2023

California Right Care Initiative Data and Briefs Packet

Cardiovascular, Hypertension, and Diabetes Management and Prevention

Quality Indicators, Metrics and Promising Interventions

RIGHT CARE INITIATIVE

The mission of our 15+ year collaborative is to Reduce the Interval Between Scientific Advances in Evidence-Based Best Practices and their Widespread Implementation to Drive Toward Zero Preventable Deaths & Disabilities from Heart Attacks, Strokes, Diabetes & Heart Failure.

Berkeley Public Health

CHOIR CENTER FOR HEALTHCARE ORGANIZATIONAL + INNOVATION RESEARCH

Updated September 4, 2023

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California Right Care Initiative *Clinical Quality Improvement Leadership Collaborative*

Right Care Initiative Goals: ***Drive Toward Zero Preventable Heart Attacks, Strokes, Diabetic Complications, and COVID Deaths & Disabilities through Best Available Science Combined with Proactive Screening and Outreach***

*Achieve **90 %** in good control HEDIS levels for Cardiovascular Disease & Diabetes, whichever is greater for the following 3 critical targets:*

- ***90%** of hypertensive patients with blood pressure (BP) controlled**: <140/90 mm Hg (HEDIS) (Optimally <130/80 mm Hg** per **2017 American College of Cardiology Guidelines**, endorsed by ACC/AHA/APPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA)*
- ***90%** of patients with diabetes patients with blood sugar controlled: Hemoglobin A1c<8 (HEDIS)*
- ***90%** of patients with diabetes and/or cardiovascular conditions on statin therapy (HEDIS) (Optimally LDL controlled: LDL-C<100mg/dL. Or for very high risk ASCVD, LDL-c<70mg/dL or lower)*
- *Proactive Community Outreach to Screen & Identify Vulnerable Patients to Connect to Treatment & Support*

Activities:

- **University of Best Practices** (UBPs) collaborative gatherings of health care leaders built in 4 regions beginning in 2011 (now virtual) to learn what works to reach key bio-metrics, and encourage adoption of evidence-based interventions for preventing and better managing heart attacks, strokes, diabetes, and urgent health issues such as COVID-19. Practical presentations from benchmark performers are geared toward medical, pharmacy and quality improvement directors to spur achievement of national "A-grade" performance and better disease management.
- Promote adoption of strategies used by top performers, and regularly highlight and recognize progress on clinical performance (based on HEDIS, P4P, hospitalization and mortality data) in Summits since 2008.
- Foster "coopetition" among competing health systems. At all Right Care gatherings, we follow the Warren Barnes' Principle: ***We compete against disease and not each other*** **(**Warren Barnes, J.D., M.Div., Former Chief Health Lawyer, State of CA and Co-Founder, Right Care Initiative).

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For University of Best Practices operations, please contact rightcare@berkeley.edu, or albert1030@berkeley.edu

Supporters: This collaborative, expert-based, data-driven project has been supported by volunteers, resources, and leadership from:

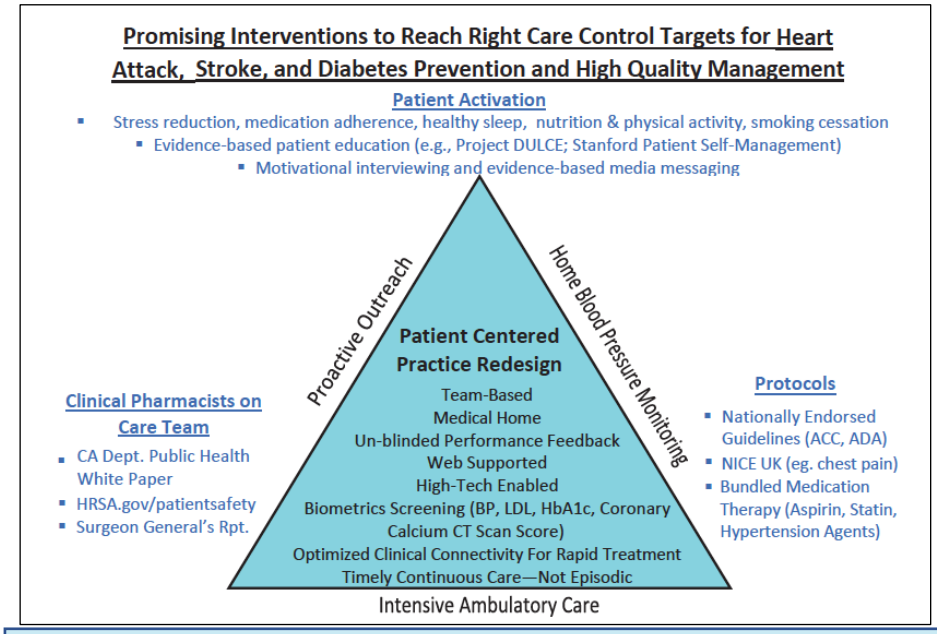
- *Grateful patients, families and physician leaders*
- *Blue Shield of California*
- *American College of Cardiology, CA Chapter*
- *American Society of Preventive Cardiology*
- *UC Berkeley School of Public Health*
- *University of California Schools of Public Health, Medicine, and Pharmacy*
- *Stanford School of Medicine & Clinical Excellence Research Center*
- *USC Schools of Medicine & Pharmacy*
- *RAND Corporation*
- *CDC Million Hearts Initiative*
- *Local Military and Veteran's Health*
- *American Medical Group Assoc. Foundation*
- *Med. groups, clinics, health plans & systems*
- *Health Trust / Community Health Partnership*
- *Sierra Health Foundation*
- *California Chronic Care Coalition*
- *Stroke Awareness Foundation*
- *No More Broken Hearts Foundation*
- *American Heart/Stroke Association*
- *American Diabetes Association*
- *California Department of Public Health*
- *Los Angeles County Dept. of Public Health*
- *CA Department of Managed Health Care*
- *CA Office of the Patient Advocate*
- *CA Office of Health Care Access & Information*
- *Amarin*
- *Amgen*
- *Boehringer-Ingelheim*
- *Johnson & Johnson*
- *Novo Nordisk*

NIH National Heart, Lung & Blood Institute

Primary Objective: Reduce preventable death, disability and suffering from the high leverage areas of cardiovascular and cerebrovascular disease, as well as diabetes, and SARS-Cov-2 through implementation of the best available science to improve patient outcomes. Since 2007, The California Right Care Initiative public-private collaborative has been working to catalyze the adoption of best practices deployed by top performers where metrics indicate that evidence-based practices are not fully deployed, with particular emphasis on control of **blood pressure, cholesterol and blood sugar.** For a synthesis of critically important strategies, see Right Care Triangle of Promising Interventions (next page).

Progress: The results of our first demonstration project, funded by the National Heart, Lung and Blood Institute, were published in two national journals as being associated with significant declines in heart attack hospitalizations. The first analysis estimated that during the first four years of our NIH-funded pilot project there were 2,735 fewer heart attack hospitalizations than would have been anticipated based on secular trend (Fulton et al. American Journal of Managed Care, Oct. 2017). The second analysis included two more years of data. That analysis estimated a sustained **22% reduction in acute myocardial infarction hospitalizations, and $86 million in savings associated with our work (an estimated 3,826 fewer heart attack hospitalizations)** than anticipated based on secular trend over six years (Fremont et al. *Health Affairs*, Sept. 2018). The *Health Affairs* analysis further **estimated that if our initial pilot results were spread statewide, $935 million would have been saved between 2011 and 2016 and over 42,000 acute myocardial infarction hospitalizations would have been prevented**.

Challenge: Data from the California Office of Statewide Health Planning and Development indicate that annually approximately **298,000 Californians were hospitalized** for heart attacks and strokes, approximately 100,000 of them younger than age 65 (2017). According to the US Centers for Disease Control, in 2017, **94,343 California deaths were caused by heart disease, stroke, diabetes, and hypertension** (62,797; 16,355; 9,595; 5,596 respectively). These conditions are strongly linked to one another, and many of these deaths are preventable. In 2008, NCQA conservatively estimated that improving California's cardiovascular disease and diabetes measures to the national HEDIS 90th percentile could save 1,694 to 2,818 CA lives each year, while avoiding $118 million in yearly hospital costs, 766,401 sick days and $125.56 million in lost productivity. Heart disease, hypertension and diabetes are increasingly well understood scientifically, and ripe for best practices collaboration. The foundation of our work is publicly available data from the US Centers for Disease Control, the California Department of Public Health, the CA Office of the Patient Advocate, the CA Office of Healthcare Access and Information, the Integrated Health Care Association, the National Committee For Quality Assurance, the Agency for Health Care Quality and Research, and the Commonwealth Foundation, among others. Over the course of this project, California has outpaced the nation in improving health system performance on control of blood pressure, cholesterol and blood sugar, building on the "100,000 Lives" campaign for reducing medical errors and the Million Hearts™ national initiative that was launched in 2011.



Our original Right Care San Diego University of Best Practices steering committee of medical directors came to early consensus that ***heart attacks and strokes could be reduced by 50% in 5 years*** *if the interventions synthesized into the* ***Right Care Triangle of promising interventions*** *were implemented (see left).*

Critical Patient Outcomes Questions:

•What are the best strategies to optimize medications and lifestyle for vulnerable patients? How to speed adoption of evidence-based practices & promising interventions for bringing patients into safer control with optimal medication therapy and titration to goal (OMT) & Therapeutic Lifestyle Coaching (TLC)?

•How can team based care be deployed to meet LDL, HTN & A1C goals?

•What strategies will quickly help address health disparities in hard hit communities?

Implementation Action:

The Right Care Initiative, operated by the UC Berkeley School of Public Health, was publicly launched with encouragement from the Department of Managed Health Care, NCQA and the Deans of UC Berkeley and UCLA Schools of Public Health in March 2008 at the 1st annual Clinical Quality Improvement Leadership Summit. Since then, more than fifteen Right Care summits were held around the state, along with over 300 monthly University of Best Practices. Each Right Care gathering is a collaborative effort to close the gap between science and practice to improve patient outcomes working with medical directors, pharmacy and quality improvement directors, as well as thought leaders in evidence-based medicine.

Virtual University of Best Practices Founding & Leadership: Thanks to an NIH GO grant (2009-July 2012), the Right Care Initiative received a special opportunity to implement in one community the best practices they **to prevent heart attacks, strokes and diabetic complications, designing & piloting** the first University of Best Practices in San Diego (subsequently renamed *Be There* San Diego.) Since 2011, Right Care University of Best Practices were built in four metro areas: San Diego 2011, Sacramento 2012, Los Angeles 2013 and Silicon Valley 2018. The University of Best Practices now meets virtually and includes all regions, endeavoring to include major delivery systems, medical groups, health plans, community clinics, public health, military and VA medical leaders, together with patient advocacy groups and other experts.

University of Best Practices leadership & regions: **William J. Bommer, MD, FACP, FACC, Statewide Chairman, Right Care Initiative University of Best Practices**; Chairman, CDPH Steering Committee for Comprehensive Heart Attack & Stroke. Specialty Delegate, California American College of Cardiology and California Medical Association; Director, California ePCI Program; Director, Prevention Forward Program and Professor of Medicine, Division of Cardiovascular Medicine, University of California, Davis. **Joseph Sky, MD, FACP, FACC, Vice-Chair, Right Care Initiative University of Best Practices**; Chief of Preventive Cardiology, Assoc. Chief of Staff, David Grant Medical Center, US Air Force; **Scott Flinn, MD,** UBP, Co-Founder; Medical Director, Blue Shield of California; Former Undersea Medical Officer with the Navy Seals; Greater LA: **Oliver Brooks, MD,** Chief Medical Officer, Watts HealthCare Corporation; Immediate Past President, National Medical Association**; Steve Chen, PharmD, FASHP, FCSHP, FNAP**, Associate Dean for Clinical Affairs, USC School of Pharmacy; **Cindy Giambrone, PharmD**, Director, Performance Improvement and ACO Pharmacy Risk, MemorialCare Foundation & Medical Group; **Tony Kuo, MD, MSHS,** Director, Chronic Disease & Injury Prevention, LA County Dept. of Public Health; Co-Program Lead, Population Health, UCLA Clinical and Translational Institute; **Karol Watson, MD, PhD, UCLA Professor of Medicine/Cardiology, Co-Director Preventive Cardiology, Director, UCLA Barbra Streisand Women's Heart Health Program, Carol Zaher, MD, MPH, MBA**, Medical Dir., Health Net CA Medical Management, Centene. Silicon Valley: **Eveline Stock, MD,** Associate Prof., Cardiology, School of Medicine, UCSF; Cardiologist, Cardiovascular Care & Prevention Center, University of California, San Francisco; **Nirali Vora, MD,** TEG Co-chair; Clinical Associate Prof., Neurology, School of Medicine, Stanford University; Director, Global Health Neurology; Program Director, Adult Neurology Residency, School of Medicine, Stanford University; **Edward M. Yu, MD, CMQ, CPPS, CPE,** Chief Quality Officer, Palo Alto Medical Foundation; San Diego *Be There* UBP: **Anthony DeMaria, MD,** University of Best Practices **Co-Founder & Chair;** Former Editor in Chief, Journal of American College of Cardiology; Founding Director, UCSD Cardiovascular Center Prof., School of Medicine, UCSD; **R. James Dudl, MD,** Retired Diabetes Lead & Community Benefits, Kaiser Permanente.

State-Wide Right Care Technical Expert Group (TEG): **Hector Rodriguez, PhD**, **MPH,** TEG Co-Chair, Prof., Health Policy and Management, School of Public Health, UC Berkeley; Director, Center for Healthcare Organizational & Innovation Research, Member, National Academy of Medicine ; **David Maron, MD,** TEG Co-chair; C.F. Rehnborg Professor of Medicine; Chief, Stanford Prevention Research Center; Director, Preventive Cardiology, Stanford University School of Medicine; **Nirali Vora, MD,** TEG Co-chair; Clinical Associate Prof., Neurology, School of Medicine, Stanford University; Director, Global Health Neurology; Program Director, Adult Neurology Residency, School of Medicine, Stanford University; **Parag Agnihotri, MD**, Chief Medical Officer, Population Health Services at UC San Diego Health; **Noel Bairey Merz, MD, FACC, FAHA, FESC,** Director, Barbra Streisand Women's Heart Center, Prof. Cardiology, Cedars-Sinai; **Catrina Chambers Taylor, PhD, NSPH**, Chief, Surveillance & Research Section, Chronic Disease Center for Healthy Communities, California Department of Public Health; **Steve Chen, PharmD, FASHP, FCSHP, FNAP**, Associate Dean for Clinical Affairs, USC School of Pharmacy; **Keith Emmons, MD**, Medical Director, CenCal Health of Santa Barbara (Medi-Cal plan); **Scott Flinn, MD,** University of Best Practices Co-Founder; Medical Director, Blue Shield of California; Former Navy Undersea Medical Officer with the Navy Seals; **Jan D. Hirsch, RPh, PhD,** Founding Dean, UC Irvine School of Pharmacy; **Robert M. Kaplan, PhD,** Research Director, Stanford University Clinical Excellence Research Center; **John Ovretviet, PhD,** Director of Research, Prof. of Health Improvement, Implementation,& Evaluation Medical Management Centre, Karolinska Institute, Stockholm, Sweden; **Steve Sidney**, **MD, MPH**, Kaiser Permanente, Nor.Cal. Director of Research Clinics & PI, CARDIA study of Coronary Calcium in the Young; **Eveline Stock, MD,** Associate Professor, Cardiology, UCSF; **Nathan Wong, PhD, FACC, FAHA,** Professor, UC Irvine School of Medicine & Dept. of Epidemiology, Director UCI Heart Disease Prevention.

Early Co-Founding Experts: **Jose Arevalo, MD,** Chief Medical Officer, Sutter Independent Practice Association, Capitol Region UBP Co-Founding Chairman**; Warren Barnes, JD, M.Div.,** Retired Chief Lawyer, CA Dept. of Managed Health Care, Minister and Co-Founder, Right Care Initiative; **Allen Fremont, MD, PhD,** Right Care TEG 2008-2020; Co-Principal Investigator and Data Lead, Right Care-NHLBI (2009-2012); Former Physician Policy Researcher and Director, RAND Q-DART Project, RAND Corporation; **Arnie Milstein, MD, MPH,** Prof. of Medicine and Director, Clinical Excellence Research Center, Stanford University; Medical Director, Pacific Business Group on Health; **Jerry Penso, MD, MBA**, President and Chief Executive Officer, American Medical Group Association; Co-Founder, Right Care Initiative University of Best Practices..

UC Berkeley School of Public Health Faculty: Stephen Shortell, PhD, MPH, MBA, TEG Founding Chair, Dean Emeritus and Prof., School of Public Health, UC Berkeley; Adjunct Professor **Susan L. Ivey, MD, MHSA**, Director of Research Health Research for Action; Adjunct Assoc. Professor **Timothy Brown, PhD;** Associate Research Professor, Health Economics & Policy **Brent Fulton, PhD, MBA**; **Helen Halpin, ScM, PhD,** Prof.Emerita and Former Director, Center for Health and Public Policy Studies.

Resources: We wish to thank our Right Care Initiative supporters: The University of California, Stanford University, USC, The California & LA Departments of Public Health, Blue Shield of California, Stroke Awareness Foundation, No More Broken Hearts Foundation, Amarin, Amgen, Boehringer-Ingelheim, Genentech, Johnson & Johnson, and Novo Nordisk for enabling the research and logistical support at the University of California, Berkeley School of Public Health for the Right Care Initiative University of Best Practices. A very special thank you to the National Institutes of Health's National Heart, Lung, and Blood Institute, and the Judith and Jack White Family for providing the initial seed funding to launch the University of Best Practices!

Right Care Website: http://rightcare.berkeley.edu

View medical group scores by county via the CA Office of the Patient Advocate: http://reportcard.opa.ca.gov/rc/medicalgroupcounty.aspx

Women: CDC Wonder Crude Deaths Rates per 100,000 for CA & US (2019)

Crude Death Rates per 100,000 California Women (2019)						
Age	Hypertensive Diseases (I10-I15)	Ischemic Heart Diseases (I20-I25)	Cerebrovascular Diseases (I60-I69)	Total HTN, IHD & Cerebrovascular Diseases	Breast Cancer (C50)	Cervical Cancer (C53)
35-44 years	1.8	2.8	3.6	8.2	7.8	2.0
45-54 years	6.3	12.3	9.0	27.6	22.5	4.0
55-64 years	18.6	47.3	22.4	88.3	39.0	4.6

Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999-2019 on CDC WONDER Online Database, released in 2020. Data are from the Multiple Cause of Death Files, 1999-2019, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Accessed at http://wonder.cdc.gov/ucd-icd10.html on Oct 25, 2021.

Crude Death Rates per 100,000 United States Women (2019)						
Age	Hypertensive Diseases (I10-I15)	Ischemic Heart Diseases (I20-I25)	Cerebrovascular Diseases (I60-I69)	Total HTN, IHD & Cerebrovascular Diseases	Breast Cancer (C50)	Cervical Cancer (C53)
35-44 years	3.6	5.5	3.7	12.8	9.2	2.6
45-54 years	9.7	20.5	10.6	40.8	22.2	4.1
55-64 years	21.0	61.0	24.6	106.6	40.4	4.6

Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999-2019 on CDC WONDER Online Database, released in 2020. Data are from the Multiple Cause of Death Files, 1999-2019, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Accessed at http://wonder.cdc.gov/ucd-icd10.html on Oct 25, 2021.

Men: CDC Wonder Crude Deaths Rates per 100,000 for CA & US (2019)

Crude Death Rates per 100,000 California Men (2019)						
Age	Hypertensive Diseases (I10-I15)	Ischemic Heart Diseases (I20-I25)	Cerebrovascular Diseases (I60-I69)	Total HTN, IHD & Cerebrovascular Diseases	Colorectal Cancer (ICD C18-21)	Prostate Cancer (ICD C61)
35-44 years	5.4	10.9	5.2	21.5	3.4	*
45-54 years	16.2	49.2	14.8	80.2	12.2	2.0
55-64 years	40.2	153.6	35.2	229.0	26.0	12.9

Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999-2019 on CDC WONDER Online Database, released in 2020. Data are from the Multiple Cause of Death Files, 1999-2019, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Accessed at http://wonder.cdc.gov/ucd-icd10.html on Oct 25, 2021.

Crude Death Rates per 100,000 United States Men (2019)						
Age	Hypertensive Diseases (I10-I15)	Ischemic Heart Diseases (I20-I25)	Cerebrovascular Diseases (I60-I69)	Total HTN, IHD & Cerebrovascular Diseases	Colorectal Cancer (ICD C18-21)	Prostate Cancer (ICD C61)
35-44 years	8.1	16.1	4.6	28.8	3.8	0.1
45-54 years	21	63.7	14.6	99.3	14.2	1.9
55-64 years	44.8	173	36.7	254.5	30.3	14.3

Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999-2019 on CDC WONDER Online Database, released in 2020. Data are from the Multiple Cause of Death Files, 1999-2019, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Accessed at http://wonder.cdc.gov/ucd-icd10.html on Oct 25, 2021.

