Heart Attacks: Hospitalizations for Heart Attack

Type of EPHT Indicator	Health Outcome
Measures	1. Age-adjusted rate of hospitalization for heart attack among persons 35 and over per 10,000 population 2. Crude rate of hospitalization for heart attack per 10,000 population 3. Number of hospitalizations for heart attack These measures exclude transfers to reduce the possibility of counting the same individual/heart attack event twice. A transfer is defined as a patient who is discharged from one acute care hospital as an inpatient and admitted to another acute care hospital as an inpatient within 24 hours of discharge (i.e., same date of discharge or next day), where both admissions have the same primary discharge diagnosis.
Derivation of Measures	*Numerator*: Resident hospitalizations for AMI, ICD-9-CM: 410.00 — 410.92 for state and by county *Denominator*: Midyear resident population, for state and by county *Adjustment*: Age-adjustment by the direct method to Year 2000 US Standard population
Unit	1. Age-adjusted rate per 10,000 population 2. Rate per 10,000 population 3. Number of Admissions
Geographic Scope	Iowa
Geographic Scale	Residents of jurisdiction — State, County
Time Period	Hospital admissions between January 1 to December 31, inclusive, for each year, 2000—Most Recent Year Available
Time Scale	Annually (as appropriate for the measure)
Rationale	There currently is no single Heart Attack, also known as Acute Myocardial Infarction (AMI), surveillance system in place in the US, nor does this exist for coronary heart disease (CHD) in general. Mortality is the sole descriptor for national data for AMI. Estimates of incidence and prevalence of AMI and CHD are largely based on survey samples (e.g., National Health and Nutrition Examination Survey) or large cohort studies such as the Atherosclerosis Risk in Communities (ARIC) study. In 2007 the American Heart Association estimated 565,000 new attacks and 300,000 recurrent attacks of acute myocardial infarction annually (National Heart, Lung, and Blood Institute: based on unpublished data from the ARIC study and the Cardiovascular Health Study (CHS)). Among Americans age 20 and older, new and recurrent MI prevalence for both men and women represented 3.7% of the US population or 7,900,000 individuals (4.9 million men and 3.0 million women). Corresponding prevalence by race and gender is 5.4% for white males, 2.5% for white females, 3.9% for black males and 3.3% for black females.

	The well documented risk factors for AMI include diabetes, hypertension, obesity, hypercholesterolemia, and cigarette smoking. Increasingly investigators both in the U.S. and abroad have shown significant relationships between air pollutants and increased risk of AMI and other forms of CHD. Studies have often focused on elderly individuals (>65 years). A number of epidemiologic studies have reported associations between air pollution (ozone, PM_{10}, CO, $PM_{2.5}$, $S0_2$) and hospitalizations for AMI and other forms of heart disease. Models have demonstrated increases in AMI hospitalization rate in relation to fine particles ($PM_{2.5}$) particularly in sensitive subpopulations such as the elderly, patients with pre-existing heart disease, especially those who are survivors of AMI or those with COPD. An increase of 10 ug/m^3 in $PM_{2.5}$ levels was associated with a 4.5% elevation in risk of acute ischemic coronary events (unstable angina and AMI) (95% CI, 1.1—8.0). Mortality statistics have been linked for a 16 year period to chronic exposure to multiple air pollutants in 500,000 adults who resided in all 50 states. Each 10 ug/m3 in annual $PM_{2.5}$ was related to a 12% increased mortality risk.
Use of the Measures	The development of a standardized measures method for AMI hospital admissions among residents in each state will inform multiple users at the national, state, and local levels. These measures, and associated indicators, will allow for monitoring of trends over time and have the potential to identify high risk groups not reflected in current national data. These data may also inform prevention, evaluation and program planning efforts. These measures will address the following surveillance functions: • Examination of time trends in AMI hospitalizations. • Identification of seasonal trends. • Assessment of geographic differences in hospitalizations. • Evaluation of differences in AMI hospitalizations by age, gender, and race/ethnicity. • Determination of populations in need of targeted interventions. • Identification of possible environmental relationships warranting further investigation or environmental public health action, when AMI data are linked with environmental variables.
Limitations of the Measures	• Hospitalization data for AMIs omits individuals who do not receive medical care or who are not hospitalized, including those who die in emergency rooms, in nursing homes, or at home without being admitted to a hospital, and those treated in outpatient settings. • Differences in rates by time or area may reflect differences or changes in diagnostic techniques and criteria and in the coding of AMI or in medical care access. • Differences in rates by area may be due to different socio-demographic characteristics and associated behaviors. • When comparing rates across geographic areas, a variety of non-environmental factors, such as access to medical care and diet, can impact the likelihood of persons hospitalized for AMI. • Reporting rates at the state and/or county level will not show

