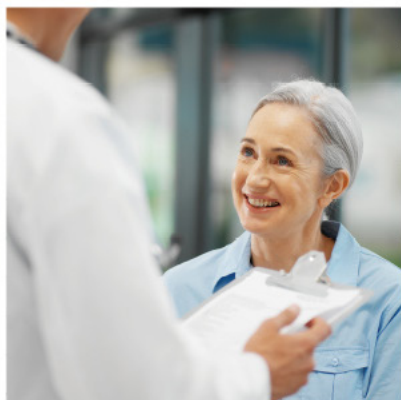




Million Hearts®: Meaningful Progress 2012–2016



A Final Report

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Million Hearts®: Meaningful Progress 2012–2016

A Final Report

Million Hearts®, a U.S. Department of Health and Human Services initiative co-led by the Centers for Disease Control and Prevention (CDC) and the Centers for Medicare & Medicaid Services (CMS), aimed to prevent 1 million heart attacks and strokes in the United States over the course of 5 years.

During the first 2 years of the initiative, about 115,000 cardiovascular events were prevented, relative to the expected number of events if 2011 rates had remained stable.¹ Although final numbers will not be available until 2019, we estimate that up to half a million events may have been prevented from 2012 through 2016. (For details about the

methods used to determine the number of events prevented, see **Appendix A.**)

Working alongside 120 official partners, 20 federal agencies, and all 50 states and the District of Columbia, Million Hearts® aligned efforts across the country to prevent cardiovascular disease (CVD) using a select set of evidence-based public health and clinical strategies. A focus on the “ABCS” (**A**spirin when appropriate, **B**lood pressure control, **C**holesterol management, and **S**moking cessation) provided direction for clinical quality improvement, and community approaches were taken to eliminate artificial trans fat intake and reduce sodium intake and smoking.

Keeping People Healthy

Million Hearts® supported activities and policies that resulted in healthier habits and environments for people across the nation.

- **Reduce Smoking:** 7 million fewer people smoked cigarettes in 2015 than in 2011.² Quitting smoking immediately reduced their risk for a heart attack or stroke.³
- **Reduce Sodium Intake:** Draft guidance to the food industry for voluntarily reducing sodium in processed and commercially prepared food was issued in June 2016.⁴ This important step is intended to help Americans gradually reduce their sodium intake to the recommended level of less than 2,300 mg per day, which will improve their blood pressure.
- **Eliminate Trans Fat Intake:** Partially hydrogenated oils will be removed from the food supply by 2018. This action is expected to prevent thousands of fatal heart attacks every year.⁵

Keeping People Healthy

Reduce smoking



Reduce sodium intake



Eliminate trans fat intake



Optimizing Care

Million Hearts® mobilized health care systems to deliver high-value care for people who have or are at risk for CVD.

- **Focus on the ABCS:** Embedding ABCS clinical quality measures in national reporting and performance programs means that millions of Americans are now served by health care systems that are recognizing or rewarding performance in the ABCS.^{6,7}
- **Health Tools and Technology:** CMS Electronic Health Record (EHR) Incentive Programs rewarded health care practices for achieving meaningful use of EHRs. Use of EHRs for outpatient care increased from 34% in 2011 to 87% in 2015.⁸ Health information technology has helped identify more than half a million people who may have hypertension.⁹
- **Innovations in Care Delivery:** Health care systems have been able to use millions of dollars in public and private funds to improve performance on the ABCS.^{10,11,12}

Optimizing Care

Focus on the ABCS



Use health tools and technology



Innovate in care delivery



Progress and Projections in Measures That Matter

A focus on the ABCS has generated slow but steady improvement nationally in aspirin use, blood pressure control, and statin use among people who are eligible based on current guidelines. Impressive reductions in tobacco use mean that millions of people have improved their health and millions more are protected from secondhand smoke.¹³ Although daily sodium intake has not dropped significantly in the past 5 years, widespread implementation of healthy food purchasing policies and voluntary industry adoption of recommendations for lower sodium food choices are expected to help all Americans eat healthier in the years ahead.

Results of progress in the ABCS and sodium intake through 2016 and final numbers of cardiovascular events prevented during the first phase of Million Hearts® will be available in 2019. **Appendix B** details known and projected progress for all of these indicators.

Future Opportunities

Although much has been accomplished,¹⁴ CVD remains the nation's number one killer, and high rates of obesity and diabetes threaten to undo the progress of the past few decades. Particularly disturbing is the number of CVD events occurring now in people under the age of 65. Communities and their health care systems have continuing work to do in keeping people healthy and free from heart attack and stroke.

The next phase of Million Hearts® (<https://millionhearts.hhs.gov/files/MH-Framework.pdf>)

Select Programmatic Achievements

Million Hearts® Hypertension Control Challenge

This annual competition recognizes practices, clinicians, and health systems that have achieved blood pressure control rates at or above 70%. Fifty-nine doctors, health care practices, and health systems serving more than 13.8 million patients have been recognized.

Million Hearts® Cardiovascular Disease Risk Reduction Model

A total of 516 organizations from 47 states, the District of Columbia, and Puerto Rico will test the impact of financial incentives on the identification and management of risk for CVD to prevent first-time heart attacks and strokes among eligible Medicare beneficiaries.

is committed to preventing 1 million cardiovascular events in the next 5 years. Million Hearts® 2022 will continue focusing on improving the ABCS and participation in cardiac rehabilitation as well as reducing tobacco use and sodium intake. New in Million Hearts® 2022 are efforts to increase physical activity and a specific focus on highly affected populations. The collective power of committed partners is needed now more than ever to achieve better cardiovascular health for all Americans.

For more information about Million Hearts®, visit <https://millionhearts.hhs.gov>.

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Appendix A. Methodology Used to Project the Number of CVD Events Prevented by the Million Hearts® Initiative Through 2016¹

Million Hearts® is using three datasets to track progress toward meeting the goal of preventing 1 million heart attacks, strokes, and related CVD events by 2017. The Nationwide Emergency Department Sample (NEDS), supported by the Agency for Healthcare Research and Quality's (AHRQ's) Healthcare Cost and Utilization Project (HCUP), collects data on emergency department encounters for CVD. HCUP's National Inpatient Sample (NIS) collects data on CVD hospitalizations. CDC's National Vital Statistics System (NVSS) collects data on CVD deaths.

At this time, complete data from all three systems are available only through 2013. Therefore, using the best information available, we attempted to project event rates through 2016, when the first phase of Million Hearts® ended. We used the most current available data from each dataset (NEDS: 2012–2013; NIS: 2012–2014; NVSS: 2012–2014), projected hospitalization data from AHRQ, and analyses of recent rate trends (i.e., from 2011 onward) within the NEDS and NVSS datasets to project the overall event rates through 2016. We then compared these projected rates with our baseline expected rates (see definition below) to estimate the number of events potentially prevented during the entire initiative (2012–2016).

Using this methodology, we predict that Million Hearts® may have prevented up to half a million events in its first 5-year phase. More detailed information about the methodology used is provided below.