Assessing Effectiveness of University of Best Practices: Right Care Pilot Demonstration Project in San Diego Shows Improvements in Acute Myocardial Infarction Hospitalization Rates Compared with Rest of California

The Right Care Initiative of UC Berkeley School of Public Health has worked since 2007 to improve clinical outcomes by catalyzing uptake of patient-centered, evidence-based best practices among medical groups, clinics, and health plans. This public-private partnership is led by UC Berkeley School of Public Health and was publicly launched collaboratively with UCLA School of Public Health and the CA Department of Managed Health Care in 2008. Our collaborative is comprised of physician and clinical quality improvement leaders, health systems, multiple UC campuses, USC, Stanford, RAND, public health officials, patients, and advocates such as the CA Chronic Care Coalition. With support from NIH for our first pilot, and with subsequent charitable funds, we built four regionally-focused University of Best Practices (UBP) starting in 2011: San Diego, Sacramento, Los Angeles and the Bay Area Silicon Valley. Our 4th UBP was launched in Bay Area Silicon Valley in 2018 to continue to spread best practices to prevent and better manage heart attacks, strokes, and diabetes by building on the sustained 22% reduction of heart attacks we have seen with our initial pilot. Our University of Best Practices focus on leaders from organizations with breakthrough clinical quality who share strategies to improve patient outcomes. Data from our first NIH funded pilot University of Best Practices is described here.

University of Best Practices: Right Care's Translational Model to Implement Evidence-Based Innovations

- Monthly 2+ hour convenings are held with leaders from major regional health care delivery systems and public health.
- Leaders from high-performing organizations and/or experts present "how they did it" along with lessons learned.
- A break-out session or discussion involving all participants follows to consider how to apply the speaker's ideas in the local setting and to problem-solve overcoming barriers for improved patient outcomes.
- Trusted performance data is the bedrock of the UBP model.

Lessons Learned in Implementing University of Best Practices

- A collaborative, "non-combat zone" spirit among local clinical leaders is the essential ingredient, following the Warren principle: ***In this room we compete against disease, not against each other.***
- High performing medical directors, coupled with cardiology and endocrinology experts, co-lead the discussions and mentor others to achieve better outcomes.
- 75% or less of our gathering time is for presentations to allow for sufficient discussion on achievable, locally applicable action plans.
- Many hours of behind-the-scenes planning and organizing are needed for a successful collaborative.
- Enthusiastic participation is built on the quality of intellectual content.

UBP Resources – A National Institutes of Health - Grand Opportunity (NIH-GO) grant, awarded in late 2009, supported the UC Berkeley, UCLA and RAND Right Care research teams to meet with individual San Diego delivery systems in 2010; supported hosting three separate day-long Right Care Initiative Scientific Summits in San Diego in 2010-2011; and launched the initial pilot University of Best Practices in San Diego in February 2011. When NIH-GO grant funds expired, Right Care Champions Judith and Jack White provided bridge funding to continue the San Diego UBP until new federal grant funds were obtained. Charitable contributions, grant funding, and membership contributions continue to support the regional University of Best Practices sites.

Since the introduction of the University of Best Practices in San Diego County in early 2011, there has been an observable decline in hospitalizations for adult heart attacks (myocardial infarction) when compared to the rest of California (see graphs below) (Fulton et al., 2017; Fremont et al., 2018). This is similar to trends seen in South Carolina where physician collaboratives across the state focused on fighting against heart disease. South Carolina efforts on better control of blood pressure and lipids moved the state from 51st on CVD deaths to 35th place nationally between 1995 and 2006 (Egan et al, 2011).

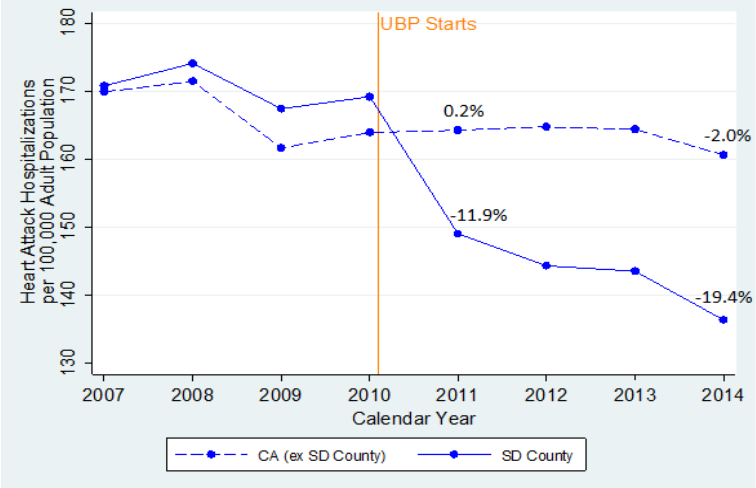


Figure 1: Hospitalizations per 100,000 Adult Population for Heart Attacks Comparing San Diego County with the rest of California, 2007-2014

Source: Fulton et al, 2015, analysis of California Office of Statewide Health Planning and Development's 2007 to 2014 Patient Hospitalization Discharge Data

Notes: SD County = San Diego County; CA (ex. San Diego County)= California excluding San Diego County; Heart attacks (ICD-9-CM code 410.xx); UBP= University of Best Practices. UBP started in February 2011, just after the 2010 data points. Percentages are percent changes since 2010.

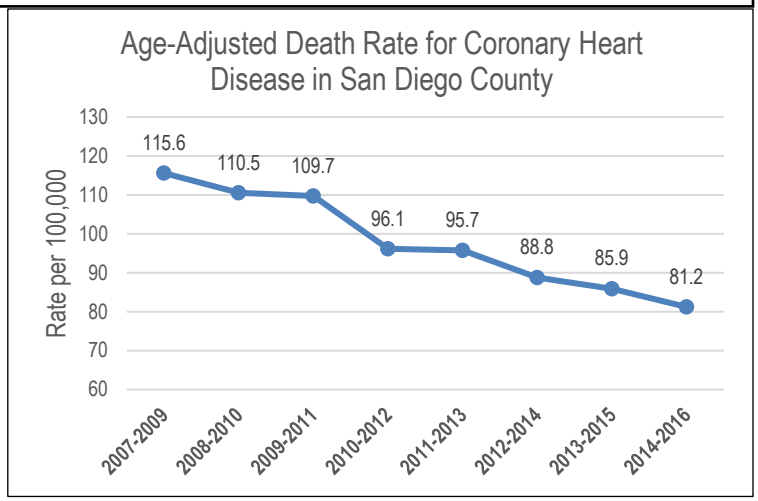


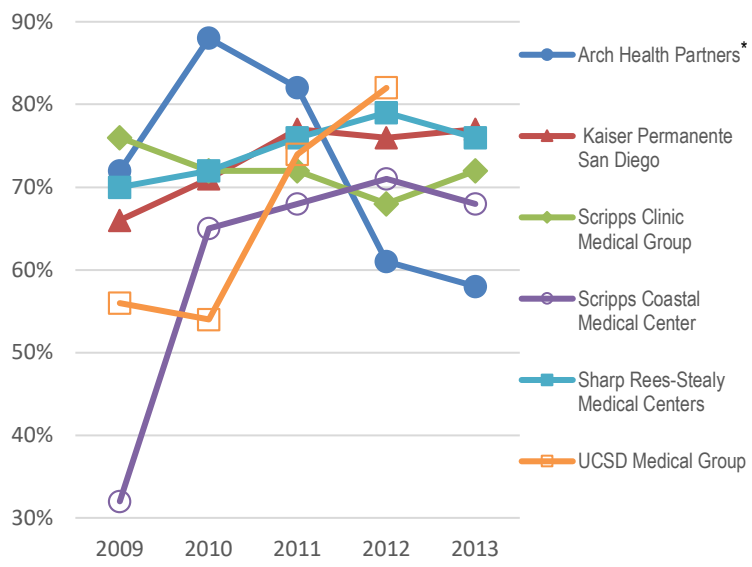
Figure 2: Three-Year Average Age-Adjusted Death Rate for Coronary Heart Disease in San Diego County 2007-2016

Source: California Department of Public Health County Health Report 2011-2018

Notes: Coronary Heart Disease (CHD): ICD-10 codes I20-I25 as underlying cause of death.

The Right Care Initiative started statewide convenings in 2008, and with NIH support began planning focused implementation in San Diego County (SD) in 2010. Starting in 2011, SD medical groups were supported by RAND to have regular data sharing meetings (in addition to the NIH supported Right Care University of Best Practices) to drive improved control of LDL cholesterol, blood pressure, and HbA1c. Two figures below illustrate individual medical group performance in SD in controlling LDL 100 cholesterol and blood pressure. Results from recent state report cards appear below. LDL 100 cholesterol and BP control in SD delivery systems outperformed California.

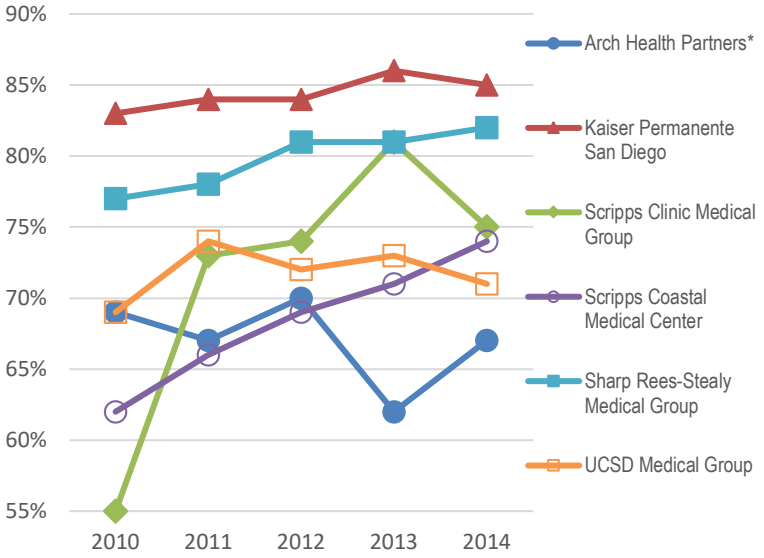
LDL Control <100 mg/dL for People with Heart Disease



** Performance of this group may be adversely impacted by incorporation of small practices observed during this time period.*

Figure 3: LDL Cholesterol Control (<100 mg/dL) for People with Heart Disease. Note: LDL data were no longer recorded in San Diego County after 2013

Blood Pressure Control <140/90 mm Hg among Diabetics



** Performance of this group may be adversely impacted by incorporation of small practices observed during this time period.*

Figure 4: Blood Pressure Control (<140/90 mm Hg) for People with Diabetes. Note: Data were not available for this measure until 2010

Looking Forward

Results and lessons learned from the University of Best Practices approach to prevention and better management of heart attacks, strokes and diabetic complications are being spread to UBPs in Los Angeles, Sacramento, Santa Clara County. Significant progress has been made toward the initial goal set by the steering committee of medical directors from the initial Right Care Initiative San Diego University of Best Practices (now renamed *Be There San Diego*) who came to consensus in 2011 that heart attacks could be reduced by 50% in 5 years by implementing the interventions on the Right Care Triangle (see triangle to right and Right Care Initiative Project Brief). **From 2011 to 2014, the hospitalization rate decrease in San Diego County was 16.5 percentage points more than the decrease in the rest of the state for heart attacks.** If those results were achieved throughout the rest of California, there would have been approximately 5,000 fewer hospitalizations for heart attacks each year, saving over $100 million in annual payments to hospitals.

A September 2018 ***Health Affairs*** article indicated that if our initial pilot results were spread statewide, **$935 million would be saved between 2011 and 2016 and over 42,000 acute myocardial infarction hospitalizations would have been prevented.**

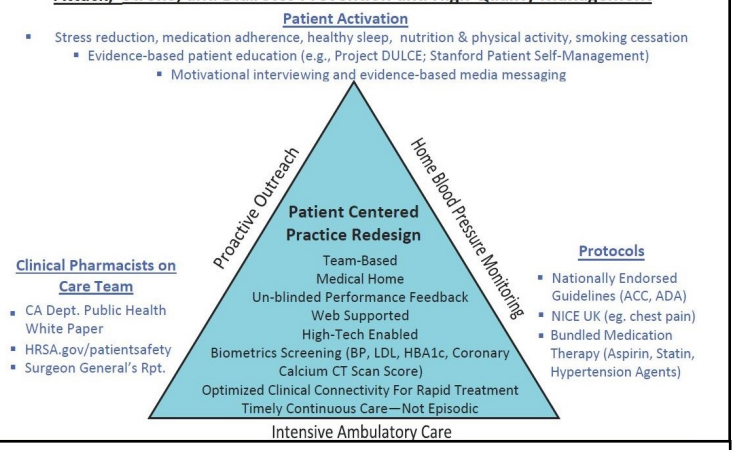
Please see Press Release of ***Health Affairs*** study (Fremont et al., 2018) indicating a sustained **22% reduction in acute heart attack** hospitalizations over 6 years in our initial pilot community: here

Building on the Shoulders of Giants

The Right Care Initiative launched the University of Best Practices pilot program in San Diego building on the conceptual learnings of collaboratives that had come before (Egan et al, 2011).

Note: In 2014, after NIH funding ran out, The San Diego UBP obtained independent funding and was renamed *Be There San Diego* University of Best Practices. Its goals and leadership by renowned cardiologist Anthony DeMaria, MD, remain unchanged.

Promising Interventions to Reach Right Care Control Targets for Heart Attack, Stroke, and Diabetes Prevention and High Quality Management



Publications and References

Results of the Right Care Demonstration Project have been published in *The American Journal of Managed Care 2017; 23(10):596-603.* and in *Health Affairs 2018 37(9): 1457-1465*

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Fulton, B, Ivey, SL, Rodriguez, HP, Shortell, SM. Countywide Physician Organization Learning Collaborative and Changes in Hospitalization Rates. Am J Manag Care. 2017; 23(10):596-603.

Fremont, A, Kim, A, Bailey, K, Hanley, H, Thorne, C, Dudl, J, Kaplan, R, Shortell, SM, DeMaria, A. One In Five Fewer Heart Attacks: Impact, Savings, And Sustainability In San Diego County Collaborative. Health Affairs 2018; 37(9):1457-1465.

Egan, BM, Laken, MA, Shaun Wagner, C, Mack, SS, Seymour-Edwards, K, Dodson, J, Zhao, Y, Lackland, DT. Impacting population cardiovascular health through a community-based practice network: update on an ASH-supported collaborative. J Clin Hypertens (Greenwich). 2011;13(8): 543-550.

Fulton, B, Ivey, SL, Rodriguez, H, Shortell, SM, Spautz, L, Lu, A, Klein, SL, Spencer, B, Hanley, HR. The relative hospitalization rate decrease for AMIs in San Diego County occurred across all age groups. RCI Annual Summit, Berkeley, CA. November, 2015.

County Health Status Profiles 2011-2018 Reports. California Department of Public Health.

Additional resources can be found at: www.RightCare.Berkeley.edu The Right Care Initiative is a charitably funded collaborative operated by UC Berkeley School of Public Health, and was originally launched in collaboration with UCLA and the CA Department of Managed Health Care

Project Brief Updated: May 2019; Originally Produced: 2016 by UC Berkeley Right Care Research Team: Professor Susan L. Ivey, MD, MHSA, Professor Brent Fulton, PhD; and research assistants Amanda Lu and Bryan Vuong

Coronary Artery Calcium Heart CT Screening for Early Detection of Atherosclerotic Plaque: Measuring Heart Attack Risk to Determine Need for Preventive Medication

Right Care Initiative Project Brief as of Dec 2021

Cardiovascular Disease Indicator: Coronary Artery Calcium is an Effective & Personalized Predictor of Cardiovascular Events

Heart attacks and strokes, the leading cause of death in the United States, strike without warning in approximately 50% of cases.[1,2] They are often caused by plaque buildup in the walls of the arteries. The plaque usually includes calcium, which makes it visible on a CT scan. For this reason, it is possible to identify if plaque is present in the heart (coronary) arteries long before a heart attack strikes. Therefore, a CT scan of the coronary arteries is a means of screening for patients without symptoms who may be at high risk for a heart attack, refining clinical risk prediction and informing treatment decision-making to obtain better health outcomes and reduce costs. The presence of coronary artery calcification (CAC) increases the likelihood of having deposits in other arteries, including those that supply the brain. Therefore, finding coronary artery calcium may indicate an increased risk of stroke as well as heart attack. The 2018 joint guidelines issued by the American Heart Association (AHA) with the American College of Cardiology (ACC); and UK National Health Service guidelines, endorse this test to improve cardiovascular disease (CVD) risk classification and identify a group of individuals who receive major benefit from statins.[3,4] Conventional risk factors of vascular disease that guide early detection include: family history, diabetes, elevated LDL cholesterol, low HDL cholesterol, tobacco use, hypertension, obesity/physical inactivity and stress. Measuring coronary artery calcium is a specific indicator of an individual's mortality risk that has proven to be a very effective predictor of risk, highly motivating for patients to be adherent to preventive medications & lifestyle changes, while being also cost-effective.[5,6,7] Higher CAC scores are associated with higher risk and need for more intensive preventive intervention.[8]

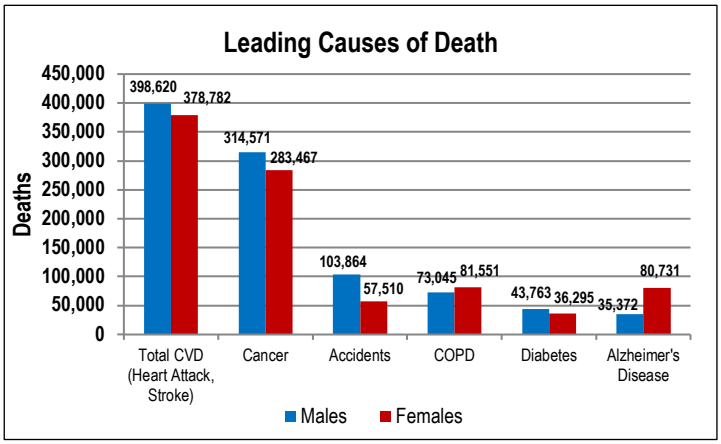


Figure 1: Leading Causes of Death for All Males and Females in the United States (2016)

Source: Health, United States, 2017. Centers for Disease Control and Prevention, National Center for Health Statistics. US Department of Health and Human Services[9]

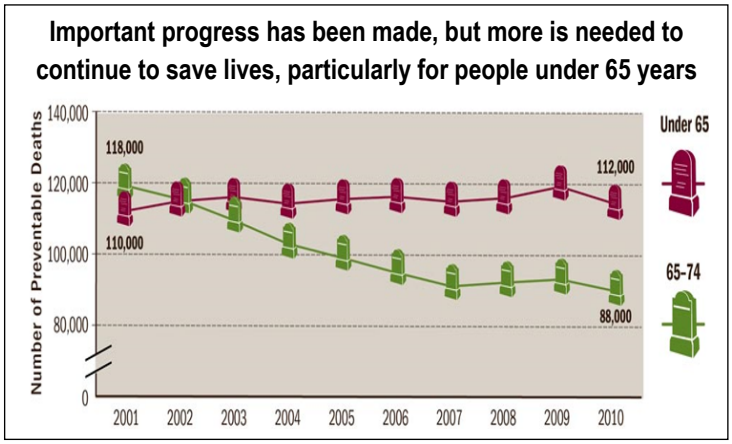


Figure 2: Preventable Cerebrovascular Deaths in the U.S. (2001-2010)

Source: National Vital Statistics System, US Census Bureau, 2001-2010[10]

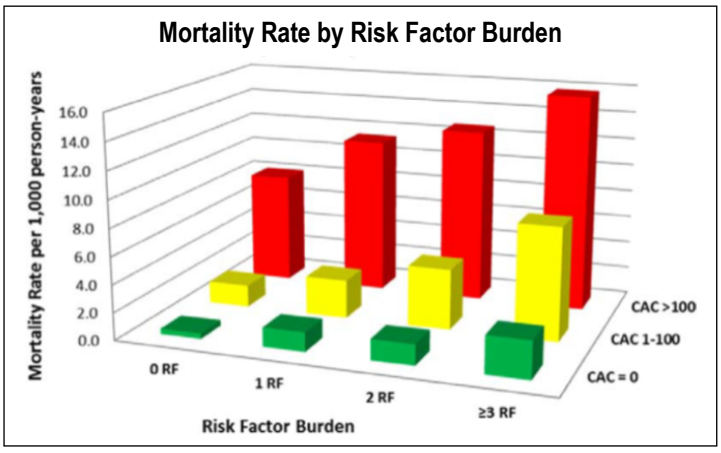


Figure 3: Mortality Rate by Risk Factor Burden and CAC Score

Source: Nasir, et al. Circulation Cardiovascular Imaging, 2012[11]

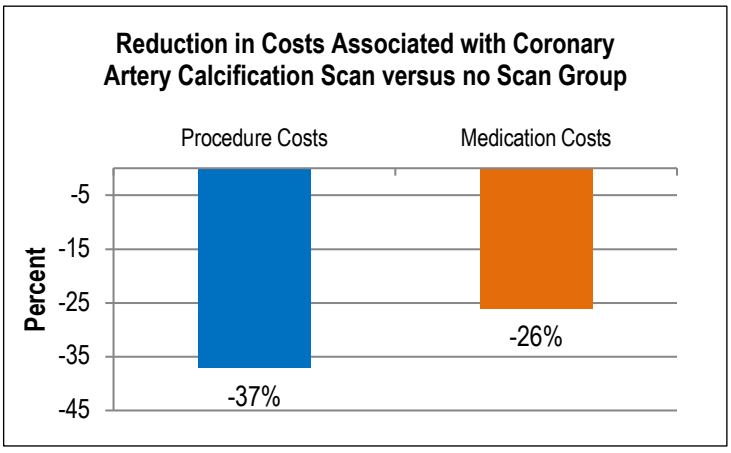


Figure 4: Reduction in Costs Associated with Coronary Artery Calcification Scan Versus No Scan Group

Source: Rozanski, et al. Journal of the American College of Cardiology 2011[12]

Notes: p<0.005 for both measures

Coronary Artery Calcium is a Cost-Effective and Reliable Indicator of Cardiovascular Risk and Mortality

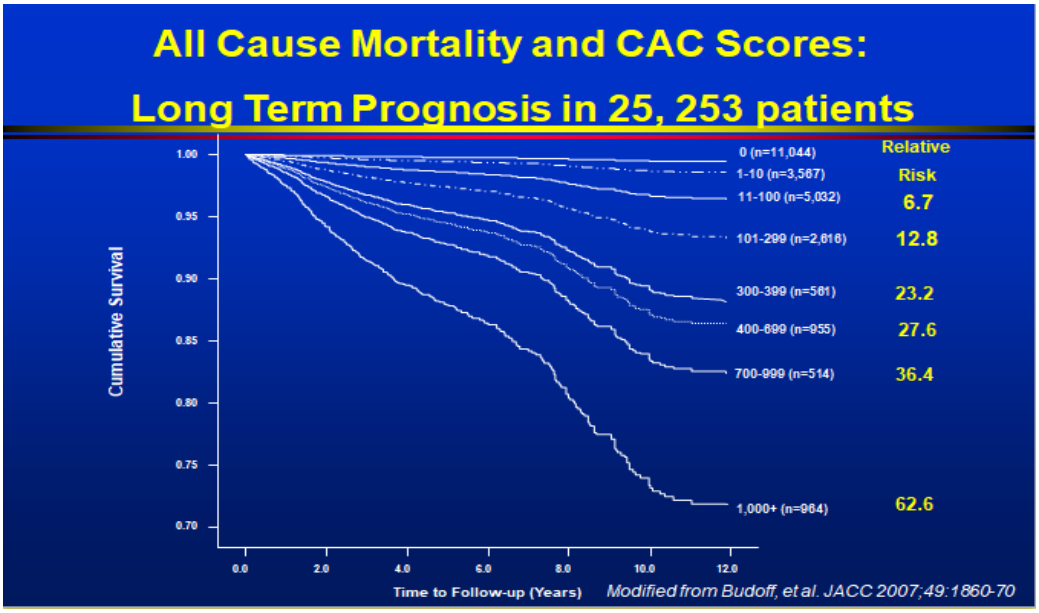


Figure 5: All-Cause Mortality and Coronary Artery Calcification Scores: Long Term Prognosis in 25,253 patients

Source: Budoff, et al. Journal of the American College of Cardiology, 2007[5]

Notes: With greater CAC score, cumulative survival decreases. Relative risk calculation uses those with 0 CAC score to compare.