	the true AMI burden at a more local level (i.e. neighborhood). • Reporting rates at the state and/or county level will not be geographically resolved enough to be linked with many types of environmental data. • When looking at small geographic levels (e.g. ZIP code), users must take into consideration appropriate cell suppression rules imposed by the data providers or individual state programs. • Although duplicate records and transfers from one hospital to another are excluded, the measures are based upon events, not individuals, because no unique identifier is always available. When multiple admissions are not identified, the true prevalence will be overestimated. • Even at the county level it can be expected that the measures generated will often be based upon numbers too small to report or present without violating state and federal privacy guidelines and regulations. Careful adherence to cell suppression rules in cross tabulations is necessary and methods to increase cell sizes by combining data across time (e.g., months, years) and geographic areas may be appropriate.
Data Sources	*Numerator*: State inpatient hospitalization data (using admission date) *Denominator*: US Census Bureau population data
Limitations of the Data Source	<u>State hospital discharge data:</u> • Using a measure of all AMI hospitalizations will include some transfers between hospitals for the same individual for the same AMI event. Variations in the percentage of transfers or readmissions for the same AMI event may vary by geographic area and impact rates. • Without reciprocal reporting agreements with abutting states, statewide measures and measures for geographic areas (e.g., counties) bordering other states may be underestimated because of health care utilization patterns. • Each state must individually obtain permission to access and, in some states, provide payment to obtain the data. • Veterans Affairs, Indian Health Services and institutionalized (prison) populations are not usually included in hospitalization datasets. • Practice patterns and payment mechanisms may affect diagnostic coding and decisions by health care providers to hospitalize patients. • Street address is currently not available in many states. • Sometimes mailing address of patient is listed as the residence address of the patient. • Patients may be exposed to environmental triggers in multiple locations, but hospital discharge geographic information is limited to residence. • Since the data captures hospital discharges (rather than admissions), patients admitted toward the end of the year and discharged the following year will be omitted from the current year dataset.

	• Data will need to be de-duplicated (i.e., remove duplicate records for the same event). • There is usually a two year lag period before data are available from the data owner. <u>Census data:</u> • Only available every 10 years, thus postcensal estimates are needed when calculating rates for years following the census year.
Related Indicators	• Annual average ambient concentration of $PM_{2.5}$ in microgram per cubic meter • Number of days with maximum 8-hour average ozone concentration over the National Ambient Air Quality standard • Number of person-days with maximum 8-hour average ozone concentration over the National Ambient Air Quality standard • Number of person-days with $PM_{2.5}$ levels over the National Ambient Air Quality standard • Percent days with $PM_{2.5}$ levels over the National Ambient Air Quality standard
References	1. Rosamond, W., et al., Heart disease and stroke statistics--2007 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Circulation, 2007. 115(5): p. e69–171. 2. Boland, L.L., et al., Occurrence of unrecognized myocardial infarction in subjects aged 45 to 65 years (the ARIC study). Am J Cardiol, 2002. 90(9): p. 927–31. 3. Thom, T., et al., Cardiovascular disease in the United States and preventive approaches, in Hurst's The Heart, Arteries and Veins, V. Fuster, R. Alexander, and R. O'Rourke, Editors. 2001, McGraw-Hill: New York, NY. 4. Jones, D.W., et al., Risk factors for coronary heart disease in African Americans: the atherosclerosis risk in communities study, 1987–1997. Arch Intern Med, 2002. 162(22): p. 2565–71. 5. Kannel, W.B., et al., Menopause and risk of cardiovascular disease: the Framingham study. Ann Intern Med, 1976. 85(4): p. 447–52. 6. Pope, C.A., 3rd, et al., Cardiovascular mortality and long-term exposure to particulate air pollution: epidemiological evidence of general pathophysiological pathways of disease. Circulation, 2004. 109(1): p. 71–7. 7. Vermylen, J., et al., Ambient air pollution and acute myocardial infarction. J Thromb Haemost, 2005. 3(9): p. 1955–61. 8. Pope, C.A., 3rd, et al., Ischemic heart disease events triggered by short-term exposure to fine particulate air pollution. Circulation, 2006. 114(23): p. 2443–8 9. von Klot, S., et al., Ambient air pollution is associated with increased risk of hospital cardiac readmissions of myocardial infarction survivors in five European cities. Circulation, 2005. 112(20): p. 3073–9.