Detailed Description of Methodology

- Stable and previous trend baselines were established.
- *Stable baselines* assumed that no change in event rates would occur during Million Hearts® and were established by holding sex- and age-specific 2011 rates constant through 2016.
- *Previous trend baselines* assumed rate trends observed during 2006–2011 would continue during Million Hearts® (2012–2016).
- Using the most current available data (NEDS: 2012–2013; NIS: 2012–2014; NVSS: 2012–2014), we developed new projections through 2016.
- Within NEDS and NVSS, the mean annual percent change (APC) in the sex- and age-specific rates was calculated using available data from 2011 onward (representing change during the initiative).
 - The mean APCs and their standard deviations were used to generate 1,000 simulated random variables with a normal distribution, which were then applied to 2013 NEDS and 2014 NVSS rates to project rates through 2016.
- AHRQ used data from the State Inpatient Databases, which included data as current as 2015, to estimate 2015 hospitalization rates and project 2016 hospitalization rates. The trends in these annual rates (relative percent change) were then applied to the 2014 NIS rates to project the 2015 and 2016 NIS rates.
- The projected rates generated from the three primary data systems were then applied to U.S. Census estimates through 2016 to determine the number of expected events.
- The baseline event totals (both stable and previous trend) were then subtracted from the observed and newly projected expected event totals to describe the number of events potentially prevented through 2016.

Appendix B. Progress on the Million Hearts® Intermediate Indicators

In addition to measuring progress using longer-term CVD event data (see Appendix A), Million Hearts® is measuring improvements in the intermediate indicators of aspirin use when appropriate, blood pressure control, cholesterol management, combustible tobacco use, and daily sodium intake.

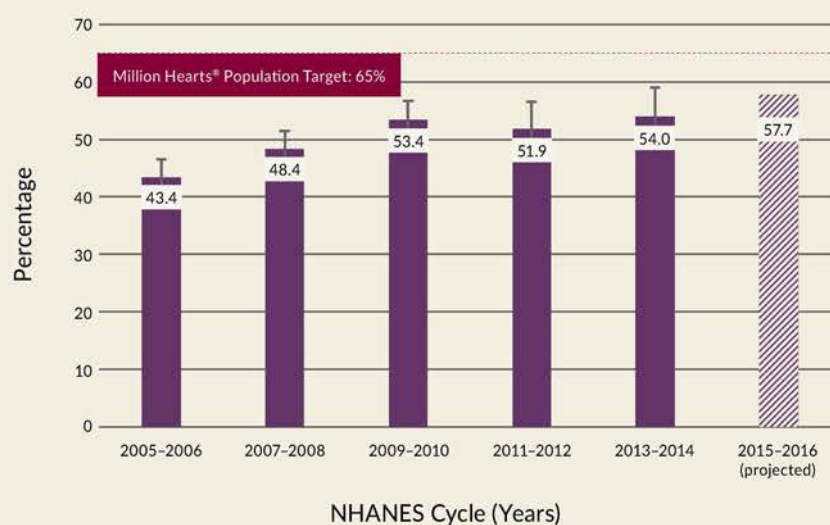
Aspirin When Appropriate

- Data on aspirin use are from the National Health and Nutrition Examination Survey (NHANES) and represent the self-reported use of aspirin among adults aged 40 years or older with a history of CVD. These data were not available before 2011–2012.
- In 2011–2012, aspirin use among adults aged 40 years or older with CVD was 81.1%.
- There is need for improvement in some populations (e.g., non-Hispanic blacks: 70.4%; Hispanics: 65.4%; people aged 40–64 years: 71.3%).
- Actual 2013–2014 aspirin data will be available in 2017; actual 2015–2016 data will be available in summer 2018.

Blood Pressure Control

- Blood pressure control among adults aged 18 years or older with hypertension is monitored using NHANES, which measures population-level control. NHANES participants include people who are not currently receiving medical care.
- The Million Hearts® population-level target for blood pressure control is 65%. The target for clinical settings is 70%.
- Blood pressure control has been improving slowly since at least 2005; it is projected to increase from 53.4% in 2009–2010 (Million Hearts® baseline) to 57.7% in 2015–2016 (see **Figure 1**).
- Pockets of improvement to at least 70% have been demonstrated across diverse clinical settings (e.g., more than 220 Federally Qualified Health Centers, 59 Million Hearts® Hypertension Control Champions, Kaiser Permanente, the American Medical Group Association Foundation's Anceta Collaborative, large medical groups reporting via the CMS Group Practice Reporting Option).
- Actual 2015–2016 data will be available in fall 2017.

Figure 1. Prevalence of blood pressure control among adults (≥18 years) with hypertension, NHANES, 2005–2016



NHANES = National Health and Nutrition Examination Survey

Cholesterol Management

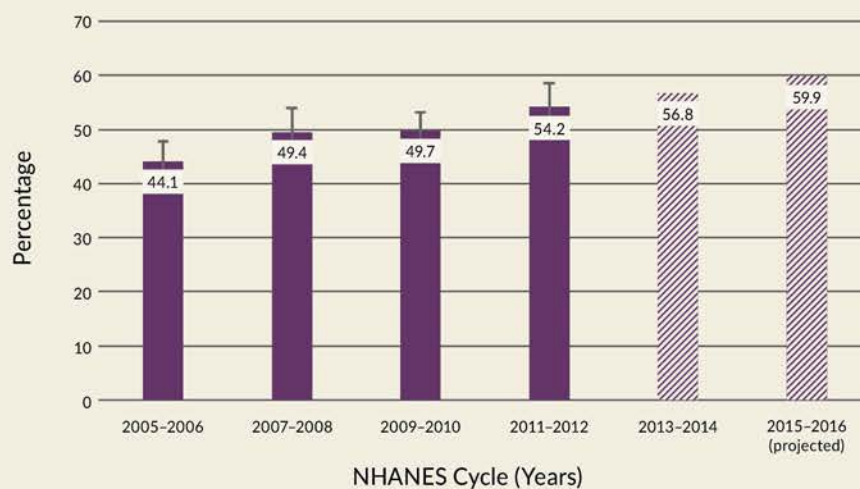
- In 2013, the American College of Cardiology (ACC) and the American Heart Association (AHA) released new clinical guidelines on the treatment of blood cholesterol to reduce atherosclerotic CVD (ASCVD) risk in adults.
- The new guidelines no longer focus on achieving specific low-density lipoprotein (LDL) targets but rather call for statin use in (1) adults with clinical ASCVD, (2) adults with LDL ≥ 190 mg/dL, (3) adults aged 40–75 years with type 1 or 2 diabetes, and (4) adults aged 40–75 years with an estimated 10-year ASCVD risk of at least 7.5%.
- Clinical quality measures using LDL targets that were chosen from the CMS Physician Quality Reporting System (PQRS) and the National Quality Forum (NQF) at the beginning of Million Hearts® (PQRS 316, NQF 0064, and NQF 0075) and analogous surveillance measures have become irrelevant. A federal workgroup drafted a new “Statin Therapy for the Prevention and

Treatment of Cardiovascular Disease” measure (PQRS 438). This measure assesses statin use among the first three of the four risk groups from the 2013 guidelines and is available in the 2016 PQRS through registry and claims reporting. It will be available in 2018 for electronic health record reporting. PQRS 438 measure specifications are available at

http://www.mdinteractive.com/files/uploaded/file/CMS2016/2016_PQRS_Measure_438_11_17_2015.pdf.