**Kaplan-Meier Survival Estimate shows 99.6% survival for people with CAC = 0 without family history of CHD and 99.3% survival for people with CAC = 0 and family history of CHD[13]*

Coronary Artery Calcium Scanning Improves Outcomes by Increasing Initiation and Continuation of Pharmacological and Lifestyle Preventive Therapies for People with Non-zero CAC Scores

Parameters	Odds Ratio	95% CI	p value
Aspirin Initiation	2.61	[1.81,3.78]	<0.0001
Lipid Lowering Medication Initiation	2.86	[1.85,4.41]	<0.0001
Blood Pressure Lowering Medication Initiation	1.94	[1.61,2.33]	<0.0001
Lipid Lowering Medication Continuation	2.26	[1.56, 3.28]	<0.0001
Increased Exercise	1.84	[1.41, 2.41]	<0.0001
Dietary Change	1.94	[1.52, 2.49]	<0.0001

Table 1: Pharmacological Initiation and Continuation Improved by Coronary Artery Calcium Scanning

Source: Gupta et al. Journal of the American College of Cardiology: Cardiovascular Imaging, 2017[7]

Notes: The data above shows that non-zero CAC score significantly increases the likelihood of initiation or continuation of pharmacological and lifestyle therapies for the prevention of cardiovascular disease.

Primary Prevention Patients with Coronary Artery Calcium Scores ≥1000 have CVD Mortality Rates that Exceed High-Risk Secondary Prevention Patients

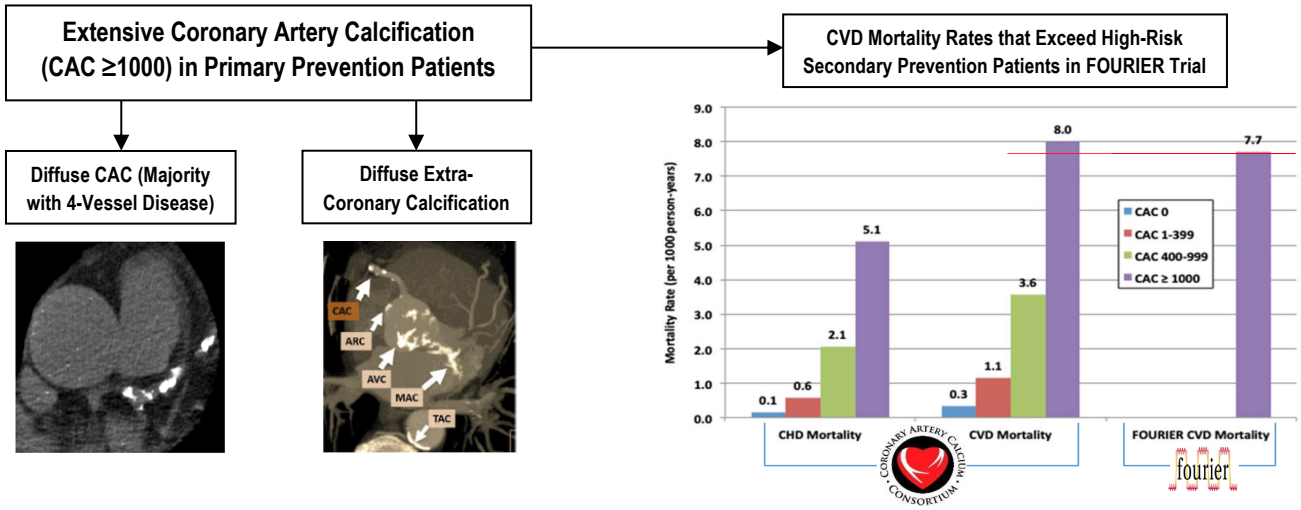


Figure 6: Understanding Extensive CAC (CAC Score ≥1,000) in Primary Prevention Patients

Source: Results from the Coronary Artery Calcium Consortium; Peng et al. Journal of the American College of Cardiology: Cardiovascular Imaging, 2019[8]

Coronary Artery Calcium's Role in Predicting Mortality and Identifying Groups for Statin Medication

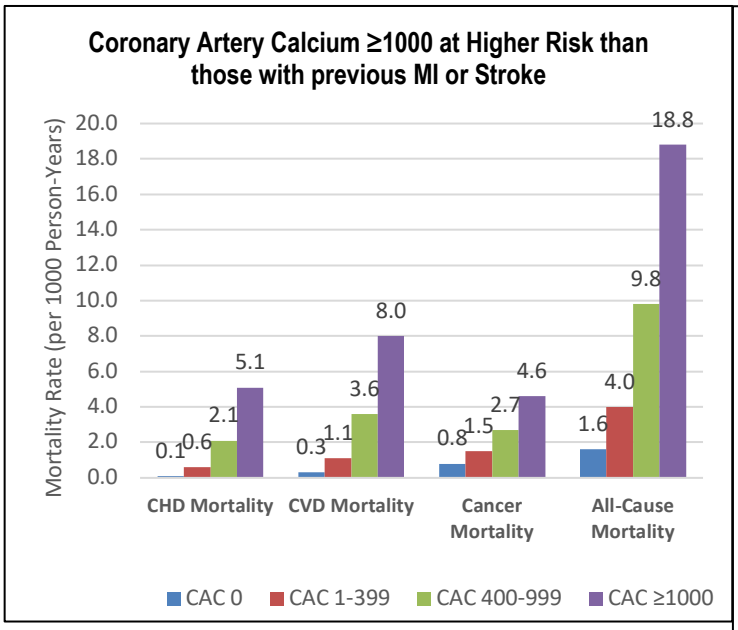


Figure 7: Mortality Rate Per 1,000 Person-Years for CVD, CHD, Cancer, and All-Cause Mortality by CAC Score Group

Source: Results from the Coronary Artery Calcium Consortium; Peng et al. Journal of the American College of Cardiology: Cardiovascular Imaging, 2019[8]

Notes: CAC = coronary artery calcium; CHD = coronary heart disease; CVD = cardiovascular disease

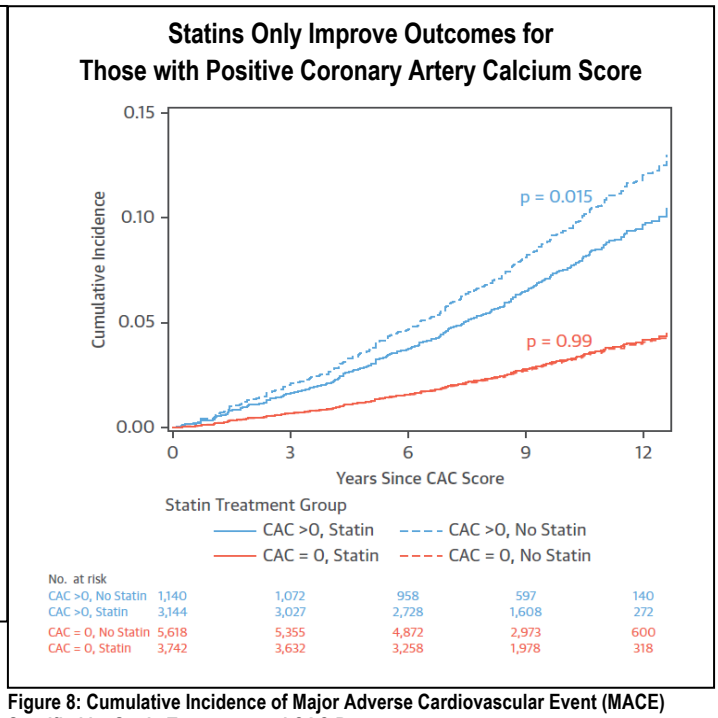


Figure 8: Cumulative Incidence of Major Adverse Cardiovascular Event (MACE) Stratified by Statin Treatment and CAC Presence

Source: Mitchell et al. Journal of the American College of Cardiology 2018[14]

Notes: In a 10-year observational study of 13,644 Military Personnel at Walter Reed Medical Center (mean age 50 years), no statin benefit was found among those with CAC scores of zero.

Changing the Trajectory of the Outsized Cost of CVD Through Targeted Preventive Therapy

Condition	Total Direct Cost (in Billions)
Heart Disease	**$113.4**
COPD, Asthma	$78.5
Hypertension	**$52.2**
Hyperlipidemia	**$35.2**
Pneumonia	$30.5
Stroke	**$27.5**
Other Circulatory Conditions	$25.1
Anemias	$4.8

Table 2: Direct Economic Cost for Selected Conditions, U.S., 2015

Source: Center for Financing, Access and Cost Trends, Agency for Healthcare Research and Quality, Medical Expenditure Panel Survey, 2015[15]

Notes: CVD conditions are bolded

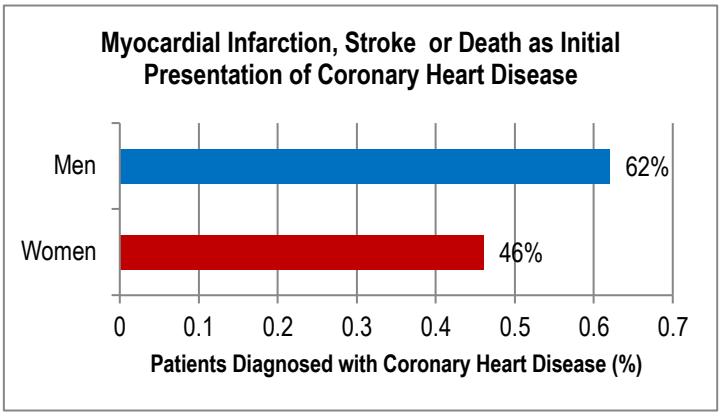
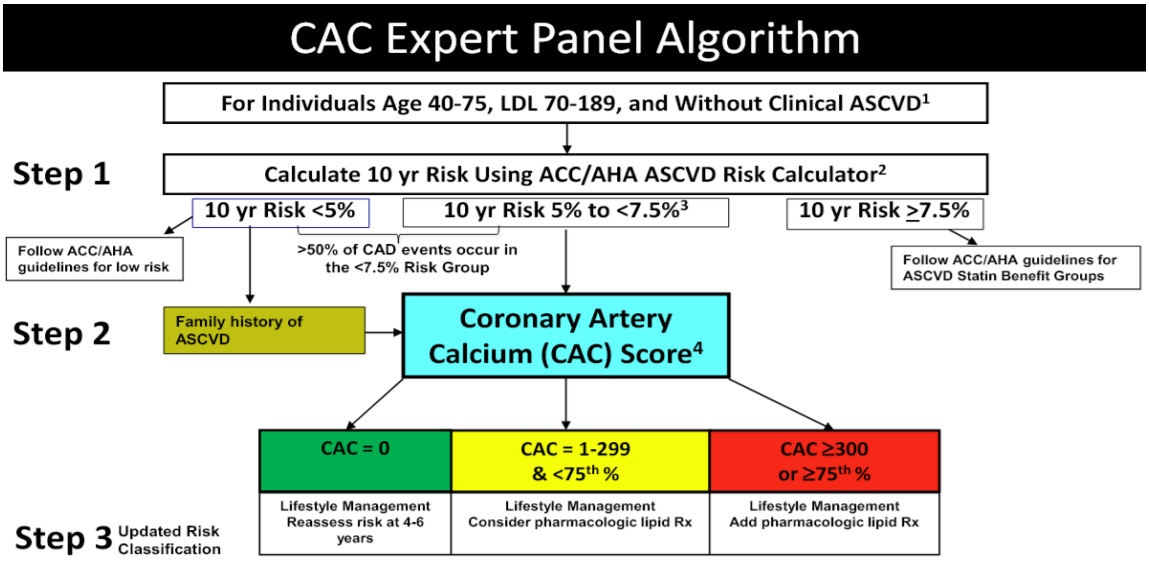


Figure 9: Myocardial Infarction (MI), Stroke or Death as Initial Presentation of Coronary Heart Disease

Source: Murabito, et al. Circulation, 1993[2]

David J. Maron, et al. MD, Director of Preventive Cardiology, Stanford Medical School. (As Presented to the Right Care Initiative Leadership Summit at the University of California, Berkeley; Nov. 2015)



[1] ASCVD = atherosclerotic cardiovascular disease
[2] http://tools.cardiosource.org/ASCVD-Risk-Estimator/
[3]ACC/AHA 2013 Cholesterol Guidelines state "for those with a 5% to <7.5% estimated 10-year ASCVD risk, the potential for adverse effects may outweigh the potential for ASCVD risk reduction benefit when high-intensity statin therapy is used in this risk group. However, for moderate-intensity statin therapy the ASCVD risk reduction clearly exceeds the potential for adverse effects."
[4]ACC/AHA 2013 Cholesterol Guidelines state "Before initiating statin therapy, the clinician and patient discussion should include consideration of the potential for ASCVD risk reduction benefits, adverse effects, and drug-drug interactions. Additional factors may also be considered to inform treatment decision making in selected individuals. Factors that may contribute to assessment of ASCVD risk include...coronary artery calcium score ≥300 Agatston units or ≥75 percentile for age, sex, and ethnicity." For additional information, see http://www.mesa-nhlbi.org/CACReference.aspx.

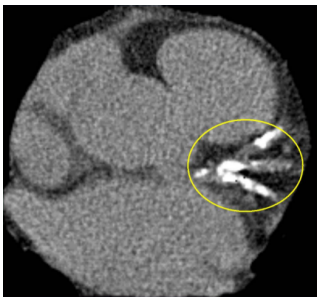
Coronary Artery Calcification CT Scan Priority Scanning Groups

American College of Cardiology and American Heart Association Cholesterol Clinical Practice Guidelines, 2018 (Grundy SM, et al.)[3]

- In adults 40 to 75 years of age without diabetes mellitus and with LDL-C levels ≥70 mg/dl (≥1.8 mmol/L), at a 10-year ASCVD risk of ≥7.5%, start a moderate-intensity statin if a discussion of treatment options favors statin therapy. Risk-enhancing factors favor statin therapy**. If risk status is uncertain, consider using CAC to improve specificity**. If statins are indicated, reduce LDL-C levels by ≥30%, and if 10-year risk is ≥20%, reduce LDL-C levels by ≥50%.
- In adults 40 to 75 years of age without diabetes mellitus and with LDL-C levels ≥70 mg/dl-89 mg/dl (≥1.8-4.9 mmol/L), at a 10-year ASCVD risk of ≥7.5%-19.9%, **if a decision about statin therapy is uncertain, consider measuring CAC**. **If the CAC score is zero, treatment with statin therapy may be withheld or delayed**, except in cigarette smokers, those with diabetes mellitus, and those with a strong family history of premature ASCVD. A CAC score of 1-99 favors statin therapy, especially in those >55 years of age. **For any patient, if the CAC score is ≥100 Agatston units or ≥75th percentile, statin therapy is indicated** unless otherwise deferred by the outcome of clinician–patient risk discussion.

United Kingdom's National Health Service Guidelines for Chest Pain Recommend Heart CT Scan for Chest Pain[4]

- Updates to United Kingdom's national guidelines for chest pain involve recommendations that "**cardiac CT is the first-line investigation for patients** presenting with new-onset chest pain due to suspected coronary artery disease because of the **diagnostic accuracy and cost effectiveness**"[16]
- "If a patient's pre-test likelihood of significant cardiovascular disease was low (10–29%), **a coronary artery calcium score was the recommended first-line investigation** with subsequent CT coronary angiography if the calcium score was between 1 and 400 Agatston Units"[16]



The Importance of Coronary Artery Calcification Screening: Case Study

An asymptomatic 55-year-old white with unremarkable cardiovascular risk factors (no hypertension, no smoking, no diabetes, lipids: TC:222; TG:122; HDL:42; LDL:156, family history: father is alive at 78; had a myocardial infarction at 50 and 55; had CAB; athletic) presents a 10-year atherosclerotic cardiovascular disease (ASCVD) risk score of 6.6%. With this ASCVD risk score, providers may consider prescribing a statin or aspirin and discuss lifestyle management, however a coronary artery calcification scan shows a calcium score of 1153 (shown left). The risk factors described, taken with the calcium score, indicate that the patient is at high risk for cardiovascular disease and it is recommended that a statin and aspirin are prescribed along with intensifying lifestyle management.

Take Action

Stanford Health Care, LA BioMed in Los Angeles, UC Davis Health Preventive Cardiology and Gundersen Health System are lowering the barrier to receiving the coronary artery calcium scan as a preventive screening test by offering it to patients for a cash price of $200 or less to receive this precision prevention information for understanding patients' actual risk profile.

Results from our informal survey of price and availability for consumers to receive the heart CT scan to learn their CAC score can be found at this link.

Occupational Use of Coronary Artery Calcification CT Scan

This scan is used as a tool in determining fitness for duty by predicting cardiovascular risk and yielding actionable information to prevent heart attacks and strokes.

- **The President of the United States**
  - After President Clinton's heart attack, **the Coronary Calcium CT Scan was added to presidential physicals to enable a more preventive approach to protecting the President's health. This test enables greater clarity on whether cardiovascular medications are needed, and at what dose, as well as needed lifestyle modifications.**
- **Astronauts**
  - Astronauts' medical assessments include calculating a 10-year cardiovascular Framingham Risk Score, measuring high-sensitivity C-reactive protein levels and **using coronary artery calcium scores** to screen for cardiovascular disease and decrease the likelihood of a crewmember experiencing a cardiac event during spaceflight.[17]
  - The 2014 NASA Human Research Program Investigators' Workshop developed a tool **using CAC scores** along with other risk factors to calculate astronaut cardiovascular health and risk.[18]
- **Firefighters**
  - Cardiovascular disease contributes to 45% of on-duty fatalities and is the leading cause of on-duty death among firefighters.[16]
  - Forward leading fire departments across the country, such as Los Angeles, CA and Gwinnett County, GA have determined this scan to **be useful for preventing cardiovascular events and are also cost saving**.[19,20]

Coronary Artery Risk Development in Young Adults (CARDIA) (1985-Present) is a prospective community-based study examining the development and determinants of clinical and subclinical cardiovascular disease and their risk factors. CARDIA includes over 5,000 black and white participants aged 18 to 30 years from multiple national sites including Kaiser. The following table shows that **by age 45, 1 in 20 women and 1 in 7 men already have coronary calcium, which puts them at high risk for heart attacks and strokes, many of which are preventable with generic medications.**

Table 1 **Prevalence of CAC at Year 15 in the CARDIA Study, 2000 to 2001**

	n	%	p Value
Any CAC			
Overall	3,043	9.6	
Race-gender group			<0.0001
African-American women*	800	4.9	
African-American men†	576	11.3	
White women*	860	5.2	
White men†	807	17.6	
Gender			<0.0001
Men	1,383	15.0	
Women	1,660	5.1	
Age			<0.0001
33 to 39 yrs	1,464	5.5	
40 to 45 yrs	1,579	13.3	
Agatston score			
>0–10	95	3.1	
>10–20	46	1.5	
>20–100	102	3.3	
>100–400	40	1.3	
>400	8	0.3	

*p = 0.76, African-American versus white women. †p = 0.001, African-American versus white men.
CAC = coronary artery calcium.

Loria, C. M., et al. (2007). "Early Adult Risk Factor Levels and Subsequent Coronary Artery Calcification: The CARDIA Study." Journal of the American College of Cardiology 49(20): 2013-2020.

