triglycerides showed better management in New Ulm over time compared to the controls. The proportion of residents in New Ulm with controlled blood pressure increased by 6.2 percentage points compared to an increase of 2 points in controls ($p < 0.0001$). As the cohort aged, 10-year ASCVD risk scores increased less in New Ulm (5.1) than the comparison community (5.9). The intervention and control community did not differ with regard to inpatient stays, smoking, or glucose. Findings suggest efficacy for the HONU project interventions for some outcomes.

1. Introduction

Achieving population level improvements in cardiovascular (CVD) health can only happen through prevention strategies that reach beyond the clinical setting. Medical care is estimated to contribute about 10%–20% of health outcomes, while the relative influence of behavioral, social, and environmental factors contribute 60–70% (Health Policy Brief, 2014; DHHS Public Health Service, 1980; McGinnis et al., 2002; Booske et al., 2010). Tobacco, diet, and physical activity are estimated to contribute 36–50% of health outcomes related to CVD (Health Policy Brief, 2014; DHHS Public Health Service, 1980; McGinnis et al., 2002; Booske et al., 2010; McGinnis and Foege, 1993;

Mokdad et al., 2004; Danaei et al., 2009; Eyre et al., 2004). Effective strategies to reduce CVD risk must address the social, environmental, and policy determinants of these risk factors (Health Policy Brief, 2014; Mozaffarian et al., 2015; Mozaffarian et al., 2012; Pearson et al., 2013). The American Heart Association (AHA) guidelines identify the need for community CVD prevention programs to address optimal behaviors through interventions delivered at a variety of community settings including healthcare, worksites, the broader community, and employ a complex set of interventions ranging from educational, organizational, healthcare, policy, and environmental changes (Pearson et al., 2013; Pearson et al., 2003). While there is a recognized priority to incorporate population-level strategies into public health and healthcare efforts to

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promote cardiovascular health, there is limited evidence on their effectiveness (Mozaffarian et al., 2015; Mozaffarian et al., 2012). The need for more robust evaluations of population-level programs is clear (Mozaffarian et al., 2012), but randomized trials of large community-based prevention programs are rarely feasible and rigorous evaluations are generally beyond the limited resources available.

The Heart of New Ulm Project (HONU) is a community-wide CVD prevention project created to help address gaps in population-based prevention strategies (Boucher et al., 2008; VanWormer et al., 2012). Outcomes after five years demonstrated improvement in several CVD risk factors at the population-level compared to no change in a demographically similar subsample from a national population (Sidebottom et al., 2016). The purpose of this study was to apply a more rigorous methodology leveraging available electronic health record (EHR) data to assemble a comparison cohort. Specifically, this study compared trends in CVD risk factors and healthcare utilization between the HONU community and matched controls from a similar rural community without interventions.

2. Methods

2.1. Setting

HONU, initiated in 2009, is a community-based demonstration project aimed at reducing myocardial infarctions (MI) and improving modifiable CVD risk factors in the rural community of New Ulm, MN (Boucher et al., 2008; VanWormer et al., 2012). HONU is a collaborative partnership of Allina Health, the Minneapolis Heart Institute Foundation, and the community of New Ulm. While HONU interventions are open to and may impact, the full community, the priority population is residents of the 56,073 ZIP code age 40–79. This age group was selected as preliminary evaluations indicated they were most likely to experience incident MIs. The target ZIP code has a population of 16,759, with 7855 (47%) residents in the 40–79 year age range (American Fact Finder, 2010). Health insurance levels are high, with an estimated 9% of county residents under age 65 lacking insurance (Community Health Status Indicators, 2015). Healthcare in this community is provided primarily by one health system (Allina Health) that operates the New Ulm Medical Center (NUMC). This proffers the opportunity for near-complete surveillance of health outcomes using a single EHR system. Previous research suggests that EHR data provides a reasonable assessment of the health of the HONU community (Sidebottom et al., 2014).