- New analyses reflecting statin use among all four groups of now eligible people, using 2005–2012 NHANES data, show that statin use has been steadily on the rise since at least 2005–2006 (see **Figure 2**).
- Actual 2013–2014 NHANES data will be available in 2017; actual 2015–2016 data will be available in the summer of 2018.

Figure 2. Prevalence of statin use among adults (≥ 21 years) for whom statin therapy is recommended, NHANES, 2005–2016



NHANES = National Health and Nutrition Examination Survey

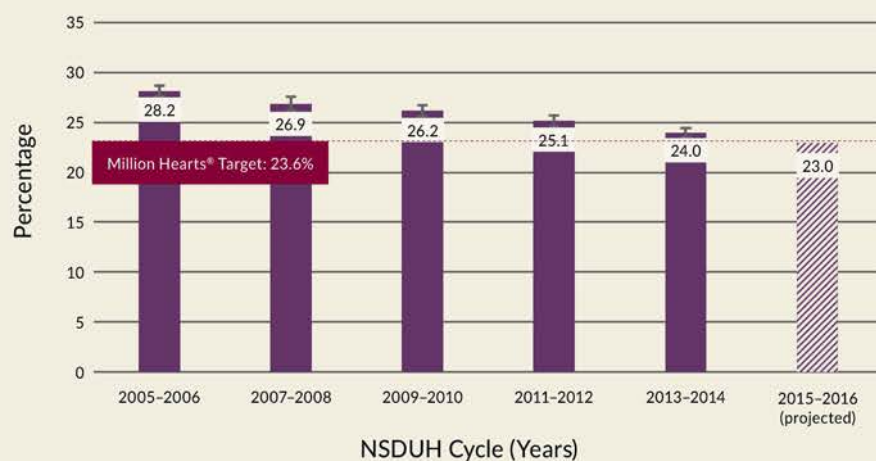
Smoking Prevalence—Combustible Tobacco

- The use of combustible tobacco products, including cigarettes, cigars, and pipes, is monitored in the Substance Abuse and Mental Health Services Administration's (SAMHSA's) National Survey on Drug Use and Health (NSDUH).
- Combustible tobacco use has been declining since at least 2005–2006 and is projected to surpass the Million Hearts® target of 23.6% by 2017 (see **Figure 3**).
- Actual 2015–2016 data are expected in late 2017 or early 2018.

Sodium Intake

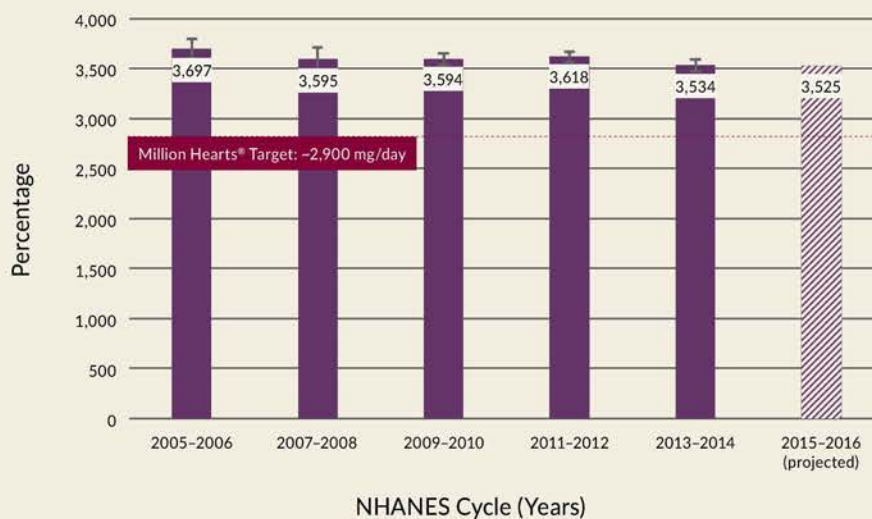
- Mean sodium intake (mg/day) among adults aged 18 years or older is estimated using NHANES dietary intake data.
- Mean daily sodium intake has decreased slightly since 2005, but during Million Hearts®, the values have leveled off (see **Figure 4**). In 2011–2012, mean daily sodium intake was highest among adults aged 18–44 years (3,907 mg/day) and men (4,255 mg/day). The Million Hearts® target is a 20% reduction from the 2009–2010 mean daily sodium intake (~2,900 mg/day).
- Actual 2015–2016 data will be available in summer 2018.

Figure 3. Prevalence of current combustible tobacco use among adults (≥18 years), NSDUH, 2005–2016



NSDUH = National Survey on Drug Use and Health

Figure 4. Mean sodium intake (mg/day) among adults (≥18 years), NHANES, 2005–2016



NHANES = National Health and Nutrition Examination Survey

Projection Methods

Provisional estimates were generated for future cycles through 2015–2016 (“projections”) based on the assumption that the observed trends from 2005–2006 forward were strictly and monotonically linear for all measures except blood pressure control. For statin use, combustible tobacco use, and sodium intake, we used univariate linear regression models to predict the observed prevalence or mean (dependent variable) by the cycles (independent continuous variable). We then applied the intercept and slope terms from these models to extrapolate the predicted prevalence or mean for the future cycle(s). For blood pressure control, because there were changes in the trend observed in 2009–2010 and 2011–2012, we used the slope from 2011–2012 to 2013–2014 to project the future cycle. This is a simplified approach, and results should be interpreted with caution.

We performed all analyses in SAS (version 9.4), SAS-callable SUDAAN (version 11), and Joinpoint (version 4.3.1); incorporated sampling weights; and accounted for the complex survey designs.

Measure Details

Aspirin When Appropriate

Data Source: NHANES

This measure includes adults aged 40 years or older with a history of CVD, defined by an answer of “yes” to any of the following questions: “Has a doctor or other health professional ever told you that you had angina, also called angina pectoris?”; “Has a doctor or other health professional ever told you that you had coronary heart disease?”; “Has a doctor or other health professional ever told you that you had a heart attack (also called myocardial infarction)?”; or “Has a doctor or other health professional ever told you that you had a stroke?”

Aspirin use was defined as any of the following: (1) an answer of “yes” to the question “Doctors and other health care providers sometimes recommend that you take a low-dose aspirin each day to prevent heart attacks, strokes, or cancer. Have you ever been told to do this?” and an answer of “yes” or “sometimes” to the question “Are you now following this advice?”; (2) an answer of “yes” to the question “On your own, are you now taking a low-dose

aspirin each day to prevent heart attacks, strokes, or cancer?"; or (3) aspirin or antiplatelets identified in the Rx medication data files. Participants who reported taking an anticoagulant (as identified in the Rx medication files) but not taking aspirin or antiplatelets were excluded.