Coronary Artery Calcification Screening Additional Materials

1) Precision Medicine for Early Detection and Treatment of Coronary Artery Disease for People without Symptoms – Preventive Cardiology Expert Panel
   - Right Care Initiative Leadership Summit Presentation: https://rightcare.berkeley.edu/wp-content/uploads/2015/11/6.-M.-Expert-Panel-Maron-ARS.pdf
   - Video: Part 1: https://www.youtube.com/watch?v=Lx3w_kc7BNY
     Part 2: https://www.youtube.com/watch?v=_cjpYbADJ9c
     Part 3: https://www.youtube.com/watch?v=znvbrFeWfYs
2) Studies Featured/ Further Readings
   - The Multi-Ethnic Study of Atherosclerosis (MESA) (MESA is a medical research study involving more than 6,000 men and women from six communities in the United States. MESA is sponsored by the National Heart Lung and Blood Institute of the National Institutes of Health)
   - Coronary Artery Risk Development in Young Adults (CARDIA) (1985-Present) is a prospective community-based study examining the development and determinants of clinical and subclinical cardiovascular disease and their risk factors. CARDIA includes over 5,000 black and white participants aged 18 to 30 years from multiple national sites including Kaiser.
     - Association of Coronary Artery Calcium in Adults Aged 32 to 46 Years with Incident Coronary Heart Disease and Death (Jama Cardiology 2017) is one example of an article utilizing the CARDIA Study.
   - The St. Francis Heart Study (Treatment of Asymptomatic Adults with Elevated Coronary Calcium Scores with Atorvastatin, Vitamin C, and Vitamin E)
   - The EISNER Study (Early Identification of Subclinical Atherosclerosis by Noninvasive Imaging Research)
   - The COURAGE Trial (Optimal Medical Therapy with or without percutaneous coronary intervention (PCI) for Stable Coronary Disease)
   - 2018 ACC/AHA Guideline on the Management of Blood Cholesterol
   - 2010 ACCF/AHA Guideline for Assessment of Cardiovascular Risk in Asymptomatic Adults
   - 2013 European Society of Cardiology Guidelines on the Management of Stable Coronary Artery Disease
3) Irish Heart Disease Awareness' video Widowmaker (discusses evidence-base for using the CAC scan for proactive screening similar to a mammogram for the heart, but with much less frequency): Irish Heart Disease Awareness – Heart Attacks, The Facts

About the Right Care Initiative

Since 2007, the Right Care Initiative's goal has been to apply scientific evidence and outcomes improvement strategies to reduce cardiovascular and diabetes morbidity and mortality through a collaborative focus on achieving measurable quality goals where performance metrics indicate that evidence-based, life-saving practices are not fully deployed. 2017 data from the California Office of Statewide Health Planning and Development indicate that **annually approximately 298,000 Californians are hospitalized for heart attacks and strokes,** approximately 100,000 of them younger than age 65. According to the US Centers for Disease Control, in 2017, **94,343 California deaths were caused by heart disease, stroke, diabetes, and hypertension** (62,797; 16,355; 9,595; 5,596 respectively). Many of these could be prevented with evidence-based preventive patient management, clinical quality improvement and adoption of best practices to implement best medical knowledge. Our work is focused in these high-leverage areas of better management of cardiovascular disease and diabetes, with particular emphasis on control of blood pressure, cholesterol and blood sugar, and is informed by data from Integrated Health Care Association, the National Committee for Quality Assurance, the federal Agency for Health Care Quality and Research, the Commonwealth Foundation, CMS, and the US Centers for Disease Control and the NIH.

The Right Care Initiative, operated by the UC Berkeley School of Public Health, was publicly launched with the Department of Managed Health Care, NCQA and the Deans of UC Berkeley and UCLA Schools of Public Health in March 2008 at the 1st annual Clinical Quality Improvement Leadership Summit. Since the first leadership summit, more than a dozen Right Care summits have been held around the state, along with over 250 University of Best Practices. Each Right Care gathering is a collaborative effort to close the gap between science and practice to improve patient outcomes working with medical directors, pharmacy and quality improvement directors, as well as thought leaders in evidence-based medicine.

More information on The Right Care Initiative can be found at: https://RightCare.Berkeley.edu/

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*Dr. Joseph Sky's views do not reflect an official position of the military.

Top 10 Take-Home Messages to Reduce Risk of Atherosclerotic Cardiovascular Disease through Cholesterol Management

Grundy SM, et al. 2018 Cholesterol Clinical Practice Guidelines

1. In all individuals, emphasize a heart-healthy lifestyle across the life course. A healthy lifestyle reduces atherosclerotic cardiovascular disease (ASCVD) risk at all ages. In younger individuals, healthy lifestyle can reduce development of risk factors and is the foundation of ASCVD risk reduction. In young adults 20 to 39 years of age, an assessment of lifetime risk facilitates the clinician–patient risk discussion (see No. 6) and emphasizes intensive lifestyle efforts. In all age groups, lifestyle therapy is the primary intervention for metabolic syndrome.

2. In patients with clinical ASCVD, reduce low-density lipoprotein cholesterol (LDL-C) with high intensity statin therapy or maximally tolerated statin therapy. The more LDL-C is reduced on statin therapy, the greater will be subsequent risk reduction. Use a maximally tolerated statin to lower LDLC levels by ≥50%.

3. In very high-risk ASCVD, use a LDL-C threshold of 70 mg/dL (1.8 mmol/L) to consider addition of non-statins to statin therapy. Very high-risk includes a history of multiple major ASCVD events or 1 major ASCVD event and multiple high-risk conditions. In very high-risk ASCVD patients, it is reasonable to add ezetimibe to maximally tolerated statin therapy when the LDL-C level remains ≥70 mg/dL (≥1.8 mmol/L). In patients at very high risk whose LDL-C level remains ≥70 mg/dL (≥1.8 mmol/L) on maximally tolerated statin and ezetimibe therapy, adding a PCSK9 inhibitor is reasonable, although the long-term safety (>3 years) is uncertain and cost effectiveness is low at mid-2018 list prices.

4. In patients with severe primary hypercholesterolemia (LDL-C level ≥190 mg/dL [≥4.9 mmol/L]), without calculating 10-year ASCVD risk, begin high-intensity statin therapy without calculating 10- year ASCVD risk. If the LDL-C level remains ≥100 mg/dL (≥2.6 mmol/L), adding ezetimibe is reasonable. If the LDL-C level on statin plus ezetimibe remains ≥100 mg/dL (≥2.6 mmol/L) and the patient has multiple factors that increase subsequent risk of ASCVD events, a PCSK9 inhibitor may be considered, although the long-term safety (>3 years) is uncertain and economic value is low at mid-2018 list prices.

5. In patients 40 to 75 years of age with diabetes mellitus and LDL-C ≥70 mg/dL (≥1.8 mmol/L), start moderate-intensity statin therapy without calculating 10-year ASCVD risk. In patients with diabetes mellitus at higher risk, especially those with multiple risk factors or those 50 to 75 years of age, it is reasonable to use a high-intensity statin to reduce the LDL-C level by ≥50% (2018 AHA/ACC Guideline on the Management of Blood Cholesterol).

6. In adults 40 to 75 years of age evaluated for primary ASCVD prevention, have a clinician–patient risk discussion before starting statin therapy. Risk discussion should include a review of major risk factors (e.g., cigarette smoking, elevated blood pressure, LDL-C, hemoglobin A1C [if indicated], and calculated 10-year risk of ASCVD); the presence of risk-enhancing factors (see No. 8); the potential benefits of lifestyle and statin therapies; the potential for adverse effects and drug–drug interactions; consideration of costs of statin therapy; and patient preferences and values in shared decision-making.

7. In adults 40 to 75 years of age without diabetes mellitus and with LDL-C levels ≥70 mg/dL (≥1.8 mmol/L), at a 10-year ASCVD risk of ≥7.5%, start a moderate-intensity statin if a discussion of treatment options favors statin therapy. Risk-enhancing factors favor statin therapy (see No. 8). If risk status is uncertain, consider using coronary artery calcium (CAC) to improve specificity (see No. 9). If statins are indicated, reduce LDL-C levels by ≥30%, and if 10-year risk is ≥20%, reduce LDL-C levels by ≥50%.

8. In adults 40 to 75 years of age without diabetes mellitus and 10-year risk of 7.5% to 19.9% (intermediate risk), risk-enhancing factors favor initiation of statin therapy (see No. 7). Risk-enhancing factors include family history of premature ASCVD; persistently elevated LDL-C levels ≥160 mg/dL (≥4.1 mmol/L); metabolic syndrome; chronic kidney disease; history of preeclampsia or premature menopause (age <40 years); chronic inflammatory disorders (e.g., rheumatoid arthritis, psoriasis, or chronic HIV); high-risk ethnic groups (e.g., South Asian); persistent elevations of triglycerides ≥175 mg/dL (≥1.97 mmol/L); and, if measured in selected individuals, apolipoprotein B ≥130 mg/dL, high-sensitivity C-reactive protein ≥2.0 mg/L, ankle-brachial index <0.9 and lipoprotein (a) ≥50 mg/dL or 125 nmol/L, especially at higher values of lipoprotein (a). Risk-enhancing factors may favor statin therapy in patients at 10-year risk of 5-7.5% (borderline risk).

9. In adults 40 to 75 years of age without diabetes mellitus and with LDL-C levels ≥70 mg/dL- 189 mg/dL (≥1.8-4.9 mmol/L), at a 10-year ASCVD risk of ≥7.5% to 19.9%, if a decision about statin therapy is uncertain, consider measuring CAC. If CAC is zero, treatment with statin therapy may be withheld or delayed, except in cigarette smokers, those with diabetes mellitus, and those with a strong family history of premature ASCVD. A CAC score of 1 to 99 favors statin therapy, especially in those ≥55 years of age. For any patient, if the CAC score is ≥100 Agatston units or ≥75th percentile, statin therapy is indicated unless otherwise deferred by the outcome of clinician–patient risk discussion.

10. Assess adherence and percentage response to LDL-C–lowering medications and lifestyle changes with repeat lipid measurement 4 to 12 weeks after statin initiation or dose adjustment, repeated every 3 to 12 months as needed. Define responses to lifestyle and statin therapy by percentage reductions in LDL-C levels compared with baseline. In ASCVD patients at very high-risk, triggers for adding non-statin drug therapy are defined by threshold LDL-C levels ≥70 mg/dL (≥1.8 mmol/L) on maximal statin therapy (see No. 3).

My Action Plan to Prevent Heart Attacks and Strokes

To drive down preventable heart attacks, strokes, and diabetes, I will personally & professionally:

____**Know My Numbers and teach others to know theirs** (keep Blood Pressure less than 130/80 [*optimally under 120/80*]; LDL Cholesterol less than 100 [less than 70 if heart disease is present]; HbA1c Blood Sugar less than 8. If coronary calcium score is greater than 0, discuss treatment such as statin and aspirin with doctor).

____**Take necessary evidence-based medications** (e.g. Statin, Blood Pressure & Diabetes medications *if prescribed by doctor/ clinical team*. Monitor doses to reach targets to prevent heart attacks, strokes, or diabetic complications).

____**Get preventive screenings to protect my heart, brain and body** (e.g. Blood Pressure; LDL Cholesterol; & Blood Sugar levels; & after age 40, ***especially if family history***, Heart CT scan to check Coronary Calcium score).

____ **Monitor blood pressure at home** using a home blood pressure monitor (if blood pressure is elevated)**.**

____ **Switch to a Plant- Centric Mediterranean Whole Foods eating (Fish, Vegetables, Fruits & Nuts; low salt, meat and cheese used as spice);** or CDC's Dietary Approaches to Stop Hypertension (DASH) diet

____ **Exercise 30 minutes every day, 7 days a week** (minimum of at least 150 minutes every week).

____ **Reduce stress & improve sleep quality** (sleep 7-8 hours per night, and cultivate activities that lift your spirits).

____ **Ask** a doctor if help is needed to stop smoking, drugs or alcohol.

My Team Action Plan to Prevent Heart Attacks and Strokes

- Name of physician with whom I will discuss my prevention plan for stroke and heart attack (including potential need for medication reconciliation and potential titration to reach your targets of LDL Cholesterol less than 100; blood pressure less than 130/80 and HbA1c Blood Sugar less than 8).
  Name: _____ Phone Number/email: _____
- Name of person who would take care of personal hygiene and finances if disabled by heart attack or stroke and unable to handle selfcare (unlikely if control targets for BP, LDL-Cholesterol and Blood Sugar met)*
  Name: _____ Phone Number/email: _____
- Name of the spiritual advisor, rabbi, priest, minister, friend or family member that you would want others to contact in the event of a health care crisis.
  Name: _____ Phone Number/email: _____

Most Heart Attacks, Strokes are Preventable if you take ACTION.

Reduce chance of having a heart attack or stroke by following recommendations on the other side of this card.

Visit https://RightCare.Berkeley.edu for more information.

Early Identification and Treatment of Women's Cardiovascular Risk Factors Prevents Cardiovascular Disease, Saves Lives, and Protects Future Generations

Cardiovascular diseases (CVD) including heart attacks, strokes, heart failure, and uncontrolled hypertension are leading causes of death among women of all ages[1]. These conditions strike women at younger ages than is commonly understood, causing death, disability, and family devastation. Despite efforts to increase awareness about CVD among women, over the past decade there has been stagnation in the reduction of CVD in women, and CVD among younger women and women of color has in fact increased[2]. Many heart attacks, strokes, and hypertensive conditions are preventable with early detection and awareness of risk factors. Lifestyle changes and better application of guideline-based care can prevent premature deaths from CVD[3]. Conversely, women's retention of adverse lifestyles, along with provider underestimation of women's risk categorization and failure to identify and treat CV risks and clinical disease, can widen gender disparities in CVD prevention[4].

There is a misperception that CVD is not an issue for women until after menopause. The data speak otherwise. In 2019, the total CVD (e.g., hypertensive, ischemic heart, and cerebrovascular disease) crude death rates per 100,000 United States women occurred at higher rates than breast and cervical cancer, combined, from age 35+ (**Table 1**)[1]. Women are more likely to die from CVD than from any other condition, including those women aged 35-44, 45-54, and 55-64 years of age[5]. Additionally, young women ages 18-35 have 44% more ischemic stroke than men[6], and stroke is a leading cause of death among Black women[7]. CVD also accounts for about 33% of the rising maternal deaths. Thus, young women are especially important to target for screening, treatment, and research because CVD prevention during this life stage can have great personal and societal health benefits[8].

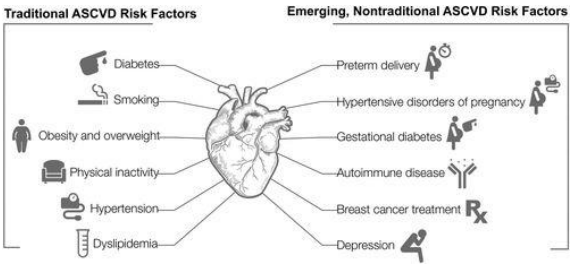
Table 1: Age-Stratified Crude Death Rates per 100,000 Women – US (2019).

Age	Hypertensive Diseases (I10-I15)	Ischemic Heart Diseases (I20-I25)	Cerebrovascular Diseases (I60-I69)	Total HTN, IHD & Cerebrovascular Diseases	Breast Cancer (C50)	Cervical Cancer (C53)
35-44 years	3.6	5.5	3.7	12.8	9.2	2.6
45-54 years	9.7	20.5	10.6	40.8	22.2	4.1
55-64 years	21.0	61.0	24.6	106.6	40.4	4.6

Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999-2019 on CDC WONDER Online Database, released in 2020. Data are from the Multiple Cause of Death Files, 1999-2019, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Accessed at http://wonder.cdc.gov/ucd-icd10.html on Oct 25, 2021.

While women have many traditional cardiovascular risk factors including dyslipidemia, some risks - including smoking and diabetes - have a greater impact on coronary heart disease risk in women compared with men[9]. Women may also be at risk for heart attack and stroke based on adverse pregnancy outcomes, hormonal factors which change over time, and increased rates of autoimmune conditions (lupus/rheumatoid arthritis)[10,11] (**Figure 1**)[12]. Women also have high rates of depression and other conditions that impact pro-inflammatory factors, thus increasing their vulnerability to CVD. Moreover, being African American, being pregnant at older ages (>35 years), or having obesity boost maternal risk[13]. CVD risk factors can also adversely impact the fetus and contribute to future CVD risk in the next generation[14]. With a trend towards pregnancies later in life, more attention is needed to identify and manage women's CVD risk in the pre-conception period.

Figure 1: Traditional versus emerging, non-traditional ASCVD risks among women



Despite these known risks, young women are less likely to be screened, provided with early preventive care, achieve targets for cholesterol or HbA1c, reach target blood pressure goals, and are less aggressively treated with medical therapies and percutaneous or surgical interventions despite studies showing benefits in women and men[15,4] (**Figure 2,** see last page)[16]. Despite similarities in medication exposure, women are less likely than men to achieve BP, LDL-cholesterol, and HbA1c targets after a coronary event, highlighting the importance of achieving risk factor control earlier in life[17]. Another factor to be considered is that, in many situations, pharmacological treatment is begun too

late, when non-reversible atherosclerotic plaque is already established. This is one justification for primordial (lifestyle and diet) and primary prevention with an aim of ASCVD risk mitigation. Pharmacologic management of BP, diabetes, and dyslipidemia is safe and effective in at-risk young women[2]. The "black box" warning for statins in pregnancy has also been removed due to evidence of safety[18].

Early CV risk factor analysis and diagnostics can identify risks and predict CVD in young women. The updated 2020 Recommendation for the Prevention of CVD in women[19] considers the presence of polycystic ovary syndrome, premature menopause, and pregnancy-associated conditions like preeclampsia, gestational diabetes mellitus, gestational hypertension, or systemic autoimmune collagen-vascular disease (e.g., lupus or rheumatoid arthritis) as risk-enhancing factors for future CVD. The joint 2018 AHA and American College of Obstetrics and Gynecology (Ob-Gyn) Presidential Advisory endorses having Ob-Gyn providers screen for CVD and cardiovascular risk factors in women by eliciting a full patient history to reveal critical clues about patient risk factors and trigger appropriate referrals[20]. Preventive care decision-making also requires providers to have and use unbiased tools to assign women to the correct risk category so women can receive guideline-based care and recommended lifestyle changes, regardless of perceived health. Physicians targeting risk factors for treatment can reduce heart attacks and strokes.

A recent survey of US cardiologists, CV team members, and trainees showed that although CVD is the number-one cause of pregnancy-related deaths in the US, there are significant gaps in knowledge and confidence among providers pertaining to care of pregnant and postpartum women with CVD. This finding supports the need for developing new standards for training and educating members of the cardiology and obstetrics workforce to optimize the care provided to young mothers, and to facilitate the expansion of dedicated cardio-obstetrics centers[21]. These efforts will improve the care we provide to women at risk for CVD who are planning or experiencing pregnancy, and may help reverse the alarming increase in rates of maternal morbidity and mortality experienced in the United States.

The American Heart Association (AHA) constructed the 2020 Impact Goal to improve the cardiovascular (CV) health of all Americans with 7 health metrics defining ideal CV health[22]. Based on 4 behavioral factors (smoking, physical activity, diet, and weight) and 3 health factors (total cholesterol, blood pressure, and metabolic-blood sugar control), scores are divided into ideal, intermediate, or poor levels of attainment.

Providing feedback to patients about their risk level and tracking their progress can be a simple way to improve behaviors. Preventive care includes empowering women to know their blood pressure and cholesterol numbers, supporting women in achieving healthy lifestyle (non-smoking, physical activity, plant-centric Mediterranean diets), and understanding the many social determinants of health that can impact adoption of a healthy lifestyle[23]. Motivational interviewing and team-based care can support a variety of behavior changes, with evidence strongest for smoking cessation, physical activity changes, and behavior changes among persons with metabolic syndrome[24].

Figure 3: 1 in 20 Women have Atherosclerosis (based on Coronary Artery Calcium Scores) by Age 45, Indicating Need for Preventive Treatment

Coronary Artery Calcium indicates subclinical atherosclerosis
Adapted from Table 1 of Loria CM, Liu K, Lewis CE, et al.. Early Adult Risk Factor Levels and Subsequent Coronary Artery Calcification. *Journal of the American College of Cardiology*. 2007;49(20):2013-2020. doi:10.1016/j.jacc.2007.03.009 (based on data from the CARDIA Study of Atherosclerosis 1985-Current).

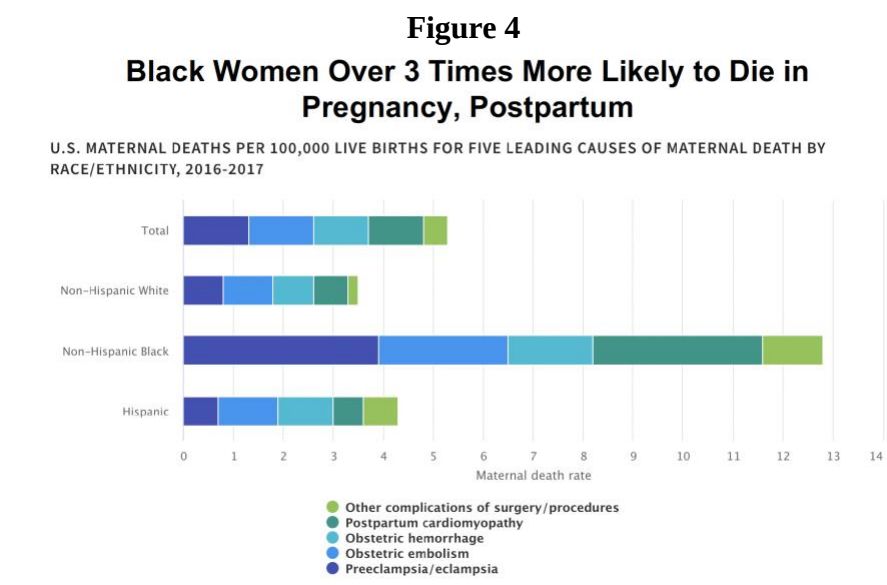
The NIH-funded CARDIA study of atherosclerosis among the young (conducted at Kaiser research clinics and other national centers since 1985) found that by age 45, approximately 1 in 20 women already test positive for calcium deposits in their coronary arteries, concrete evidence of established atherosclerosis and that biological mechanisms leading to heart attack and stroke are already in motion, likely to progress if left untreated **(Figure 3)**[5]. This level of subclinical atherosclerosis among women is well known based on information from little-used heart CT scans with a low category of radiation exposure, similar to the category of mammography. However, while heart CT findings that are positive for calcium in the coronary arteries indicate higher risk for heart attacks and strokes, optimal lifestyle and medication management can reduce this risk. Finding these vulnerable women and prioritizing them for preventive therapies is key.