HONU interventions, described previously (Boucher et al., 2008; VanWormer et al., 2012; Sidebottom et al., 2016; Benson et al., 2013; Sillah et al., 2014; Benson et al., 2017), were designed to address specific CVD risk factors identified as most prevalent in the community at baseline: overweight/obesity, metabolic syndrome, low fruit and vegetable consumption, and medication use among those with elevated risks (VanWormer et al., 2012). The HONU model aligns with evidence-based strategies and AHA guidelines for improving cardiovascular health at the community level by partnering with healthcare organizations, public sector, community organizations, and employers to implement a comprehensive set of interventions addressing behaviors through a variety of settings and intervening at (Mozaffarian et al., 2012; Pearson et al., 2013) all levels of the social-ecological model (McLeroy et al., 1988). Examples include: free health screenings in community and workplace settings, run/walk events, a community-wide weight loss challenge, social marketing, food environment improvements in partnership with local restaurants, grocery stores and the farmer's market; a primary prevention intervention for residents at high risk for heart disease (Benson et al., 2013; Benson et al., 2017), a weight management phone coaching program, worksite partnerships including worksite behavior change programs, and built environment initiatives to improve the ability of residents to bike and walk in the community. HONU promoted existing resources where available (e.g. smoking

cessation programs offered through the state or clinic) rather than duplicating efforts.

2.2. Design

To assess the degree to which improvements previously identified in the New Ulm (NU) community (Sidebottom et al., 2016) were related to the HONU intervention, we compared trends for CVD risk factors and healthcare utilization in a cohort of NU residents and matched controls selected from a similar community in Minnesota served by the same health system.

2.3. Sample

The community that was selected to serve as the comparison for this study is similar to NU as there is a single medical facility owned by Allina Health with both primary care and a hospital; and is the only medical provider in the community. In NU, 12,585 adults (18+) had an active record during the baseline period, which is an estimated 95% of the adult population (13,290), (American Fact Finder, 2010). In the comparison community, representation was 77% (with 8487 adults with a record/10,961 adult residents) (American Fact Finder, 2010). As the medical facilities in both NU and the comparison community are part of the Allina Health system, they use the same electronic health record, laboratories, and same clinical workflow procedures ensuring a level of uniformity of measurement of key parameters and inclusion criteria. The community selected did not have any large scale health prevention initiatives, is 2.5 hours from NU, with independent provider groups (with little potential for communication or cross-over). NU is 98% white and 98% non-Hispanic and the comparison community is 95% white and 99% non-Hispanic (American Fact Finder, 2010).

Extracts of data from the EHR were conducted for baseline (2008–2009) and 3 follow-up time periods: 2010–2011, 2012–2013, and 2014–2015. Individuals were included in the cohort if: 1) they lived in the NU or comparison community zip codes, 2) were 40–79 at baseline, 3) had not opted out of the use of their EHR data for research, and 4) had at least one ambulatory face-to-face visit during baseline with a blood pressure value. Individuals who died during the baseline period were excluded. People who died during any of the follow-up periods contributed data available prior to their death. The use of these data was determined to be exempt by the Allina Health Institutional Review Board.

2.4. Measures

Patient demographics included gender, age, race, Hispanic ethnicity, and marital status. Pre-existing CVD or diabetes was determined using visit ICD codes. CVD risk factors were selected as the last available measure within each time period and were dichotomized into categories of “at goal” or “high-risk” based on relevant guidelines (National Cholesterol Education Program Expert Panel on Detection E, 2002; Chobanian et al., 2003) at the time of the assessment. At-goal levels were defined as: blood pressure (BP) < 140/90 mmHg, total cholesterol (TC) < 200 mg/dL, low density lipoprotein cholesterol (LDL-C) < 130 mg/dL, high density lipoprotein cholesterol (HDL-C) ≥ 40 mg/dL for men/≥ 50 mg/dL for women, triglycerides < 150 mg/dL, fasting blood glucose < 100 mg/dL, body mass index (BMI) ≤ 30 kg/m². Tests for lipids and glucose were fasting. The most recent value for smoking status (current, former, never) was used as long as it was before the end of the extract period in alignment with the clinical workflow for updating this field if there is a change since the previous visit. Medication use (lipid-lowering, anti-hypertensives, or anti-platelet) measures reflected whether an order was present in the record. We calculated 10-year risk for atherosclerotic cardiovascular disease (ASCVD risk) according to the Pooled Cohort Equations calculator (Stone et al., 2013) for each individual with sufficient data within

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