Blood Pressure Control

Data Source: NHANES

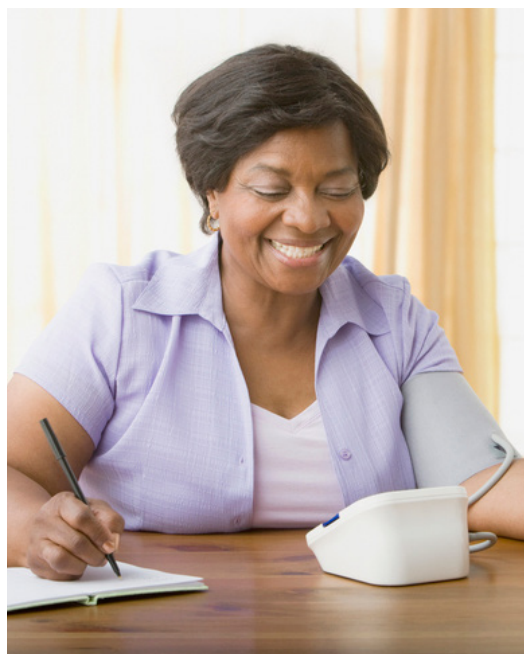
This measure includes non-pregnant adults aged 18 years or older. Blood pressure control is defined as an average systolic blood pressure less than 140 mm Hg and an average diastolic blood pressure less than 90 mm Hg; it is calculated among adults with hypertension, which is defined as an average systolic blood pressure of 140 mm Hg or higher, an average diastolic blood pressure of 90 mm Hg or higher, or self-reported current use of blood pressure-lowering medication. Current use of blood pressure-lowering medication is defined as an answer of "yes" to the following questions: "Because of your high blood pressure/hypertension, have you ever been told to take prescribed medicine?" and "Are you currently taking medication to lower your blood pressure?"

Cholesterol Management

Data Source: NHANES

This measure includes non-pregnant fasting adults aged 21 years or older for whom a statin is recommended (see Groups 1–5 below) based on their risk for ASCVD, as defined in the 2013 ACC and AHA guidelines.* Current statin use (HMG-CoA reductase inhibitors) is defined via the prescription medication data files.

Group 1 includes those with clinical ASCVD. Moderate-intensity statin therapy is recommended for adults older than 75 years; high-intensity statin therapy is recommended for adults aged 21–75 years. Clinical ASCVD is defined by self-report of any of the following conditions: (1) stable or unstable



angina, based on an answer of "yes" to the question "Has a doctor or other health professional ever told you that you had angina, also called angina pectoris?" or on responses to the Rose questionnaire criteria (https://wwwn.cdc.gov/NCHS/Nhanes/2011-2012/CDQ_G.htm); (2) coronary heart disease, based on an answer of "yes" to the question "Has a doctor or other health professional ever told you that you had coronary heart disease?"; (3) acute myocardial infarction, based on an answer of "yes" to the question "Has a doctor or other health professional ever told you that you had a heart attack (also called myocardial infarction)?"; or (4) stroke, based on an answer of "yes" to the question "Has a doctor or other health professional ever told you that you had a stroke?"

Group 2 includes adults aged 40–75 years with fasting LDL cholesterol of 190 mg/dL or higher, with no clinical ASCVD (as defined above). High-intensity statin therapy is recommended.

* Stone NJ, Robinson J, Lichtenstein AH, Bairey Merz CN, Blum CB, Eckel RH, et al. 2013 ACC/AHA guideline on the treatment of blood cholesterol to reduce atherosclerotic cardiovascular risk in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation*. 2014;129(25 Suppl 2):S1–45. Available from: http://circ.ahajournals.org/content/129/25_suppl_2/S1.

Group 3 includes adults aged 40–75 years with diabetes, with no clinical ASCVD, and with fasting LDL cholesterol of 70–189 mg/dL. Moderate-intensity statin therapy is recommended for those with a 10-year risk for ASCVD less than 7.5%; high-intensity statin therapy is recommended for those with a 10-year risk for ASCVD of 7.5% or higher. Diabetes includes diagnosed and undiagnosed diabetes. Diagnosed diabetes is defined as an answer of “yes” to the question “Other than during pregnancy, have you ever been told by a doctor or health professional that you have diabetes or sugar diabetes?” or an answer of “yes” to the questions “Are you now taking insulin?” or “Are you now taking diabetic pills to lower your blood sugar?” Undiagnosed diabetes is defined as a fasting plasma glucose of 126 mg/dL or higher or an HbA1c of 6.5% or higher. ASCVD risk score is calculated based on the equations published by Goff and colleagues.[†]

Group 4 includes adults aged 40–75 years with ASCVD risk of 7.5% or higher, with no clinical ASCVD or diabetes, and with fasting LDL cholesterol of 70–189 mg/dL. Moderate- to high-intensity statin therapy is recommended.

Group 5 includes adults who do not meet any of the statin therapy recommendation criteria but are currently taking a statin to manage their cholesterol.

Smoking Prevalence

Data Source: NSDUH

This measure includes current use of combustible tobacco products, including cigarettes, cigars, or pipes, among adults aged 18 years or older. Current cigarette smoking is defined as an answer of “yes” to the question “Have you smoked at least 100 cigarettes in your entire life?” and an answer of “within the past 30 days” to the question “How long has it been since you last smoked part or all of a cigarette?” Current cigar smoking is defined as an answer of “within the past 30 days” to the question “How long has it been since you last smoked part or all of any type of cigar?” Current pipe smoking is defined as an answer of “yes” to the question “During the past 30 days, have you smoked tobacco in a pipe, even once?”

Sodium Intake

Data Source: NHANES

This measure includes adults aged 18 years or older with a complete and reliable first-day 24-hour dietary recall (collected in person at the mobile examination center). Sodium values are not adjusted for salt added during food preparation or at the table.

[†] Goff DC Jr, Lloyd-Jones DM, Bennett G, Coady S, D’Agostino RB, Gibbons R, et al. 2013 ACC/AHA guideline on the assessment of cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation*. 2014;129(25 Suppl 2):S49–73. Available from: http://circ.ahajournals.org/content/129/25_suppl_2/S49.



May 2017



Million Hearts®: 2012–2016 Final Report Addendum

Significant Impact; Significant Opportunity

Authors: Matthew D. Ritchey, Hilary K. Wall, Judy Hannan, Laurence S. Sperling

This addendum serves as an update to the final report, **“Million Hearts®: Meaningful Progress 2012–2016.”** It provides final estimates for the number of heart attacks, strokes, and related acute cardiovascular events prevented during the initial 5-year period (2012–2016) of the Million Hearts® initiative.

A methodology was developed at the beginning of the initiative to monitor trends in both non-fatal and fatal cardiovascular events that are potentially preventable by the community and clinical interventions recommended by Million Hearts®.¹ This methodology combined findings from three datasets to track progress toward meeting the goal of preventing 1 million acute cardiovascular events in 5 years. The Nationwide Emergency Department Sample (NEDS), supported by the

Agency for Healthcare Research and Quality’s (AHRQ) Healthcare Cost and Utilization Project (HCUP), collects data on emergency department encounters related to cardiovascular disease (CVD). HCUP’s National Inpatient Sample (NIS) collects data on CVD hospitalizations. CDC’s National Vital Statistics System (NVSS) collects data on CVD deaths. At the time of publication of the final report, complete data from all three systems were available only through 2013, so a methodology to calculate projected event rates and estimates of events prevented through 2016 was used (for details about the methodology used, please see Appendix A in the original report). At that time, using the available data, we estimated that up to 500,000 events may have been prevented from 2012 through 2016.