Women's reproductive lifestage offers a unique opportunity to identify and reduce CV risk given 86% of women will have a pregnancy[25]. Adverse pregnancy outcomes (e.g., hypertensive disorders of pregnancy, small-for-gestational-age birth, preterm birth, and stillbirth) are prevalent in *more than one in five women*[26], most commonly in non-Hispanic black women (**Figure 4**), and independently are associated with CV risk, indicating that adverse pregnancy outcomes require careful monitoring[27]. The need for risk assessment and follow-up before, during, and after pregnancy[28,29] is evident in multiple guidelines including those from AHA.

Pregnancy is a time of both increased healthcare usage as well as increased motivation[30], which can be leveraged to support lifestyle changes such as exercise[31] and Mediterranean diet[32] that improve both pregnancy outcomes and lifelong cardiovascular health. Many women will be motivated by the prospect of improving outcomes for their baby, highlighting the importance of informing women that supporting their own prenatal health will confer benefits to their child after birth. Efforts to address pregnancy risks, such as identifying and treating gestational diabetes, and prescribing prenatal aspirin[33] for pre-eclampsia prevention, can be accompanied by education about associated future CV risks and how to continue to assess and mitigate those risks. In the postpartum period, programs such as transition clinics and group visits, as well as telehealth interventions, are being developed that can help maintain care linkages and lifestyle changes so that ongoing CV risk can be addressed[34].

Peripartum depression is a comorbidity in many adverse pregnancy outcomes, and represents a barrier to ongoing engagement with care, yet only a minority of women (18%) seek treatment for perinatal depression[35]. Many women may not engage with mental healthcare nor want to take anti-depressant medications[36].
A range of options to improve mental health, including mindfulness[37] and sleep interventions[38], may be useful adjuncts and can be part of an anti-inflammatory lifestyle that improves cardiovascular risks. Increased provider awareness of cardiovascular risks conferred by adverse pregnancy outcomes, treatment of comorbid postpartum depression, and awareness of other challenges to patient engagement such as demands of new parenting, as well as studies of interventions that help black, brown, and Indigenous women, will be essential.

Figure 4



Policy Recommendations

1) Consistently implement current guidelines for CVD risk factor screening and treatment in women. For example, the Right Care Initiative's NIH-funded San Diego demonstration project to drive guideline-based care was associated with rapid reductions in heart attack hospitalizations for women (**Figure 5,** see next page)[39];
2) Increase identification of very young women with familial hypercholesteremia and early onset hypertension;
3) Improve uptake of physician/mid-level provider CVD risk factor screening and treatment during women's reproductive age period, including screening for adverse pregnancy outcomes;
4) Expand post-partum Medicaid for at least 12 months to allow for risk assessment and treatment post-delivery.

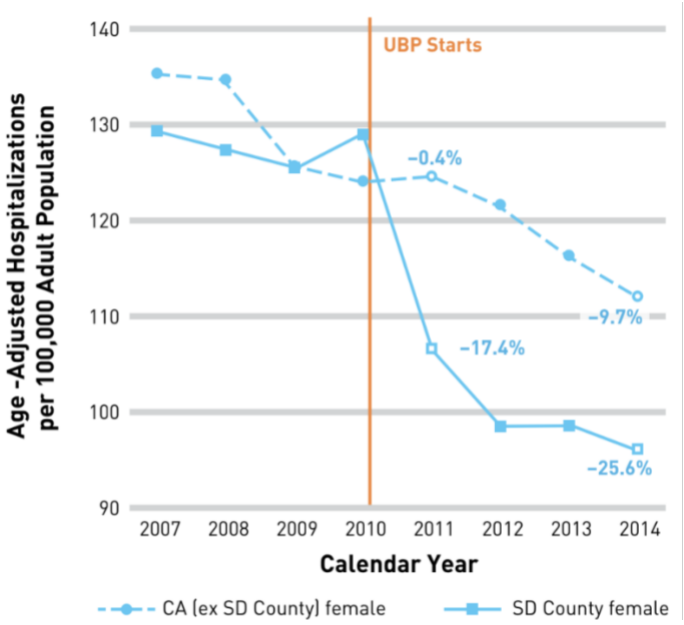
Figure 5: Rapid Progress Possible for Women with Guideline Directed Therapy

Age-Adjusted Hospitalizations per 100,000 Women for Heart Attacks in California, 2007 to 2014

"CA (ex SD County)" indicates California excluding San Diego County;

SD County = San Diego County;
UBP = University of Best Practices.

[a]The Right Care Initiative's initial University of Best Practices (UBP**)** started in February 2011 just after the 2010 data points. Percentages are percent changes since 2010. This NIH-funded Right Care Demonstration Project was associated with rapid improvement.



Source: Fulton, Ivey, et al., 2017 (California Office of Statewide Health Planning and Development's 2007 to 2014 Patient Discharge Data).

Take Action, Utilize Policy Levers

1. Promote periodic screening for risk factors including blood pressure, lipids/cholesterol, diabetes for all women starting at 18-21 years, with calculated ASCVD risk score use among women 40 years or older. Advocate for improved risk scoring models for women.
2. Consider coronary artery calcium (CAC) screening for those with *intermediate risk* per current guidelines[40]. For those with family history of early heart attacks and strokes, offer the heart CT when the patient is 10 years younger than when an immediate family member suffered a heart attack or stroke.
3. Enhance Ob-Gyn and PCP education on reproductive age cardiovascular disease (CVD) risk markers, and that follow-up is needed, including extended post-partum follow-up.
4. Offer Coaching/Motivational Interviewing to support behavior change. Teach pregnant women to monitor BP at home. Teach young women to use self-measured blood pressure monitoring (SMBP) in child-bearing years: "Heart Healthy Mamas for Healthy Babies".
5. Fund demonstration projects using different care models: for instance, NPs embedded in Ob-Gyn practices to screen for CVD and risks; pre-partum and post-partum health coaching; consistent referral to Primary Care (Family Medicine, Internal Medicine, nurse practitioners); and team-based care models that include pharmacist protocol management of high blood pressure and lipids.
6. Create a Stop High Blood Pressure consult line (for providers and patients) and provide other support resources with actions consumers can take, modeled after the California tobacco quit line.
7. Require inclusion of adverse pregnancy outcomes in the Electronic Health Record with reminder systems to follow-up on hypertension post-partum (e.g., LADDR UC EHR registry, or other registries).

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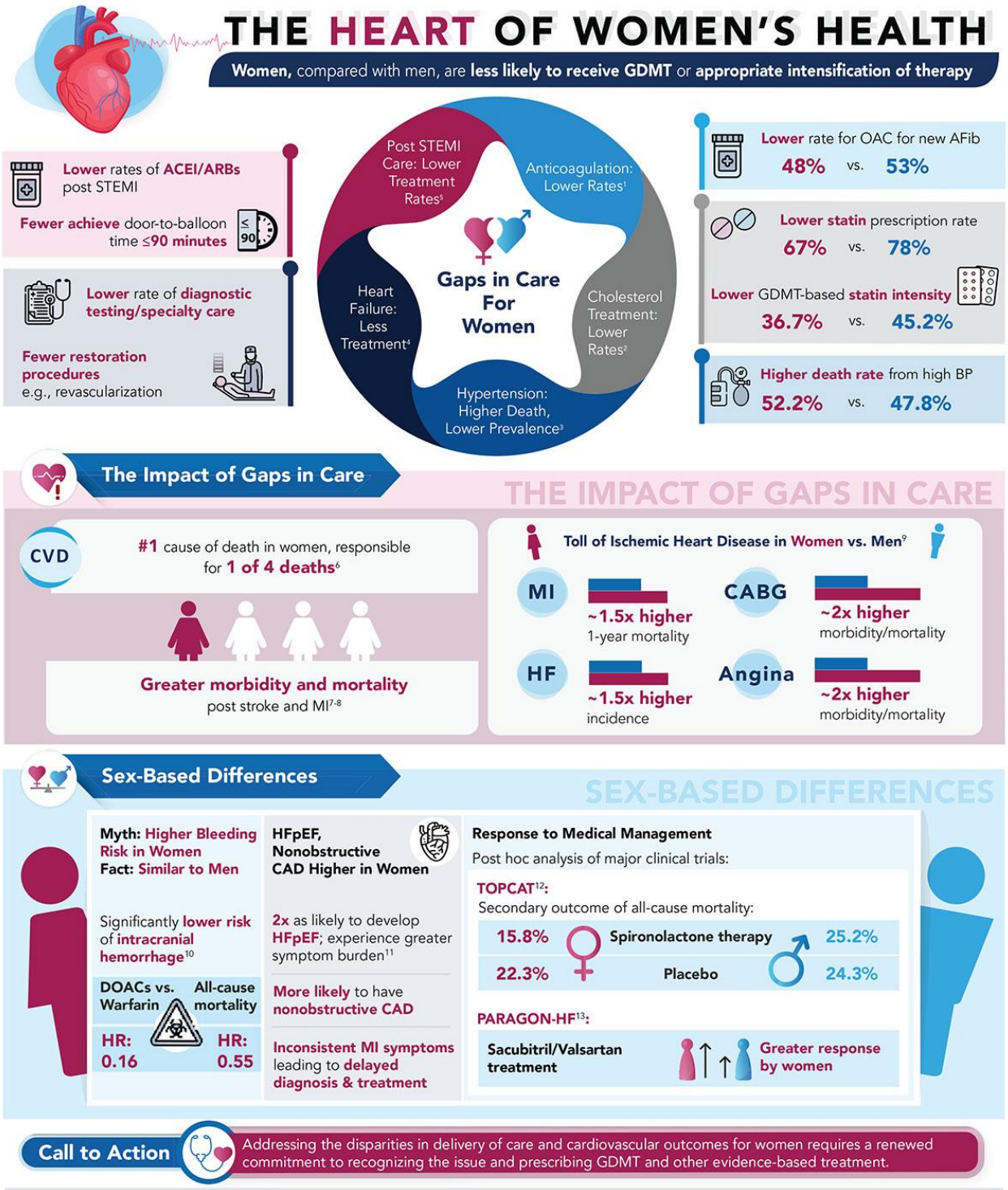
Figure 2



Abbreviations:
AFib: Atrial fibrillation | CABG: Coronary artery bypass grafting | CAD: Coronary artery disease | CHD: Coronary heart disease | DOAC: Direct oral anticoagulant | HF: Heart Failure | HFpEF: Heart failure with preserved ejection fraction | HTN: Hypertension | ICH: Intracerebral hemorrhage | IHD: Ischemic heart disease | MI: Myocardial infarction

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Educational Grant Support Provided by:
Amarin, AstraZeneca, Bristol-Myers Squibb and Pfizer Alliance, and Novartis Pharmaceuticals Corporation

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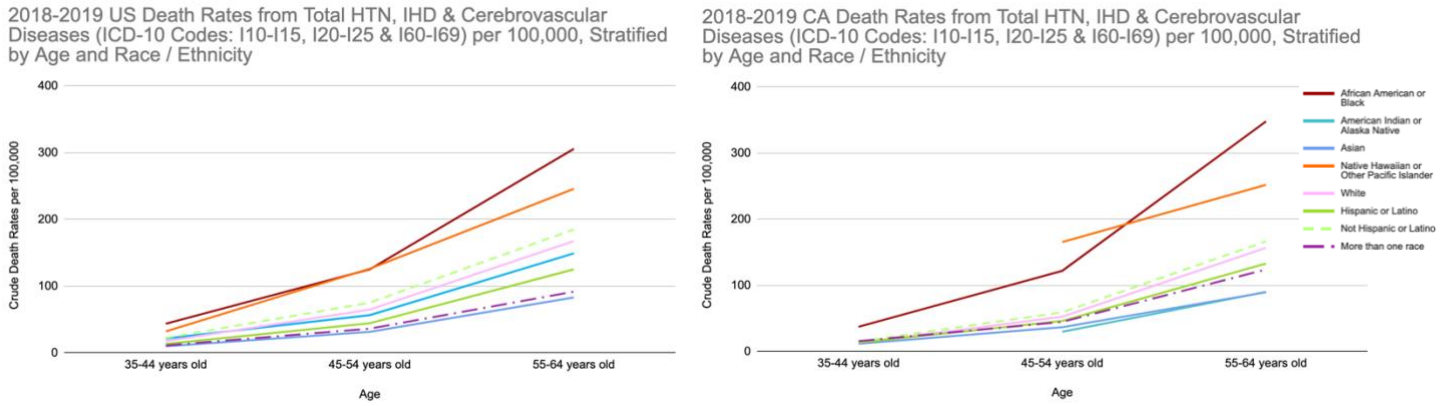
Improving Health Outcomes among African Americans: Addressing the Excess Burden of Heart Disease, Stroke, and Diabetes

In 2020, African Americans made up 12.4% of the United States (U.S.) population, and 6.5% of Californians[1,2]. African Americans experience excess risks for heart attack, stroke, diabetes, and other conditions like heart failure, chronic kidney disease, and peripheral arterial disease[3]. They carry a greater burden of chronic disease risks, often developing disease at younger ages,[4] and they experience significantly higher years of potential life lost. **Fig. 1** shows national and California 2018-2019 crude death rates per 100,000 population, stratified by age for hypertensive, ischemic heart, and cerebrovascular diseases. Cardiovascular deaths were nearly double for African Americans[1]. Stroke mortality rates are also significantly higher among African Americans than for other groups[5].

Figure 1: US vs CA Death Rates, Total HTN, IHD, & Cerebrovascular Diseases 2018-2019 - per 100,000, by Age & Race/Ethnicity



Source: CDC, 2021.[5] ICD-10 Codes: I10-I15 (hypertensive), I20-I25 (IHD) & I60-I69 (cerebrovascular).

Age-adjusted prevalence ratios (PRs) for cardiovascular diseases (CVD) using NHANES (1999-2006) and National Compressed Mortality File (5-year file for 1999-2003) for age-specific CVD mortality rates (MR) showed CVD mortality was higher in African Americans, especially at younger ages[6]. About 28% of deaths from CVD in African Americans occurred earlier than age 65, while 13% of CVD deaths occurred at <65 years for whites. Similar to mortality, CVD prevalence rates were higher in African Americans ages 35-44 years (PR 1.9, compared to whites), while the gap narrowed for those ages 65-74 years (PR 1.2 compared to whites). In a mortality study of young adults (1999 – 2019), heart failure (HF) age-adjusted MR (AAMR) per 100,000 for young adults increased from 2.36 in 1999 to 3.16 in 2019 for both men and women. AAMR also increased for all race/ethnicity groups, but African American adults had the highest AAMRs (6.41 in 1999; 8.58 in 2019)[7].

Racial Disparities in Acute Myocardial Infarctions and Strokes

AHA 2022 Statistical Update noted that incidence of acute myocardial infarctions (AMI) in African Americans exceeded rates in both male and female whites[8]. **Table 1** shows gradual improvement in U.S. age-adjusted AMI death rates (2013-2020) per 100,000, ages 35-64 years, for African Americans and whites, though African Americans continue to have higher overall mortality from AMI[5]. A longitudinal examination of AMIs (2000-2014) for Kaiser Permanente Southern California demonstrated that all groups experienced declines. AMI incidence rates in 2000 were significantly lower for African Americans, Asian/Pacific Islanders (API), and Hispanics, than rates for whites. Rates for APIs and Hispanics continued declining, remaining lower than in whites in 2014. Rates for African Americans and whites became similar, indicating a plateau in previously declining AMI rates of African Americans[9]. National Heart Lung and Blood Institute data (1995–2012), indicated that one year post-first AMI, African American working age adults, 45 to 64 years old, died at higher rates (9% in African American males, 10% in African American females) than did same-aged whites (3% in white males, 5% in white females)[8]. Post-MI, African American patients had lower risk-adjusted rates of receiving guideline-directed medical therapies (GDMT) like aspirin and lipid-lowering drugs, and received fewer indicated procedures like angiography and revascularization. Disparities in use of CVD preventive therapies were also seen in the Atherosclerosis Risk in Communities study. Hospitals were less likely to provide GDMT to African Americans.

A 2011 national study of over 27,000 strokes (2003-2007) in Reasons for Geographic And Racial Differences in Stroke (REGARDS) showed that *overall* age-adjusted stroke incidence rate ratio (IRR) for African American and white individuals was 1.5, whereas *in those aged 45 to 54 years* the IRR was 4.02, indicating there were more strokes and they occurred younger (ages 45-54 years) among African Americans compared with whites[10]. Premature deaths among working age adults, who are often active parents and grandparents, have multi-generational negative impacts on family economics, social structure, and emotional well-being.

Table 1: California Age-Adjusted Deaths per 100,000, Acute MI, Heart Failure, Cerebrovascular Diseases Age 35-64, Stratified by Race & Ethnicity (2013-2020)

	Acute Myocardial Infarction, Unspecified (I21.9)			Heart Failure (I50)			Cerebrovascular Diseases (I60-I69)		
Year	Black or African American	Asian or Pacific Islander	White	Black or African American	Asian or Pacific Islander	White	Black or African American	Asian or Pacific Islander	White
2013	18.1	7.5	12.3	5.9	1.3	1.9	23.2	11.6	11.1
2014	15.4	7.1	11.7	6.4	1.1	2.3	25.2	10.5	10.4
2015	17.2	8.3	12.3	8.4	1.2	2.7	24.5	11.6	10.5
2016	18.3	7.2	11.2	9.5	1.2	2.8	23.6	12.1	11.7
2017	14	6.8	11.3	9.1	1.6	2.8	24.1	11	11.3
2018	15.8	6.8	10	11.7	1.7	3.2	24.8	12.4	11.8
2019	16.9	6	9.5	11.7	1.5	3.6	23.4	11.7	11.9
2020	18.6	7.9	11.1	12.7	2	4.2	26.1	11.5	13

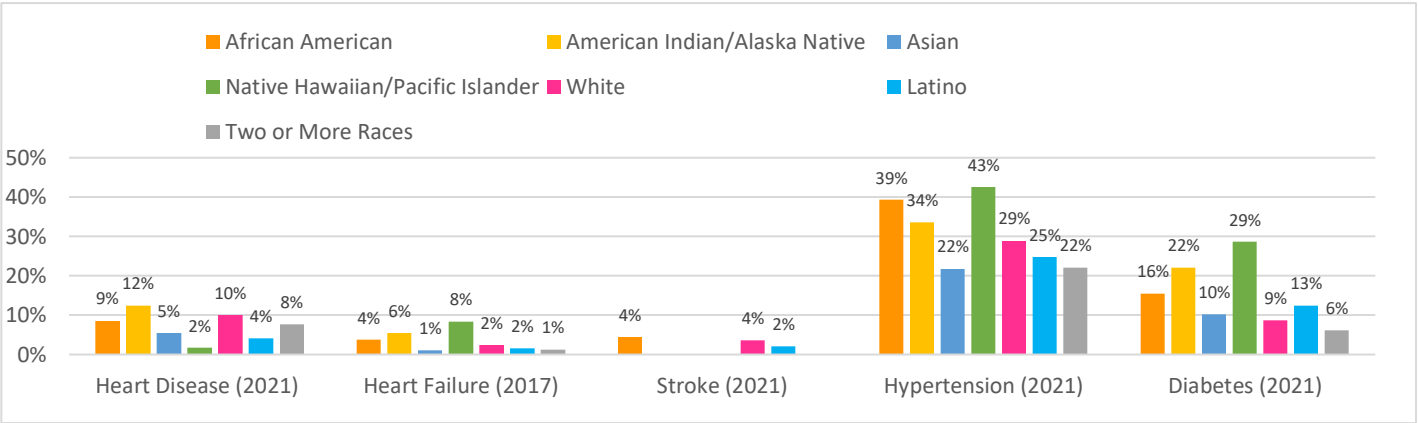
Source: CDC, 2021.[5] (ICD-10 code I21.9, I50, I60-69 – acute myocardial infarction, heart failure, cerebrovascular disease)

High performing health systems proactively deploy precision risk stratification earlier in the life course, coupling preventive care with GDMT. Private and government coverage policies should require the same standards.

Racial Disparities in Cardiovascular Disease, Stroke, and Diabetes

In 2021 Behavioral Risk Factor Surveillance Survey data (**Fig. 2**), African Americans' self-reported stroke rates (4.4%) are higher compared to all other racial groups (Whites 3.6%, Latinos 2.1%)[11]. In 2017 California Health Interview Survey (CHIS) data, 34% of African Americans self-reported hypertension (HTN), second only to Native Hawaiian/Pacific Islanders (43%)[11]. Self-reported HF is high for both also, with 4% of African Americans and 8% of NHPIs with HF. Diabetes was higher in NHPIs and African Americans (29% and 16%).

Figure 2: Self-reported rates of common cardiometabolic conditions, by Race/Ethnicity – California and US sources (2017-2021)



Source: California Health Interview Survey, AskCHIS (accessed Jan. 2023); Behavioral Risk Factor Surveillance Survey data (accessed Jan. 2023). [11]

Increased stroke prevalence is largely attributable to traditional CV risks (HTN, diabetes, BMI >25 kg/m², poor diet, or smoking). HTN is 40% more common in African Americans, who are also less likely to have controlled blood pressure (BP) than NH whites[12]. One longitudinal study (CARDIA) examined associations between BP and stroke incidence in young and middle-aged adults. The incidence of stroke about 26 years after entering the study was 76 per 100,000, similar for men and women. However, stroke incidence was significantly higher in African Americans (120 per 100,000) compared with whites (29 per 100,000), representing a 4-fold difference in stroke rates for African Americans.[13] Women's Health Initiative also showed a higher incidence of stroke (at all ages) in African American women compared with white women[14]. More information on women's CVD and stroke risks

appears in "Early Identification and Treatment of Women's Cardiovascular Risk Factors Prevents CVD, Saves Lives, and Protects Future Generations"[15,16].

Modifiable Risk Factors: CV risk factors contribute to both CVD and stroke, and they differ by race/ethnicity.

Diabetes (DM)

CDC Wonder data show that age-adjusted deaths for people with DM (ICD-10 E11) are higher for African Americans (10.9%) than for whites (7.0%)[5]. **Figure 2** shows African Americans self-report high rates of DM, a key risk factor for stroke and CVD. 1 in 4 adults diagnosed with stroke report having DM, while 1 in 2.5 adults reporting HF had DM[11]. NHANES data (2015-2018) estimated 9.8 million adults have undiagnosed DM[8]. NHANES data (2011-2014) found African Americans, Asians, and Hispanics had higher odds of *undiagnosed* DM than whites. African Americans were also twice as likely to have chronic kidney disease (linked to HTN and DM) compared to whites.[17] Studies suggest that lower screening thresholds, unique to race/ethnic groups, can potentially reduce disparities in diagnosing Type 2 DM[18,19].

Hypertension (HTN)

In the long-term observational CARDIA Study, adults aged 18-30 years old with no HTN were followed and evaluated for new-onset HTN, defined as 130 mmHg systolic, 80 mmHg diastolic or greater, or self-reported antihypertensive medication by age 55 years. African American men and women had higher cumulative incidence of HTN (74.5% and 75.7%, respectively) compared to white men and women (54.5% and 40.0%, respectively)[20]. According to American Heart Association, HTN prevalence in African Americans is the highest in the world. Moreover, HTN develops earlier for African Americans[21]. NHANES data (2017-18) compare age-adjusted HTN prevalence in non-Hispanic African American adults (57.1%) to rates in NH whites (43.6%) and Hispanics (43.7%)[12]. African Americans are among the top three racial/ethnic groups for high prevalence of HTN (**Fig.2**).

Cholesterol and other Lipid Disorders

As a key risk factor for atherosclerosis and CVD, control of high cholesterol promotes CV health, as long-term exposure to even modestly elevated high cholesterol can have impact later in life[8]. A 2018 study of NHANES data (2011-2014) showed no significant differences in the likelihood of African Americans being undiagnosed with high cholesterol[17]. However, for adults ages 45+ with diagnosed diabetes who enrolled in REGARDS, African Americans (57.8% males; 53.6% females) had lower statin use compared to whites (66.0% males; 55.0% females) and lower low-density lipoprotein cholesterol (LDL-C) control among African Americans (62.7% males; 56.0% females) than for whites (75% males; 69.0% females)[22]. Lipoprotein(a) is a stable biomarker for CV risk, recognized in clinical guidelines as an atherosclerotic CV risk enhancer, and can inform initiation of or intensifying of statin therapy[23]. The increased risk from elevated Lp(a) has not yet gained widespread recognition by practicing physicians[24]. The INTER-HEART Study established the usefulness of Lp(a) to assess AMI risk in ethnically diverse populations, demonstrating wide racial/ethnic differences in Lp(a) levels as well as differences in risk of AMI conferred by elevated Lp(a)[25]. Mean Lp(a) levels are almost twice as high in African Americans as in whites [26–28]. Unlike acquired, modifiable risk factors, levels of Lp(a) are genetically determined and not modified by lifestyle; therapies to reduce Lp(a) are currently being investigated[28]. Populations that are especially vulnerable to adverse effects of elevated Lp(a) include people with family history of early onset ASCVD disease such as stroke, Familial Hypercholesteremia, T2DM, and autoimmune conditions (e.g., lupus, rheumatoid arthritis), placing them at risk of accelerated atherosclerotic disease. High-risk individuals over age 20 should be screened for this biomarker[29].

Tobacco

Tobacco use is a key preventable risk factor for CVD, dramatically impacts health worldwide, and causes 10% of CV deaths[30]. California's successful anti-smoking policies (including a free Quitline[31]) produce lower smoking rates than nationally. African Americans continue to be disproportionately burdened by tobacco use (10.8%) compared to whites (8.2%). They also experienced the lowest decline in self-reported current smoking from 2018 (12.3 % African American and 11.5% white) to 2021 (10.8% African American and 6.2% white)[11]. California's strong anti-tobacco policies reduced smoking rates, but may need fine-tuning to work better for African Americans. Higher smoking rates in the African American community may be due to years of targeted marketing

of menthol-flavored cigarettes. With the passage of a ban on menthol in California and some other states[32], future policy successes may include African Americans having improved rates of smoking cessation.

Overweight/Obesity

According to CDC, people with body mass index (BMI) of 25 to <30 kg/m^2, vs. 30 kg/m^2+, are categorized as overweight or obese, respectively[33]. Nationally, African Americans have high rates of obesity, along with American Indians/Alaska Natives, and Latinos. Pooled CHIS data (2018-2021) showed 31.3% of African Americans self-report being overweight and 39.1% self-report obesity compared to 33.1% and 24.2% for whites[11]. Being overweight or obese increases risks for pre-diabetes, Type 2 DM, and CVD.

Physical Activity/Inactivity

2018 Physical Activity Guidelines for Americans recommend that adults accrue >150 minutes of moderate intensity physical activity (PA) weekly, and muscle-strengthening activities at least 2 days/week[34]. 2018 NHIS data showed 57.5% of NH white adults met recommended levels of aerobic PA; while only 47% of African Americans did[35]. NHIS prevalence of adults 18+ meeting both aerobic and muscle-strengthening is 30.5% for NH white men, 29.7% for African American men. For NH white women it was 24.3%, compared to African American women at 16.5%[36]. PA may be lower in neighborhoods with fewer safe places to exercise or higher air pollution rates. High performing health systems can use PA as a vital sign, promoting its importance with patients. Discussing PA with African American patients is key, given the lower average levels of PA, especially in women.

Effective Health System Actions:

Healthcare Access, Team-Based Care, and Guideline-Based Healthcare Can Help Improve Outcomes

The U.S. and California have made great strides to improve health insurance coverage in the last decade, including health insurance exchanges and Medicaid expansions[37]. California sponsors subsidies for health insurance, narrowing gaps in health insurance for residents <65, and augments care over national standards. In 2020, 7% of Californians were uninsured; rates were highest for Latinos (11%) and African Americans (5%)[38]. Having insurance is not the same as having access to high quality healthcare that improves health outcomes. NHANES national data have linked lack of health insurance to increased odds of undiagnosed DM and hyperlipidemia; whereas, recent visits to a medical provider lowered likelihood of undiagnosed HTN and DM[17].

Improving Medication Adherence Improves Outcomes

Lower medication adherence has been seen in African Americans and Hispanics, even in patients with private insurance or Medicare.[39] Gerber noted a lower "percent of days covered" by medication for African Americans and Hispanics, but no difference by race in prescription refills after adjusting for SES[40]. A recent study showed that African Americans with DM were less often prescribed recommended medications, especially new medications demonstrated to reduce CVD,[41] indicating differential physician prescribing by race.

Early Detection & Treatment of Asymptomatic Disease is Critical to Health Outcomes and Mortality

According to the CARDIA study, by age 45, 1 of 9 African American men, and 1 of 20 African American women already have subclinical atherosclerosis which, left untreated, contributes to heart attack and stroke[42]. It is treatable and definitively determined using a low-cost heart CT scan to find calcification of arteries (i.e., hardening of the arteries). These vulnerable patients found to have atherosclerosis are at high risk of heart attack and stroke, and must have blood pressure, cholesterol, and glucose carefully managed. Indicated medications must be optimized and titrated to achieve optimal LDL, BP, and (for diabetes) HbA1c targets. Based on family history, clinical judgement, GDMT, and ASCVD risk score (e.g., intermediate), early detection of subclinical atherosclerosis using heart CT can be considered. More guidance on using CAC score to predict CVD in intermediate risk people is in Right Care's detailed brief on "Coronary Artery Calcium Heart CT Screening for Early Detection of Atherosclerotic Plaque: Measuring Heart Attack Risk to Determine Need for Preventive Medication"[43](https://tinyurl.com/CACbrief). By late adolescence, appropriate screening includes measuring BP regularly, screening for tobacco use, and identifying young people with high risk family history, like lethal familial hypercholesterolemia, and prioritizing them for measurement of biomarkers like Lp(a) at age 20[44].

Implementing Evidence-based Approaches: Expanding Clinical and Community Care Teams to include Community Health Workers, Nurses, & Pharmacists, including in Faith-Based Communities

Strong evidence exists for clinic- and community-based interventions, including culturally-tailored interventions delivered in diverse settings (e.g., churches, other faith-based settings, barbershops, beauty parlors, community centers) and by various health workers[45]. A systematic review of clinical team-based care (TBC) that included 80 studies concluded there is strong evidence for TBC, with stronger effects when teams included nurses and pharmacists[46], resulting in a strong endorsement of TBC from the Community Preventive Services Taskforce. Results for the SPRINT clinical trial of intensive BP treatment demonstrated reductions in CV mortality when BP was reduced to <120 mmHg systolic[47]; SPRINT's recent follow-up study showed BP results were not maintained at 4.5 years[48]. Nasser's 2018 review of community outreach for African Americans[49] included an add-on study to *Target BP* (AHA/AMA program), adding CHWs to the clinical team. CHWs achieved improved BP control, from 61% of individuals controlled to nearly 90% controlled. Strategies included self-monitoring of BP, reducing pill burden, and addressing medication costs in a group of medically underserved patients, showing effectiveness of programs addressing medication barriers/costs and education on SMBP. Evidence is strong that community health workers (CHWs) such as promotoras, trained students, lay health coaches[50], parish nurses, and pharmacy techs provide effective, needed community-based education, promote access to care, and improve care for marginalized patient communities[49,51]. There is also 40 years of history of including barbers in HTN outreach for African American men, along with increasing rigor in intervention design and evaluation[49]. Victor's breakthrough 2018 cluster randomized study of adding pharmacists in Los Angeles barbershops showed significantly improved BP; compared to barbers alone (who achieved reduction of -9.3 mmHg), barbers plus community pharmacists who were empowered to adjust medications (using collaborative orders developed with physicians) achieved -27 mmHg[52]. Scaling-up is constrained by worker availability, costs, and payment models. For details see: Right Care Initiative Pharmacist on the Care team brief and our February 2023 Right Care University of Best Practices on *Tackling Disparities*.

Many faith-based interventions have been crafted by partnering with African American faith communities (e.g., Project Joy, HEALS[53], Turn the Beat Around[54], FAITH[55], etc.), including training laypersons to lead groups focused on varied clinically meaningful endpoints including BP reduction, weight reduction, PA improvement, and dietary change. Studies demonstrated significant systolic BP changes of -6 to -12 mmHg, weight reduction, PA increases, and improved medication adherence. A recent review of CV health interventions for African American women showed several programs impacted more than one CV risk factor[56]; all 3 studies with significant impacts on 3 CV risk factors were community-based (2 were in churches). These findings point to the conclusion that while healthcare access is essential, lifestyle behaviors often respond to community programs, and impact health outcomes like BP and PA. CDC's Diabetes Prevention Program (DPP) has also been culturally tailored as the *Change your Lifestyle, Change Your Life* program for African American women[57]. Key successes of tailored programs include improved community knowledge and ownership, enhanced capacity to support those with high BP or other cardiometabolic conditions, and a larger cadre of CHWs living and working in impacted communities.

Other Factors Driving Differences in Outcomes - Social Determinants of Health (SDOHs):

SDOHs influence economic, physical, psychological, and social environments of people, including factors like food supply, housing, transportation, education, health literacy, and health insurance. SDOHs influence health, healthcare access, and quality of life. Behavioral, environmental, and social determinants contribute to excess rates of CV events in African Americans[58]. People under chronic stress incur chronic conditions prematurely ("weathering"). This concept was examined with NHIS and other data for those >18 years, clustered in 10-year age groups, showing African Americans consistently had higher prevalence of HTN, stroke, and DM, compared to NH whites, for all ages. For any given age group, African Americans developed disease about 10 years before NH whites. This premature onset of chronic diseases may be partially attributed to structural factors impacting health, such as living in high risk, under-resourced areas with fewer opportunities to obtain higher education or build wealth, especially if a primary earner dies prematurely or becomes disabled. Environments in which great

effort is needed to cope contribute to earlier onset of multiple chronic illnesses (e.g., HTN, DM) via various physiologic pathways[58,59], including higher allostatic load at younger ages[60]. Deficits in basic resources like quality healthcare, education, and career opportunities can prevent populations from achieving optimal health[61]. Environmental inequities, unequal access to high quality healthcare, chronic stress, accumbent allostatic load, and discrimination all greatly impact chronic health conditions. Young African Americans have higher lifetime risk of CV conditions[14,62]. Economic disadvantages of marginalized groups contribute to adverse CV outcomes.

Health Systems Increasingly Address Food Insecurity & Poor Nutrition with Food as Medicine Programs
Progressive health systems (e.g., Geisinger, Cleveland Clinic, UC Davis Health) and federally-qualified health centers increasingly deploy *food as medicine* programs and teach the importance of plant-based nutritional patterns based on accruing evidence of positive impacts of fruit and vegetable consumption. Dietary patterns are affected by cultural preferences but also by poor access to fresh, affordable, healthy foods, especially produce. Data from the META-Health and Predictive Health studies found that African Americans with lower education levels, higher BMI, or HTN more often resided in food deserts (neighborhoods with low access to healthy foods) than in more affluent areas with better food access[63]. Several studies found that, compared to whites, African Americans consumed significantly fewer fruits, vegetables, and micronutrients essential for good health[64–66].

Housing, Healthy Communities, and Community-Based Outreach Impact CV Health
In African American communities, correlations exist between higher residential segregation and CVD risk.[61] Structural policies and historic features like segregation and inequity in housing and home ownership, are associated with current day adverse CV outcomes. Mujahid examined relationships of current CV health with past discriminatory policies[67]. Historically redlined areas included communities of African Americans, new immigrants, and working-class families. African Americans currently living in historically redlined areas have 0.83 lower (worse) CV health scores compared to those living in areas described as “best neighborhoods”. Environmental Protection Agency reported that minoritized populations are exposed to higher particulate air pollution ($PM_{2.5}$), contributing to heart disease and stroke[68]. A 2017 study in 4 Chicago churches examined impact of community-based HTN interventions[69]. Common barriers to reaching HTN goals include competing health priorities, need for better understanding of how to respond to their HTN, poor access to community health resources, financial needs, fear of injury, stress, inadequate time to exercise, and limited healthy foods. Common facilitators of BP control were having social support, practical strategies to control BP, and trained HTN coaches.

Proactive Health System Change, Policy Action, and Additional Research are needed
Proactive health systems, government policy, and education are needed to increase screening of young African Americans for CVD and DM, including detection of risk factors predictive of future disease (history of early onset CVD in families, smoking, and indicated biomarkers)[70,71]. Better assessing risks informs need for medications to manage BP, high cholesterol, or high blood sugar (for those with DM), reducing stroke and CV risk. Policy change based in transparent health plan performance data can help to illuminate lack of compliance with GDMT and care gaps in practice settings, help remove structural barriers to better health outcomes, and improve uptake of GDMT. Governmental policies can help reduce the burden in the African American community of health/wellness challenges, comorbid conditions, discrimination, racism, and chronic psychological stress that require high-effort coping mechanisms[58]. Ensuring universal and timely access to high quality healthcare and GDMT, and implementing well-tolerated, effective lifestyle programs is critical.

Inspirational publicly funded campaigns like Million Hearts, and CDC’s *Live to the Beat* campaign to improve African American CV health (https://www.livetothebeat.org/) should be further fortified with support services to achieve these aspirational goals[72]. While biologic differences hold promise for precision medicine using polygenic risk scores, many racial/ethnic groups are still grossly underrepresented in genome-wide association studies which primarily focus on persons of European ancestry. One National Institutes of Health research program aiming to accelerate research for populations underrepresented in biomedical research is the *All of Us* program,[73] a national program of participants who agree to share EHR data, complete surveys, and provide biospecimens. *All of Us* found increased burdens of CVD among African Americans, elderly, disabled, and lower income participants, and strives to advance health disparities research. Clinical trials also need more efforts for diversity in recruitment.

Health System, Policy & Education Recommendations

1. CVD's economic impacts must be analyzed, modelled, and addressed by government policy. Excess premature deaths among working-age African Americans, including parents and grandparents, have multi-generational impacts on community poverty, family economics, social structure, and emotional well-being.
2. Improve payment model designs to ensure access to high quality care for specific at-risk populations[51,74]. Because African Americans are less likely to receive guideline-concordant therapy, implement incentives for electronic health record prompts to facilitate evidence-based prescribing and treatment. Establish health system accountability mechanisms for medical errors of omission or commission when not deploying GDMT.
3. Incentivize health systems to achieve better clinical outcomes by deploying effective care teams. Ensure accessibility of telehealth for optimizing medication therapy, including titration of medications to reach therapeutic goals. Build on the models of the LA Barbershop HTN project, and HealthPartners' pharmacist-led, telephone-based medication titration approach, leveraging collaborative practice agreements[75]. Incentivize access to therapeutic lifestyle coaching, and *food as medicine* programs[76].
4. Pair linguistically and culturally-aligned care team members to bridge gaps in healthcare and patient education. Expand payment structures to incorporate CHWs into care teams and in vulnerable communities.
5. Health systems and the State of California should collaborate to ensure hypertension coaching is available via telehealth beyond regular work hours (e.g., 8AM to 8PM, six days per week) building on California's successful model of tobacco-tax funded smoking cessation quitline and web program (https://kickitca.org).
6. Geographically map heart attack and stroke hot-spots for proactive community action. Poverty-inducing long-term disabilities and premature deaths can be reduced through precision patient outreach, and investing in state of the art two-way-video-enabled advanced mobile medical units for rapid diagnostics and treatments[77].
7. Improve access to primary care and early screening for disease, prioritizing substantial improvements[17] earlier in the disease process, particularly for those with family history of young heart attacks, strokes, or diabetes. Control the key biometrics of BP, lipids, and blood sugar. For high risk people, also test for Lp(a). Incorporate coaching on stress reduction, sleep, exercise, and nutrition. Following Kaiser's example, add exercise as a vital sign in patient records. Facilitate connections to social and community resources.
8. Increase uptake of proven best practices for working with African American communities, such as improved outreach and hypertension education via trusted influencers. Hold health-enhancing activities in places where people meet, such as schools, faith communities, barbershops, salons, and community and senior centers[49,52].
9. Encourage health systems to make community investments by working with school systems to assess students for key CV risks by 12th grade; develop training and work opportunities for students to become culturally-aligned healthcare workers. Educate teens in CPR, control of BP, LDL, blood sugar, nutrition, and avoidance of tobacco, drugs, and alcohol. Integrate *grow your health school-based gardens*, teaching garden-to-fork healthful cooking strategies, and incentivize with events[76]. Improve science curricula to incorporate knowledge in nutrition, PA, and stress management. Create school competitions for CVD reduction projects.
10. Improve patient access to enabling services that are often not covered by health insurance, but that may be covered by FQHCs or Area Agencies on Aging (e.g., transportation to medical appointments).
11. Educate physicians and care teams on clinical best practices, including for discussing social determinants of health with patients[78]. Incentivize SDOH documentation in EHRs. SDOH screening holds promise for closing health disparity gaps, helping physicians and other providers to mitigate structural race-based biases[79].
12. Expand critically important research to illuminate successful strategies to negate discriminatory policies that entrench disparities, such as disparate use of diagnostics, lack of access to healthcare and medications, less timely emergency services and treatment options, emphasizing younger populations[14,79]. Encourage greater outreach for clinical trial participation and sample accrual. Use representative datasets to explore CV burden.

Note: Many of these ideas can be funded with mis-aligned community benefit dollars from non-profit health systems. Taxes could be levied on foods and beverages with excess salt or sugar, and/or on violent media.