Complete data from all three sources became available in 2019. **Figure 1** describes the trends in overall Million Hearts® event rates (i.e., a combination of mutually exclusive treat-and-release emergency department encounters, non-elective hospitalizations, and deaths) by sex and age group prior to the

initiative (2006–2011) and during the initiative (2012–2016). Comparing these event rates to those observed during 2011 (serves as a baseline) indicates that approximately 135,000 events (95% confidence interval: 32,000 excess events to 302,000 events prevented; non-significant

Figure 1. Million Hearts® cardiovascular disease† event rates, by age group‡ and sex—United States, 2006–2016¶



Data Sources: AHRQ's Healthcare Cost and Utilization Project's Nationwide Emergency Department Sample, Nationwide Inpatient Sample, and National Inpatient Sample; Centers for Disease Control and Prevention's National Vital Statistics System Mortality Multiple Cause of Death Files.

† Includes mutually exclusive non-fatal and fatal events related to acute myocardial infarction, stroke, symptomatic precursor conditions (e.g., stable angina pectoris), and other cardiovascular disease conditions (e.g., heart failure).¹

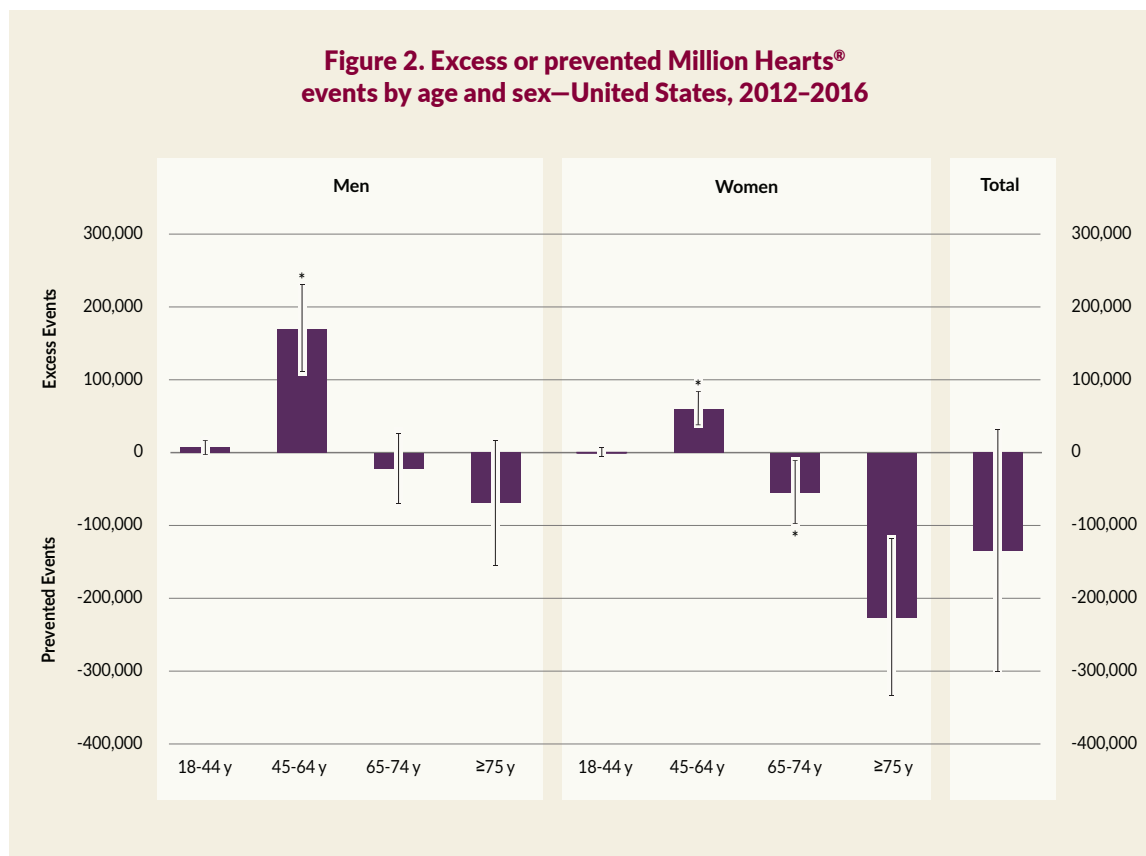
‡ Overall rates are standardized by age to the 2010 US Standard Population.

¶ Rates during 2006–2011 occurred prior to the initiative; rates during 2012–2016 occurred during the initiative.

with $P \geq .05$) were prevented during the initial 5-year phase of Million Hearts® (Figure 2). The final calculated events prevented are lower than the aspirational goal of 1 million and the interim projection of up to 500,000 events prevented. A considerable number of events were prevented among adults aged 75 years or older, especially

among women (reduction of 226,000 events [95% confidence interval: 118,000 to 335,000 events prevented]). However, these gains were offset by excess events observed among many of the younger age groups, especially among men aged 45–64 years (excess of 170,000 events [95% confidence interval: 110,000 to 230,000 excess events]).

Figure 2. Excess or prevented Million Hearts® events by age and sex—United States, 2012–2016



Data Sources: AHRQ's Healthcare Cost and Utilization Project's Nationwide Emergency Department Sample, Nationwide Inpatient Sample, and National Inpatient Sample; Centers for Disease Control and Prevention's National Vital Statistics System Mortality Multiple Cause of Death Files.

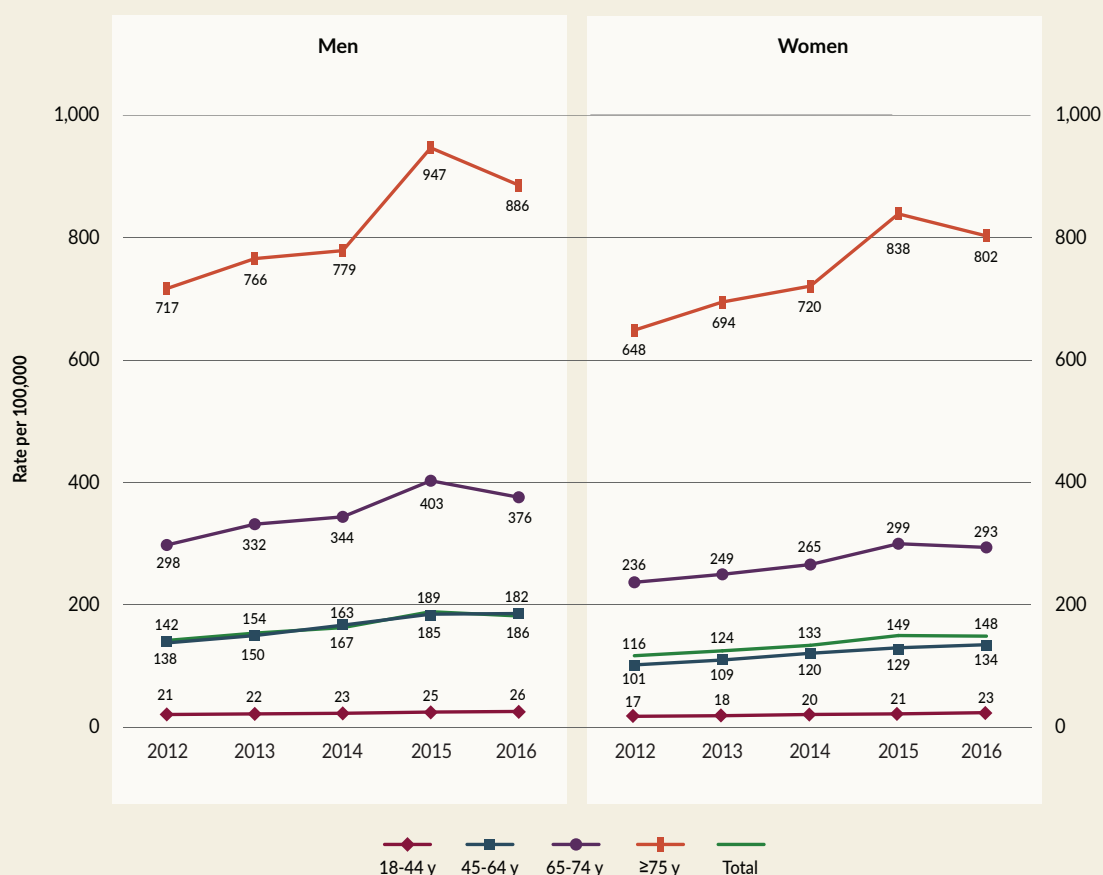
Determined by combining the observed event totals from 2012–2016 and subtracting the expected number of events calculated by multiplying the 2011 modeled sex- and age-specific rates and multiplying those rates by the US Census mid-year population estimates for 2012–2016, respectively.

* Statistically significantly different than 0 (z-score $\geq |1.96|$).

During the 5-year period, the age-standardized, treat-and-release emergency department visit rates increased by 28% among both men and women; the hospitalization rate decreased by 5% among women

and remained stable among men; and the overall mortality rate remained relatively stable among both sexes (Figures 3, 4, and 5).

Figure 3. Million Hearts® emergency department[§] event rates,[‡] by age group and sex—United States, 2012–2016

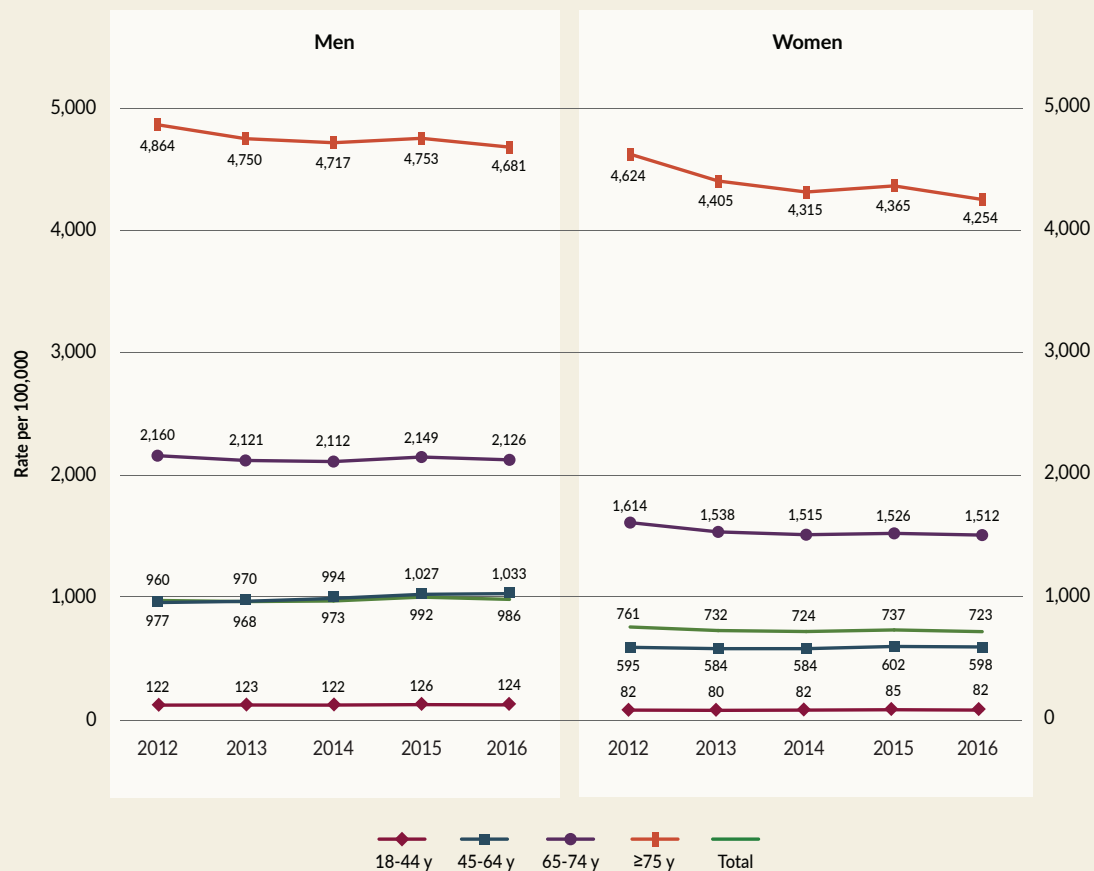


Data Sources: AHRQ's Healthcare Cost and Utilization Project's Nationwide Emergency Department Sample, Nationwide Inpatient Sample, and National Inpatient Sample; Centers for Disease Control and Prevention's National Vital Statistics System Mortality Multiple Cause of Death Files.

[§] Reflective of treat-and-release emergency department visits; events where the patients died in the emergency department, were transferred to another hospital, or were admitted to the same hospital were excluded.

[‡] Overall rates are standardized by age to the 2010 US Standard Population.