Acknowledgments

Funding: CDPH Chronic Disease Branch contract #20-10294 (PI: Ivey) & RCI. Right Care Initiative Team: Susan L. Ivey, MD, MHSA, UCB School of Public Health; Hattie Rees Hanley, MPP, Right Care Initiative Director, UCB; Eveline Stock, MD, UCSF School of Medicine; Catrina Taylor, PhD, MSPH, CDPH, Chronic Disease branch; Karol Watson, MD, PhD, UCLA; Melissa Burroughs, MD, Association of Black Cardiologists; Keith Emmons, MD, MPH, CenCal Health; Hector Rodriguez, PhD, MPH, UCB School of Public Health, and Right Care Initiative's student research team: Albert Yeam, Edith Baca, & Jenny Woo. Updated Mar. 22, 2023. For references see: https://tinyurl.com/AAbriefRef

Excess Risk for Early Heart Attacks & Cardiovascular Disease Among South Asians

Background:

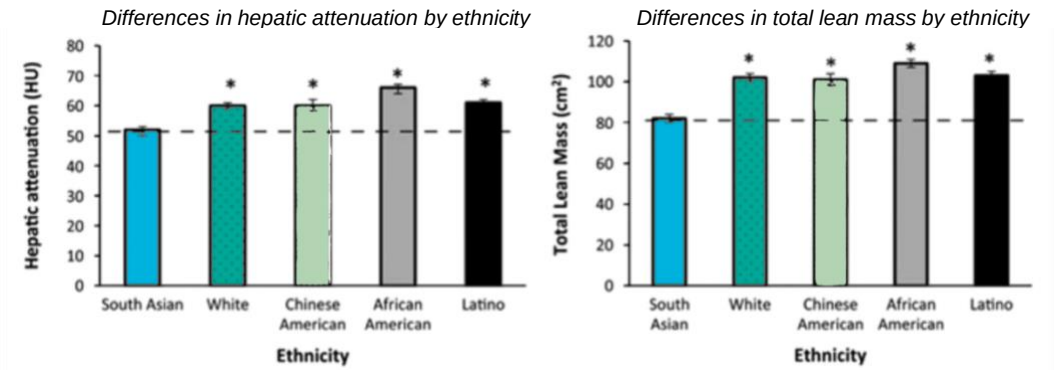
The term South Asian denotes persons whose countries of origin include India, Pakistan, Nepal, Bangladesh, Sri Lanka, Bhutan, Maldives, and other countries in the South Asian region. This term also denotes persons from the South Asian diaspora, whose families have settled in other parts of the world, such as in Trinidad/Tobago, Guyana, Fiji, Tanzania, and Kenya, often generations ago. While native South Asians (who reside in the countries aforementioned) may share genetic and cultural risk factors with diasporic South Asians (individuals of South Asian descent residing outside of their native region) in the United States, diasporic South Asians can differ in socioeconomic status, education levels, healthcare behaviors, religious beliefs and attitudes, health insurance/access, and language proficiency, which can affect the risk, treatment, and outcomes for cardiovascular (CV) disease. South Asians have experienced significant population growth in the U.S., increasing 81% from 2000 to 2010 alone, and will make up part of the largest immigrant population in the United States by 2065. As a physician in the United States, it is likely that you will take care of South Asian patients, and it is important to understand the risk profile of these communities, and how the diverse range of ethnic, religious, and socioeconomic statuses of these groups intertwine with their CV health outcomes.

In the United States, South Asian Americans are four times more likely to develop cardiovascular conditions and diseases than the rest of the population.[1] South Asians in America have an increased risk of cardiovascular disease (CVD) in comparison to non-Hispanic whites,[2] are at high risk of coronary artery disease (CAD) and mortality compared to other ethnic groups, and exhibit higher rates of premature CAD.[3] South Asians also experience a high prevalence of specific CVD risk factors, such as type 2 diabetes (T2DM), obesity, metabolic syndrome, hypertension, central distribution of weight/fat, and abnormal blood cholesterol and glucose levels.[2,4] This risk profile can be attributed to upstream factors such as urbanization and globalization, and other interactions of genetic, environmental, and behavioral lifestyle factors.[1,2]

Mediators of Atherosclerosis in South Asians Living in America (MASALA) Study:

The MASALA Study is the first longitudinal cohort study of South Asians in the U.S., seeking to understand unique factors leading to coronary artery disease (CAD) in South Asian Americans. Since 2010, South Asians have been recruited by investigators at UCSF and Northwestern University to further identify risk factors in this population and help guide future prevention efforts for heart disease in South Asians. The MASALA Study findings include high rates of diabetes, lipid disorders, and low physical activity among South Asians, and these data can be used to help prevent and treat cardiometabolic conditions among this U.S. population.

Figure 1: Ethnic differences in body composition [AD Shah et al., 2016]



Recently, the MASALA Study has found that South Asians in the study have higher levels of liver, visceral, and intermuscular fat and significantly less total lean abdominal and back muscle mass compared with four other racial/ethnic groups from the Multi-Ethnic Study of Atherosclerosis (MESA).[5] This study also found significant differences in liver fat attenuation, which was significantly lower (and thus worse) in South Asians (Figure 1). These higher levels of ectopic adiposity are associated with insulin resistance, increased inflammatory markers, and decreased insulin sensitivity.[6]

Leading causes of mortality in Asian Indians:

Research evaluating the leading causes of mortality in Asian Indians in California found cardiovascular diseases to be the leading cause of death for both males and females. Almost half of all deaths for Asian Indian males in this study were due to CVD disease. In this same study, the number of deaths due to diabetes, a major risk factor for heart disease, increased with age for both Asian Indian males and females.[4] A 2014 study examined national mortality data comparing Asian sub-groups to non-Hispanic whites using U.S. death records from 2003–2010. NHW men and women had the highest overall age-adjusted mortality rates, but Asian Indian men and women had greater proportionate mortality burden from ischemic heart disease using proportional mortality ratios (PMR) for relative risk.[7] Most recently, another study examined outcomes for mortality from ischemic heart disease (IHD) and cerebrovascular disease among the 6 largest Asian-American subgroups compared with non-Hispanic whites. The 2019 study demonstrated Asian Indians had more years of productive life lost (YPLL) to IHD than did non-Hispanic persons, and that disparity held for both men and women.[8]

Risk factors for heart disease include:

Hypertension: One of the most common CVD risk factors among South Asian Americans is hypertension, with a prevalence of 43% in men and 35% in women in the MASALA cohort.[3] Multiple studies show high prevalence of hypertension in South Asian Americans.[1,9] UK studies demonstrated increased rates of hypertension in Gujarati Asian Indians living in UK compared to a non-migrant group from India.[10]

Diabetes: One study found the prevalence of type 2 diabetes (T2DM) to be 24% among South Asians in India, with incidence continuing to rise.[11] South Asians in the MASALA cohort had age-adjusted rates of T2DM of 23%, much higher than for other U.S. groups,[12] and high levels of insulin resistance, a risk factor for T2DM. In general, South Asians are at higher risk of both T2DM and CVD compared with other populations. South Asians also develop T2DM and CVD at a significantly younger age, and tend to have more severe and extensive disease.[11]

Tobacco use: Studies show that while the frequency of smoked tobacco among South Asians is relatively low, tobacco is traditionally a key modifiable risk factor for CVD. Men tend to have higher rates of smoking than women, although rates among women increase with acculturation to American culture. It is also important to note that cultural tobacco products such as hookahs, paan, beedis, and ghutka may be commonly used among South Asian Americans and can increase one's risk of a heart attack. According to recent research,[14] items such as hookahs and paan may not be overtly considered tobacco products within the South Asian community, and thus many people underestimate the associated health risks. Second-generation diasporic South Asians also report more frequent use of hookahs and alternative tobacco use methods compared with earlier generations, which can put them at greater risk of future CVD.

Low levels of physical activity: South Asians in America tend to have lower levels of physical activity than other groups. In general, diasporic South Asians exhibit a more sedentary lifestyle on immigration to Western countries.[2,12,15] Insufficient physical activity is a significant risk factor for CVD, abnormal lipid and glucose profiles, and high blood pressure.[2] Studies have shown that participating in 2.5 hours of exercise weekly reduces the risk of CVD, improves endothelial function, increases high density lipoprotein (HDL) levels, and decreases ambulatory blood pressure. Notably, low physical activity increases cardiovascular risk as much as high blood cholesterol, high blood pressure, or smoking cigarettes.

It is essential to recognize significant barriers to improving physical activity levels among South Asian communities, including certain cultural beliefs, practices, and accessibility issues. Individual participation in regular physical activity can sometimes be seen as being in opposition to South Asian cultural norms of putting family before self. There may also be lower physical activity levels among lower socioeconomic groups due to accessibility issues, including limited time, resources, and inadequate access to safe and walkable neighborhoods.[2]

South Asian women may also participate in less leisure-time physical activity due to religious modesty, fear of going out alone, and even potential cultural stigma from the community. There is a need for culturally acceptable programs tailored for South Asian women. An example study demonstrated Bollywood dance was found to be as effective as other forms of moderate-vigorous physical activity, and that dance can significantly reduce BMI and total fat mass in South Asian women.[16,17]

A reasonable walking goal is 10,000 steps a day. The CDC recommends about 150 minutes of moderate physical activity per week (30 minutes on 5 days of the week). There also needs to be more education and information on the preventive benefits of moderate physical activity for the South Asian community, as well as a need for neighborhood and community-level interventions.

Obesity: Obesity is a crucial precursor of T2DM and also a significant risk factor for CVD. With obesity on the rise, and prevalent in South Asians, it is essential to use Asian-specific BMI cutoffs given lower BMI cutoffs are associated with increased heart disease risk. BMI of >23 kg/m^2 is categorized as overweight, and >27.5 kg/m^2

is categorized as obese.[18] When these standards were applied to the MASALA cohort, 33% of South Asian Americans exceeded these lowered BMI cutoffs for obesity, putting them at higher risk for CVD.[19] South Asians in several studies have been noted to be especially prone to developing central obesity, with fat primarily in the liver and around the abdominal visceral organs, which promotes insulin resistance and inflammation, and is metabolically much more harmful. This phenotype, 'metabolically obese-normal weight,' can be described as a higher propensity for liver and visceral fat deposition and is widely prevalent among South Asians.[13]

Coronary artery calcium (CAC): Levels of CAC are a strong predictor of CAD and cardiovascular events. In the MASALA cohort, researchers found that CAC levels in South Asian men are similar to those of white men, and are overall higher compared to African Americans, Latinos, and Chinese Americans.[20] This study also found that South Asian women tend to have similar CAC levels compared to other women, but those levels increase significantly in older age (>70).[20] This high burden of subclinical coronary atherosclerosis, as indicated by higher CAC scores in South Asians starting at earlier ages (Figure 2), partly explains the higher rates of CVD in South Asians. A UK study demonstrated higher prevalence and severity of arterial calcification in Asian Indians compared to whites with angina, even with matching of age and risk factors for CVD.[21]

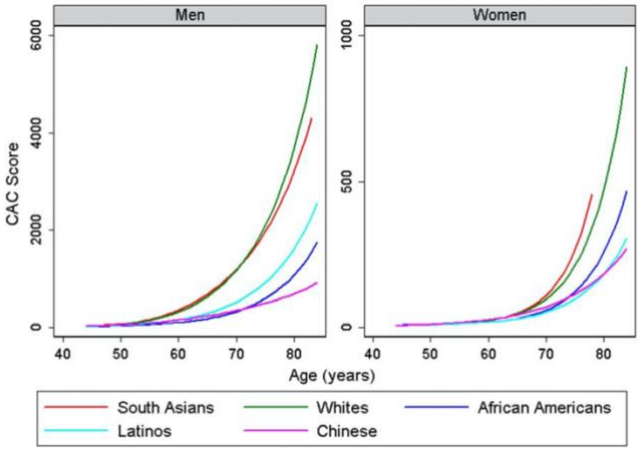


Figure 2: Mean coronary artery calcium (CAC) score by age for five ethnic groups by sex, the MASALA and MESA studies [Kanaya et al., 2014]

Poor diet: South Asians who migrate to Western countries report increased consumption of fats and decreased consumption of fiber.[22] Several studies have also noted alarmingly low fresh fruit and vegetable consumption among South Asian migrants. Emphasizing increased consumption of fresh fruits and vegetables and lowering sodium in the diet can help prevent dietary patterns that may increase hypertension in South Asians.[23]

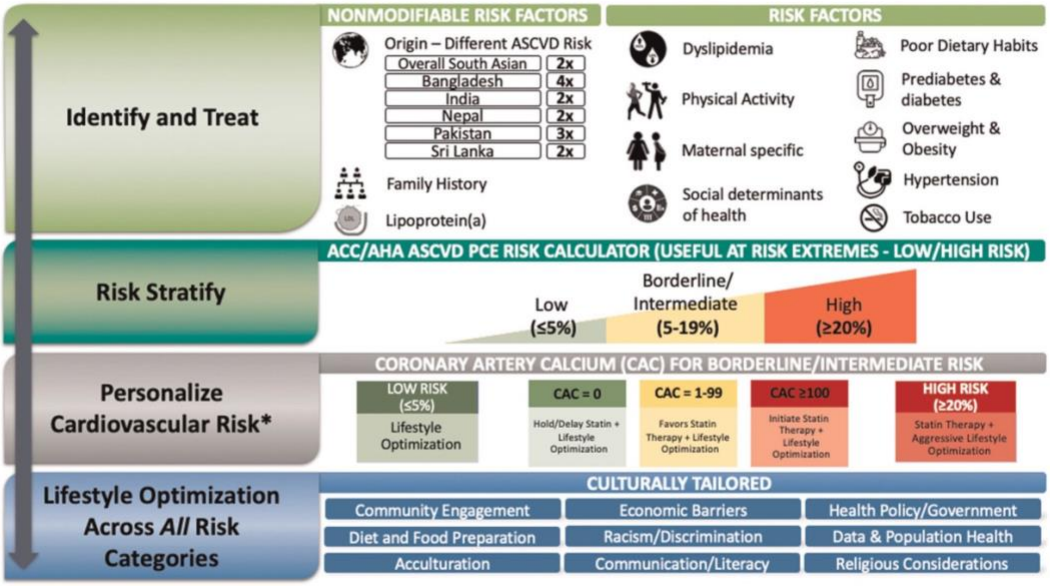
Stress: Anxiety and depression in South Asian men and stress in South Asian women were associated with thicker arterial walls (elevated carotid intima-media thickness), which is a marker for sub-clinical CVD.[24]

Next Steps:

1. Educate physicians, healthcare providers, and health systems to proactively address the unique risks South Asian individuals have for heart disease, lipid disorders, and diabetes, through screening, education, and counseling of patients.
2. South Asian patients should have their blood pressure, cholesterol, and fasting glucose levels checked even if their BMI is normal (cardiometabolic risk begins at > 23 kg/m^2). Consider ordering coronary CT scans to assess for CAC scores at younger ages.[8]
3. Control cardiometabolic risk factors in those who have already developed them; poor control of risk factors results in greater cardiovascular mortality.
4. Incorporate race, ethnicity, and country of origin in electronic health record and research studies of lipids and on genetic markers for lipid abnormalities.
5. Continue adequately funding longitudinal studies and clinical trials among these high-risk groups who have often been harder to recruit into research studies.[25]
6. Undertake culturally-tailored outreach in South Asian communities including creating culturally relevant educational materials in common South Asian languages, such as Hindi, Punjabi, Bangla, Urdu, Gujarati, Tamil, Telugu, etc. Develop interventions and evaluate them for effectiveness.
    A. Interventions can include incorporating more fresh fruits, vegetables, nuts, legumes, whole grains, and low-fat dairy products into the diet, and promotion of regular physical activity. In regards to diet, we need culturally appropriate ways to modify favorite foods, rather than eliminating beloved food items from the South Asian diet.

It is important to note that much of the research on CV risk factors in South Asian Americans focuses specifically on persons of Indian descent; those originating from other South Asian countries (Pakistan, Bangladesh, Sri Lanka, etc.) have been under-sampled in research on South Asian CV risks. There may be specific nuances in risk factors for each ethnic group not yet understood, and it is important to eventually generate more CV data for each of these subpopulations for a more representative picture of risk factors.

CENTRAL ILLUSTRATION: Primary Prevention Cardiovascular Risk Assessment and Management Considerations for the South Asian Populations in the United States



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Project Brief updated August 22, 2023, by Right Care Initiative Team: Susan L. Ivey, MD, MHSA, Professor, Adjunct, UC Berkeley, School of Public Health, and Director of Research, Health Research for Action; Amrita Ramanathan, UC Berkeley Right Care Initiative Student Research Assistant.

Acknowledgements:

The authors would like to thank Dr. Alka Kanaya, Professor-In-Residence, Department of Medicine, UCSF School of Medicine, for her careful review of the content of this brief; and Hattie Rees Hanley, MPP, Right Care Initiative Director, for her ongoing leadership to develop succinct project briefs with the goal of making complex information more readily available for taking action to improve patient outcomes.

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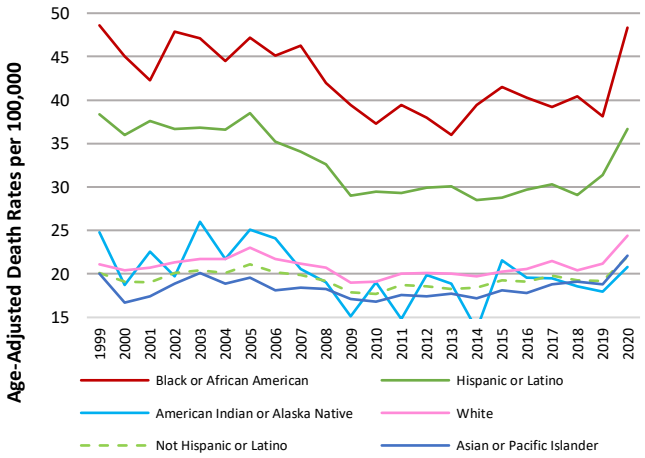
Metabolic Pathways: from Overweight, to Prediabetes, Diabetes, and Heart Disease

Cardiometabolic syndrome is a group of cardiovascular, metabolic, prothrombotic, and inflammatory issues that increase the risk of cardiovascular disease (CVD) and death[1]. The syndrome is caused by adverse changes in fatty acid metabolism, leading to increased triglycerides and insulin resistance[2]. Adverse changes include abdominal adiposity, insulin-resistant glucose metabolism, dyslipidemia, and hypertension (metabolic syndrome). Prediabetes is caused by insulin resistance, can progress to type 2 diabetes (T2DM), and is linked to dysfunctional visceral adipose tissue. Both promote CVD. Over 1/3 of United States (US) adults have prediabetes[3], which can lead to T2DM, high blood pressure, and cholesterol disorders. They accelerate progression of conditions that can lead to stroke, CVD, and chronic kidney disease[4–6]. Type 1 and other types of diabetes are not part of this gradual metabolic change pathway and are beyond the scope of this brief.

Mortality

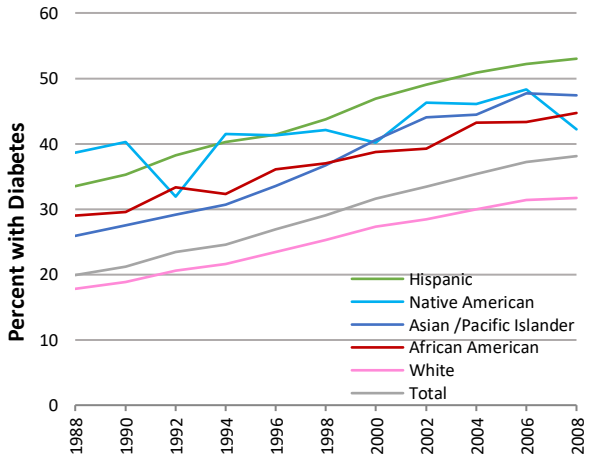
In 2021, diabetes claimed >100,000 US lives, ranking as the 8th leading cause of death[7]. Diabetes increases the risk of other major causes of death, including CVD, stroke, chronic kidney disease, and COVID-19[7]. Age-adjusted death rates due to diabetes demonstrate large differences by race/ethnicity[8] (California mortality in **Figure 1**). Age-adjusted all-cause mortality rates for US adults >25 yrs with diabetes improved in the prior decade, decreasing from 23.5/1000 person-years (p-y) in 1997-2001 to 18.1/1000 p-y in 2007-2011, a net 23% decrease[9]. Age-adjusted all-cause mortality for people with diabetes were highest for non-Hispanic whites (20.1-25.3 p-y), intermediate for non-Hispanic blacks (15.0-20.2 p-y), and lowest for Hispanics (10.3-15.7 p-y). Mortality rates were inversely related with educational attainment and income-poverty ratio.

Figure 1: CA Age-Adjusted Death Rates per 100,000 population, 1999-2020, Diabetes Mellitus (all types: ICD-10 Codes E10-E14) by Race/Ethnicity



Source: CDC Wonder Database. Jan. 12, 2023. https://wonder.cdc.gov/.[8]

Figure 2: Percentage of CA Patients with Heart Attacks that also had a Diabetes Diagnosis, 1998-2008



Source: California Office of Statewide Health Planning and Development[10]

All-cause excess mortality risk in US adults with diagnosed diabetes decreased in pooled data from 1997-2001 vs. 2007-2011, by a net decrease of 4.0/1000 p-y[9]. Differences detected between racial/ethnic groups for all-cause mortality, vs. mortality due to diabetes, could reflect a higher prevalence of T2DM in certain groups, as well as underdiagnosis in these groups[11]. T2DM also impacts young people. For adolescents and young adults ages 15-39, global age-standardized mortality from early onset T2DM increased significantly between 1990 and 2019, from 0.74/100K to 0.77/100K[12].

Diabetes/Prediabetes Incidence & Prevalence Rates

<u>Diabetes</u>

According to the CDC, in 2019, more than 37 million people in the US were estimated to have any type of diabetes (11.3% of the total population), with close to a quarter of those individuals being undiagnosed[13]. Increases in total diabetes have been driven by increasing levels of diagnosed diabetes and a decreasing proportion of undiagnosed diabetes[14]. **Table 1** shows NHANES data on the prevalence of diabetes in different race/ethnic groups and by sex. Non-Hispanic Black, Non-Hispanic Asian, and Hispanic groups all had significantly greater estimated prevalence of total diabetes compared to Non-Hispanic white. However, even within Hispanic and Asian adults, there is *significant variability in prevalence estimates for different subgroups*. 2011-2016 NHANES estimates among examined adults 20+ years demonstrated a prevalence rate of total diabetes of 24.6% for Mexican, 21.7% for Puerto Rican, 20.5% for

Cuban/Dominican, 19.3% for Central American, and 12.3% for South American subgroups (overall p<.001)[15]. The prevalence of total diabetes was 23.3% for South Asian, 22.4% for Southeast Asian subgroups, and 14.0% for East Asian (overall p=.02). Comparative analysis of MASALA (Mediators of Atherosclerosis in South Asians Living in America) and MESA (Multi-Ethnic Study of Atherosclerosis) cohorts found higher prevalence and earlier diagnosis of T2DM, especially in South Asians[16,17]. Filipino Americans also have higher T2DM rates[18,19]. At 16% prevalence, Native American rates of diabetes are high[20], with certain tribal members, such as those of the Pima Tribe, having extremely high rates of diabetes[21]. California has also experienced DM increases; the *percentage of Californian adults who self-report ever being diagnosed with any type of diabetes has significantly increased from 8.4% to 10.8% since 2011*[22].