Figure 4. Hospitalization^{†||} event rates,[‡] by age group and sex—United States, 2012–2016



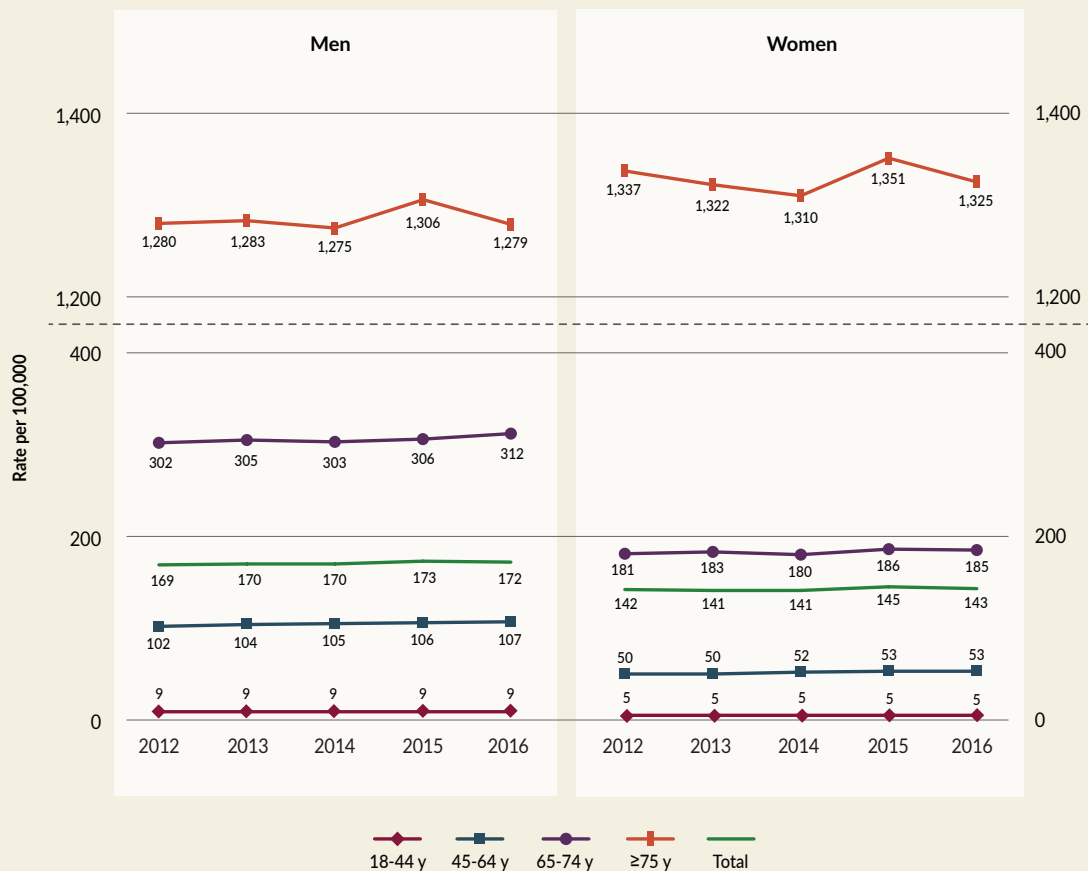
Data Sources: AHRQ's Healthcare Cost and Utilization Project's Nationwide Emergency Department Sample, Nationwide Inpatient Sample, and National Inpatient Sample; Centers for Disease Control and Prevention's National Vital Statistics System Mortality Multiple Cause of Death Files.

[†] Includes mutually exclusive non-fatal and fatal events related to acute myocardial infarction, stroke, symptomatic precursor conditions (e.g., stable angina pectoris), and other cardiovascular disease conditions (e.g., heart failure).¹

^{||} Excludes hospitalization events which were reported as elective or where the patient died in the hospital or was transferred to another hospital.

[‡] Overall rates are standardized by age to the 2010 US Standard Population.

Figure 5. Death# event rates,[‡] by age group and sex—United States, 2012–2016



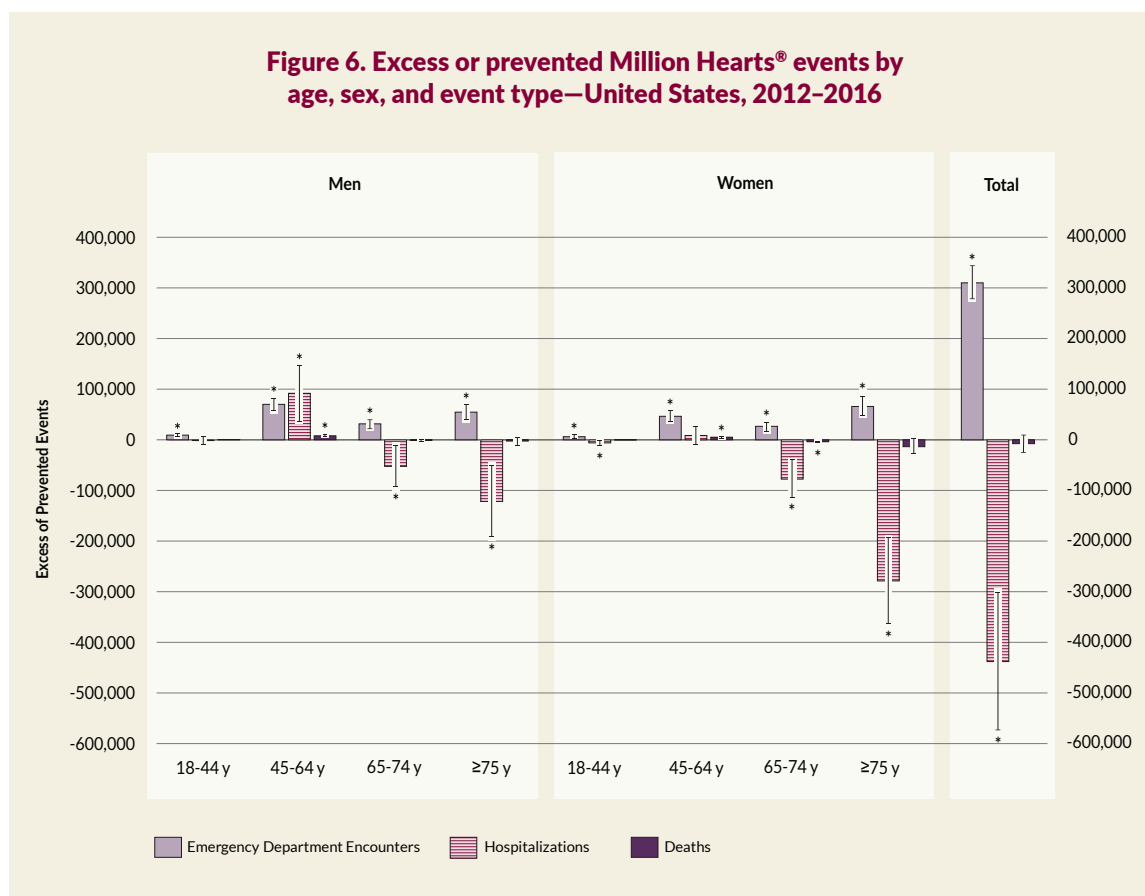
Data Sources: AHRQ's Healthcare Cost and Utilization Project's Nationwide Emergency Department Sample, Nationwide Inpatient Sample, and National Inpatient Sample; Centers for Disease Control and Prevention's National Vital Statistics System Mortality Multiple Cause of Death Files.

[#] Includes all deaths classified as potentially preventable via strategies recommended by Million Hearts®.

[‡] Overall rates are standardized by age to the 2010 US Standard Population.

Thus, most of the events prevented were non-fatal hospitalization events, with an estimated 438,000 CVD hospitalizations (95% confidence interval: 301,000 to 575,000; $P < .05$) prevented from 2012–2016 among all age groups and both sexes combined (**Figure 6**). However, an estimated

310,000 excess emergency department encounters (95% confidence interval: 277,000 to 343,000; $P < .05$) occurred among all groups combined. There was a non-significant change in death totals (8,000 deaths prevented [95% confidence interval: 25,000 deaths prevented to 10,000 excess deaths]; $P \geq .05$).^{**}



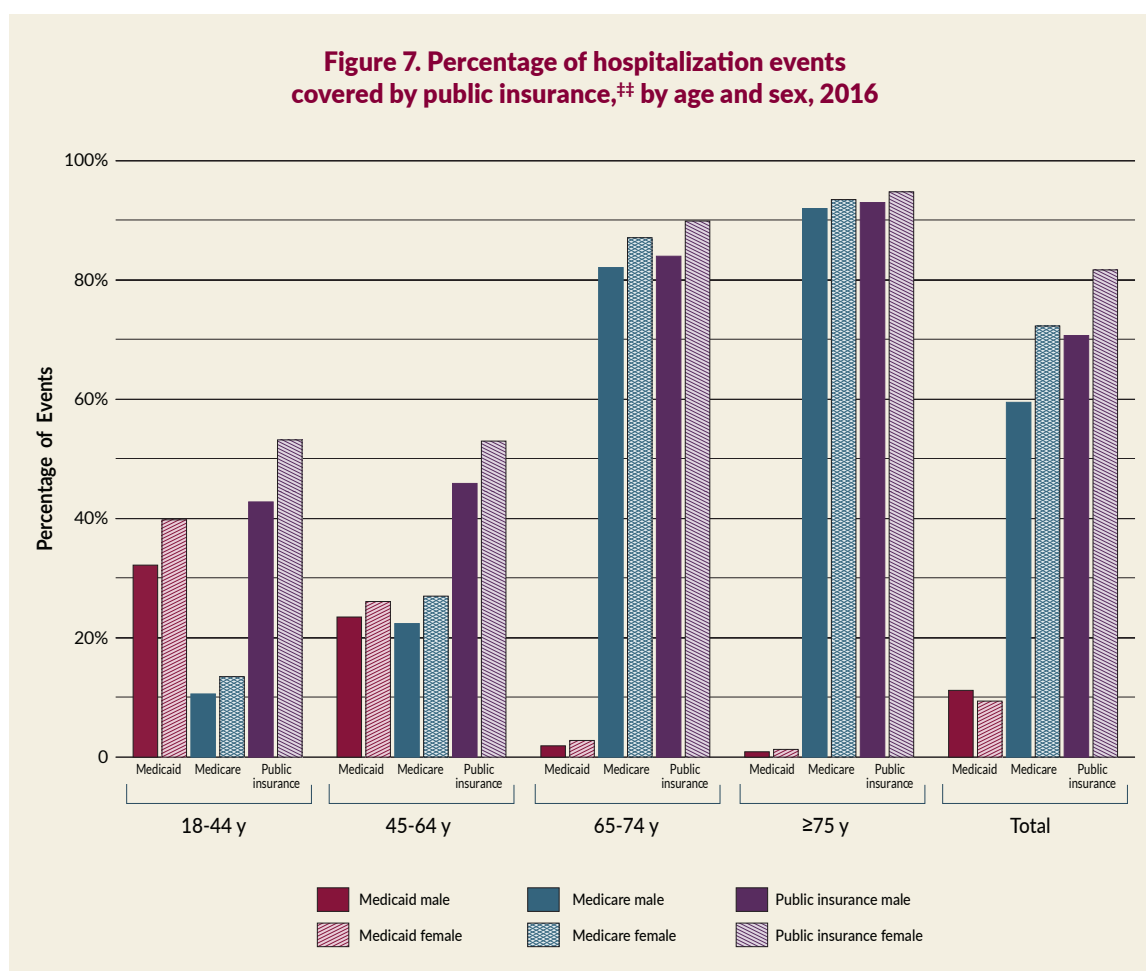
Data Sources: AHRQ's Healthcare Cost and Utilization Project's Nationwide Emergency Department Sample, Nationwide Inpatient Sample, and National Inpatient Sample; Centers for Disease Control and Prevention's National Vital Statistics System Mortality Multiple Cause of Death Files.

* Statistically significantly different than 0 (z-score $\geq |1.96|$).

** Sum of emergency department encounters, hospitalizations, and deaths does not exactly equal total because of rounding.

In 2016, the mean cost of a Million Hearts® hospitalization event was \$14,600 (includes only hospital costs; excludes professional [physician] fees) and the estimated mean cost of a Million Hearts® emergency department event was \$2,500.† Applying these averages to the estimated total number of hospitalizations prevented and excess emergency department encounters results in an estimated savings in direct medical costs of \$5.6 billion (\$US 2016) over the 5-year period.

The overall percentage of hospitalization events that occurred among adults with public insurance was substantial during 2012–2016, with a peak in 2016 (71% of total hospitalizations among men and 82% among women [data not shown]). In 2016, Medicaid was the primary payer for around one-third of Million Hearts® hospitalizations among adults aged 18–44 years, and Medicare (either via fee-for-service or through Medicare Advantage) was the primary payer for most of the hospitalization events among adults aged 65 years or older (Figure 7).



Data Sources: AHRQ's Nationwide Inpatient Sample and National Inpatient Sample.

†† Public insurance is the sum of the male and female Medicaid and Medicare values in each age range.

††† Charge information was available for emergency department and hospitalization events; however, charge amounts represent only what was billed for services and do not reflect how much the services actually cost the hospital to provide or the amount received in payment. Use of HCUP Cost-to-Charge Ratio (CCR) Files (HCUP). December 2019. Agency for Healthcare Research and Quality, Rockville, MD. <https://hcup-us.ahrq.gov/db/state/costtocharge.jsp> allowed for the conversion from charges to costs, but CCRs are available only for hospitalization charges and not for emergency department charges via HCUP. Therefore, to estimate emergency department costs, the national average CCR observed among Medicare beneficiaries in 2013² (average markup of 340% or 4.4 times the Medicare allowed amount) was applied to the average charges per emergency department encounter observed in HCUP.



The initial 5-year phase of Million Hearts® highlights the initiative's favorable impact on the significant reduction in acute cardiovascular events observed among women aged 75 years or older, the reduction in almost half a million hospitalizations that occurred predominately among older individuals, and an estimated \$5.6 billion in averted direct medical costs. The excess events that occurred among those aged 45–64 years, which affected men more than women, reflects a concerning trend of increasing cardiovascular events within this demographic group that is due, in part, to continued high rates of uncontrolled hypertension and increasing prevalence of obesity and diabetes.³ The increase in emergency department encounters occurred among both sexes and in all age groups and played an important role in limiting the total number of events prevented. Additional data are needed to better understand the factors driving this pattern. It will likely take years to realize the compounded benefits of targeted interventions focused on reducing the burden of chronic disease events in a large population from real-world multi-dimensional prevention initiatives like Million Hearts®. Developing and setting ambitious national goals and targets for how to get there has provided an important platform for focused CVD

prevention efforts. Importantly, high-quality and timely data may better inform and redirect such initiatives. This addendum further emphasizes the challenges and opportunities presented in addressing the ongoing CVD epidemic in the United States.

References

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