Table 1: Age-adjusted prevalence of diagnosed, undiagnosed, and total diabetes in US adults 18+, 2017-2020

Characteristic		Diagnosed diabetes % (95% CI)	Undiagnosed diabetes % (95% CI)	Total diabetes % (95% CI)
Total		10.1 (9.2-11.0)	3.1 (2.6-3.8)	13.2 (12.0-14.5)
Sex				
	Men	11.6 (10.3-13.0)	2.7 (2.0-3.7)	14.2 (12.7-15.9)
	Women	8.8 (7.6-10.2)	3.6 (2.6-5.0)	12.4 (10.5-14.6)
Race-ethnicity				
	White, Non-Hispanic	8.9 (7.6-10.4)	2.3 (1.5-3.5)	11.2 (9.5-13.2)
	Black, Non-Hispanic	12.4 (10.8-14.1)	4.4 (3.2-6.2)	16.8 (15.3-18.5)
	Asian, Non-Hispanic	11.1 (9.7-12.6)	5.4 (3.4-8.5)	16.4 (13.7-19.6)
	Hispanic	13.0 (11.4-14.9)	4.6 (3.5-5.9)	17.6 (16.0-19.3)

Source: Adapted from CDC Diabetes Statistic Report, accessed March 3, 2023[13]. NHANES 2017-2020

Globally, adolescents and young adults (ages 15-39) had significant increases in age-standardized diabetes incidence rates (1990 to 2019), from 117.22/100K to 183.36/100K[12]. Greater screening for abnormal blood sugar levels may account for a portion of that increase, and demographic shifts. For US adults (ages 20-44, NHANES data 2009-2020), estimated age-adjusted diabetes prevalence increased significantly from 3.0% to 4.1%[23]. Increases in incidence in adolescents and young adults parallel increasing rates of obesity[24], and T2DM is projected to increase in youth by 69% by 2060[25].

Prediabetes

Prediabetes is defined as a fasting glucose of 100 to 125 mg/dL, a glucose level of 140 to 199 mg/dL drawn 2 hours after a 75-g oral glucose load, or glycated hemoglobin levels (HbA1c) of 5.7%-6.4%. Approximately 10% of US people with prediabetes progress to diabetes each year[26]. Prediabetes represents a critical period to prevent that transition[27], and 38% of US adults age 18+ are estimated to have prediabetes[13]. Those estimates remained stable since 2005, but prediabetes awareness in patients increased steadily[13]. About 1 in 5 adolescents (age 12-18) and 1 in 4 young adults (age 19-34) were estimated to have prediabetes[28]. Prediabetes prevalence in adolescents and young adults was significantly higher in those with obesity compared to normal weight (25.7% vs 16.4% adolescents, and 36.9% vs 16.6% young adults, respectively)[28]. Obesity in ages 19-34 was defined as BMI ≥30kg/m^2, normal BMI as <25kg/m^2. For those ages 12-18, obesity was defined as BMI>95th percentile; normal BMI was <85th percentile, relative to age- and sex-groups. Adolescents and young adults with prediabetes had significantly higher non-high-density lipoprotein cholesterol levels, systolic BP, central adiposity (fat carried around the waist), and lower insulin sensitivity (p<.05). California Department of Public Health has additional information on prediabetes here. The CDC Diabetes Prevention Program (DPP) has been shown to be effective in prevention of progression to T2DM. In communities where this program exists, patients with prediabetes or overweight can be referred to local DPP programs for evidence-based lifestyle change strategies[29]. Dietary, exercise, and sleep patterns among youth contribute to the cardiometabolic trajectory over a lifetime and should be an area of special focus[30].

Complications of Diabetes Include Strokes, Heart Attacks, Amputations & Blindness

Diabetes increases risks of mortality, emergency department (ED) visits, hospitalizations, amputations, acute myocardial infarction (AMI), stroke, chronic kidney disease, and vision disability. Diabetic retinopathy is the greatest cause of visual loss in the US. The total direct and indirect cost of diagnosed diabetes in the US in 2017 was $327 billion[13].

Coronary Artery Disease (CAD), Acute Myocardial Infarction (AMI), and Stroke

Compared to people without diabetes, those with diabetes have 3 times the risk of AMI. AMI and CAD may occur up to 15 years earlier[31] than in non-diabetics. Diabetes and prediabetes are both correlated with more risk for CAD. MESA study data showed that T2DM was associated with incident CVD (AMI, angina, cardiac arrest, stroke, and fatal CV events)[32]. CARDIA, a longitudinal study of young adults, followed patients with diabetes/prediabetes, finding that, as duration of diabetes/prediabetes increased, for each 5-yr increment, the hazard ratio for coronary artery calcium (CAC) presence increased by 1.15 (for diabetes) and 1.07 (for prediabetes)[33].

Chronic Kidney Disease (CKD)

Diabetes and HTN are the two leading causes of end-stage kidney disease (ESKD), accounting for 65% of reported US cases of ESKD[34]. In the 2021 California Health Interview Survey, 62.7% of persons self-reporting diabetes also had diagnosed HTN[35]. CKD was the 10th leading cause of death in the US in 2021[7]. Estimated crude prevalence rates of CKD by race-ethnicity groups for US adults aged 18+ with diagnosed diabetes appear in **Table 2**. The US Renal Data System 2020 Annual Data Report demonstrated that for Medicare beneficiaries 65+ years of age, adjusted mortality (96.0/1,000 person-years) was over twice as high for those with CKD than those without CKD (41.0/1,000 person-years)[36].

Table 2: Percentage of CKD in US adults aged 18+ with diagnosed diabetes, total and by race/ethnicity, 2017–2020.

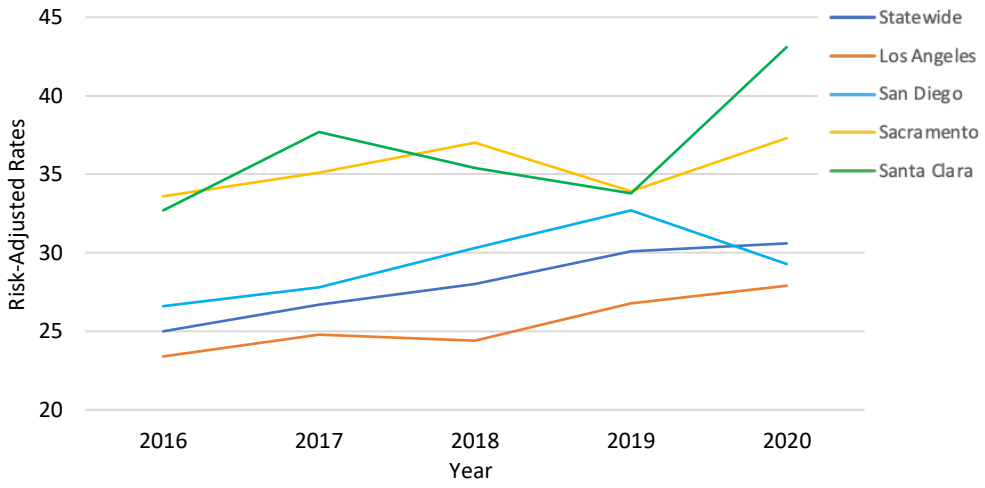
Characteristic (percentage)	CKD stages 1-4 % (95% CI)	CKD stages 3–4 % (95% CI)	CKD awareness % (95% CI)
Total	39.2 (35.7–42.9)	15.7 (13.1–18.7)	32.5 (21.8–45.4)
Race-ethnicity			
White, non-Hispanic	38.2 (31.7–45.2)	17.2 (13.4–21.9)	33.5 (19.5–51.1)
Black, non-Hispanic	46.6 (41.5–51.7)	23.1 (18.2–29.1)	31.2 (20.0–45.2)
Asian, non-Hispanic	35.1 (25.9–45.6)	Insufficient data	Insufficient data
Hispanic	38.5 (31.5–46.1)	8.9 (6.1–12.9)	29.9 (17.6–46.0)

Note: CKD based on 2021 CKD Epidemiology Collaboration serum creatinine-only GFR estimating equation, including age and sex only.
Source: Adapted from CDC Diabetes Statistic Report, accessed March 3, 2023[13] Data Source: NHANES, 2017-2020

Lower Extremity Amputations (LEA)

Diabetes-related amputations accounted for 75% of US adult hospitalizations for non-traumatic LEA in 2015[37]. LEA is an often avoidable consequence of T2DM, which greatly decreases quality of life while increasing mortality and morbidity[38,39]. Age-adjusted non-traumatic LEA rates per 1,000 adults with diabetes decreased 43% between 2000 (5.38) and 2009 (3.07) ($p<0.001$), then rebounded by 50% by 2015 (4.62) ($p<0.001$)[37]. California's statewide hospitalization data reported that the 2020 statewide risk-adjusted rate for LEA amputation (PQI#16) was 30.6/100K persons. In Right Care's UBP areas, rates were 27.9/100K in Los Angeles, 29.3/100K in San Diego, 37.3/100K in Sacramento, and 43.1/100K in Santa Clara counties (rates were risk-adjusted for age, sex, and poverty level)[40]. Trends of risk-adjusted rates for LEA from 2016 to 2020 are in **Figure 3**. A meta-analysis examining re-amputation risk in people with diabetes found that, at 1 year, re-amputation rates for all contralateral and ipsilateral re-amputations were found to be 19%, and 37.1% at 5 years[41].

Figure 3: Risk-Adjusted Rates for Lower-Extremity Amputation (PQI#16), California Overall and by County, 2016-2020



Risk-adjusted rates are age, sex, and poverty adjusted and calculated per 100,000 state/county population. Source: HCAI Patient Discharge Data; AHRQ Prevention Quality Indicators, accessed 4/27/23[40]

Diabetic Retinopathy

Diabetic retinopathy causes vision loss as hyperglycemia damages blood vessels in the retina[42]; it is a leading cause of blindness[43]. Data from National Health Interview Survey show that for US adults with diagnosed diabetes age 45+, 8.6% had diabetic retinopathy (age-adjusted)[44]. These data demonstrate that, within that age group, those diagnosed with diabetes over 10 years had almost 3-fold higher prevalence than those with <10 years of diagnosis. Globally, 22.3% of individuals with diabetes have diabetic retinopathy[45]. The age-standardized prevalence/1,000 increased 14.9% from 1990-2020[43]. The number of adults globally with diabetic retinopathy (103M) is projected to increase to 161M[45] by 2045.

Cancer

A meta-analysis in 151 cohorts found T2DM was associated with incidence of several cancers, suggesting an association between T2DM and liver, pancreatic, and endometrial cancers[46]. A 20-year population-based study in England showed that for individuals >35 years, those with T2DM had >1.5-fold higher risk of colorectal, pancreatic, liver, and endometrial cancer mortality[47]. The study demonstrated that average annual percent change in cancer mortality rates (1998-2018) increased at a higher rate in persons with morbid obesity than in those with normal body weight (5.8% vs 0.7%).

Dementia

Markers of cardiometabolic change, including insulin resistance, are also suspected in pathways to development of dementia[48]. A systematic review found that diabetes conferred a 1.25- to 1.91-fold excess risk for cognitive disorders (cognitive impairment and dementia)[49]. 31 studies demonstrated a significant association between diabetes and increased relative risk of all-cause dementia (RR: 1.43) and of Alzheimer's Disease (RR: 1.43). A UK population-based study also found that earlier onset of diabetes was significantly associated with higher risk of subsequent dementia[50]. Relative to those age 70+ without diabetes, the increased risk of developing dementia by onset of diabetes was 2.12 (>10 years), 1.49 (6-10 years), and 1.11 (5 years or less). A CDC study found that, among US adults aged ≥45 years with subjective cognitive decline (an early indicator of Alzheimer disease and related dementias), an estimated 49.9% reported high BP, 49.7% did not meet aerobic physical activity guidelines, 35.3% had obesity, and 18.6% had diabetes[51].

Hospitalizations for Diabetes, and Prevention of Complications

California's hospitalization data track various diabetes quality indicators over time. In 2020, the statewide risk-adjusted composite diabetes prevention quality indicator (PQI #93) showed an overall rate of 186.6 per 100,000 persons[40]. For key Right Care counties, rates were Los Angeles County – 182.3/100.000; San Diego County 194.6/100.000; Sacramento County -190.9/100,000; and Santa Clara County- 199.2/100,000[40]. However, rates are not race or ethnicity adjusted, an additional step that could help better understand rate variation in preventable complications. In 2018, 8.3M hospital discharges in the US reported diabetes as any diagnosis; about 1.9M of the discharges included major CVD (**Table 3**).

Table 3: Rate of hospitalizations per 1,000 US adults with diabetes, age 18+, selected causes, 2018

Risk factor	Crude rate per 1,000 (95% CI)
Diabetes as any listed diagnosis	327.9 (310.9-344.9)
Major cardiovascular disease (CVD)	74.4 (70.4-78.4)
Ischemic heart disease	17.5 (16.5-18.5)
Stroke	13.3 (12.5-14.0)
Lower-extremity amputation (LEA)	6.1 (5.8-6.4)
Hyperglycemic crisis	9.0 (8.5-9.5)
Hypoglycemia	2.2 (2.2-2.5)

Source: Adapted from CDC Diabetes Statistic Report, accessed March 3, 2023[13].

Risk Factors for Diabetes Complications

Table 4 provides crude estimated percentage for risk factors associated with diabetes-related complications in US adults with diagnosed diabetes (NHANES 2015-2018). In comparison, **Table 5** provides California Health Interview Survey data on risk factors for diabetes-related complications and comorbidities in CA adults ages 18+, by self-reported risk:

- Hypertension/CVD: For US adults 18+ (2015-2018) diagnosed with diabetes, 69% also had hypertension (HTN) (**Table 4**). In 2020-2021, 62.4% of CA adults diagnosed with diabetes were also diagnosed with HTN, and 16.7% of adults diagnosed with diabetes were also diagnosed with heart disease (See **Table 5**).
- BMI: 89.8% of US adults 18+ with diagnosed diabetes had a BMI ≥25.0 kg/m^2 (**Table 4**), while CHIS data demonstrated that 79.3% of Californians who reported diabetes also report overweight/obesity in the most recent 2021 data (**Table 5**).
- Physical Inactivity: For US adults 18+ with diabetes, 34.3% reported being physically inactive (**Table 4**); 48.9% of CA Adults 18+ with diabetes were not physically active for at least 20 minutes/day, 5 days a week (see **Table 5).**
- Tobacco Use: For US adults 18+ years with diagnosed diabetes, 2015-2018 NHANES data estimated 19.8% were current tobacco users, 37.1% were former smokers (**Table 4**). CHIS data from 2020-2021 estimated that of CA adults ever diagnosed with diabetes, 7.8% were current smokers and 27.0% were former smokers (**Table 5**).

Table 4: Crude percentage of factors associated with diabetes-related complications among US adults aged 18+, with diagnosed diabetes, NHANES 2015-2018

Risk factors for diabetes-related complications	% (95% CI)
Smoking (self-report)	
Current tobacco/serum cotinine >10ng/mL	19.8 (16.6–23.5)
Current cigarette smoker	13.8 (11.3–16.9)
Former cigarette smoker	37.1 (33.6–40.7)
Overweight and obesity, according to body mass index (BMI)	
BMI 25.0–29.9 kg/m² (overweight)	27.7 (24.7–30.9)
BMI 30.0–39.9 kg/m² (Class 1 and 2 obesity)	45.8 (42.3–49.3)
BMI ≥40.0 kg/m² (Class 3 Obesity)	16.2 (12.7–20.5)
Physical inactivity	34.3 (30.4–38.3)
HbA1C	
HbA1C 7.0–7.9%	24.9 (20.7–29.6)
HbA1C 8.0–9.0%	11.4 (9.1–14.1)
HbA1C>9.0%	13.2 (10.9–15.8)
High blood pressure	
BP≥140/90 mmHg or taking BP medication	69.0 (64.7–73.0)

Note: CI = confidence interval. Former cigarette smoker: serum cotinine levels ≤10 ng/mL, history of smoking 100+ cigarettes in lifetime, self-report of no current cigarette smoking. Physical inactivity: self-report of <10 min/wk moderate/vigorous activity (work, leisure, and transportation).
Source: CDC Diabetes Statistic Report (adapted). Data NHANES 2015-2018. Accessed 3/23[13]

Table 5: Risk factors for diabetes-related complications: Percent of CA Adults ≥18 years, ever diagnosed with diabetes, AskCHIS* 2018, and 2020-2021

Risk factors for diabetes-related complications	% (95% CI)
Smoking (self-report)	
Current smoker	7.8% (6.6-8.9)
Former smoker	27.0 % (25.2-28.7)
Ever diagnosed with high blood pressure	
Has/had high blood pressure	62.4% (60.4-64.4)
Has/had borderline high blood pressure	5.1% (4.3-5.9)
Has heart disease	16.7 % (15.3-18.1)
Physical Inactivity*	
Less than 5 days physically active at least 20 minutes (at a time)	56.1% (42.5-69.5)
5 or more days physically active at least 20 minutes (at a time)	44.0% (34.9-52.9)
Body Mass Index (kg/m²)	
18.5-24.99 (Normal)	19.9% (18.3-21.5)
25.0-29.99 (Overweight)	31.3% (29.2-33.1)
30.0 or higher (Obese)	48.0% (46.0-50.1)

*Physical inactivity data is from 2018, rest of data is from 2020-2021
Source: AskCHIS 2018, 2020-2021[52]

COVID-19

Diabetes worsens outcomes of COVID-19[53,54], is a common comorbidity in COVID-19 patients[55], and may be triggered by COVID-19. Relative to non-diabetic patients with COVID-19, patients with pre-existing T2DM require more intensive in-hospital treatment, have higher risk of all-cause mortality, and develop worse outcomes[54]. COVID-19 also increases risk of developing diabetes. Using national data from the US Department of Veterans Affairs, compared to those without COVID-19, those with COVID-19 had higher incidence of diabetes at 12 months after COVID-19 exposure[56].

Risk Factors for Type 2 Diabetes Mellitus

Better uptake of guidelines for screening for diabetes/prediabetes enhances early detection

USPSTF recommends screening[27] asymptomatic adults for diabetes/prediabetes at ages 35-70 among those with overweight or obesity. Risk factors for T2DM include higher BMI (>25 kg/m^2), physical inactivity, current smoking status, BP >140/90, and high cholesterol[13]. Risk factors often track together, and may reduce the threshold for screening for diabetes. This includes having a family history of diabetes or history of gestational diabetes in women. The onset of risk factors earlier in life is associated with increased cardiovascular events and disability later in life[57]. Regular screening of asymptomatic adults may detect prediabetes, metabolic syndrome, or T2DM earlier, allowing timely initiation of lifestyle changes (including dietary, physical activity, and tobacco behaviors) and other treatments to reduce progression.

Metabolic syndrome has similar risk factors to T2DM. From 2011-2016, over one-third of US adults 20 years+ had metabolic syndrome[58]. While the total population prevalence did not significantly increased from 2011 to 2016, it did increase significantly for those aged 20-29 (from 16.2% to 21.3%), women (31.7% to 36.6%), Asians (19.9% to 26.2%), and Hispanics (from 32.9% to 40.4%)[58]. Risk factors are not all changing at the same pace. From 2009 to 2020, among the intermediate age group of adults aged 20-44 years old, the estimated age-adjusted prevalence of obesity increased, from 32.7% to 40.9%[23]. During this time, estimated age-adjusted prevalence of HTN remained the same, while prevalence of hyperlipidemia significantly decreased, from 40.5% to 36.1%, and prevalence of smoking history stayed the same[23].

The Higher the BMI and Waist Circumference, The Higher the Prevalence of Diabetes

Overweight/Obesity

Obesity is highly prevalent in the US population. 2017-2018 NHANES data estimated that 31.1% of US adults aged 20+ are overweight (BMI 25.0-29.9 kg/m^2); 42.5% have obesity (BMI ≥ 30 kg/m^2), and 9.0% have severe obesity (BMI ≥ 40 kg/m^2)[59]. 16.1% of US children and adolescents aged 2-19 are overweight, 19.3% have obesity, and 6.1% have severe obesity[60]. Overweight and obesity are highly prevalent in CA adults and a growing concern among teens and children. In 2021, of CA adults 18+, an estimated 33.8% and 28.2% were overweight or obese[61]. 19.4% and 19.1% of teens (age 12-17 years) were either overweight or obese, and 17.0% of children (ages 0-11 years) were overweight[61]. The age-standardized estimate of total diabetes prevalence within US adults who were overweight (BMI 25.0-29.9), had class 1 and 2 obesity (BMI 30-39.9), and class 3 obesity (BMI ≥ 40kg/m^2) were 10.9%, 16.2%, 25.6%, 37.0%, respectively (**Table 6**). The age-

standardized estimate of total diabetes prevalence within US adults with abdominal obesity (often established by measuring waist circumference) was 18.3% (**Table 6**). Of those with diabetes, 78.5% had a usual source of care, but only 56.8% of adults (ages 40-75) with diagnosed diabetes were on statin therapy. (**Table 7**).

Table 6: Estimated US Age-Standardized Prevalence of Diagnosed, Undiagnosed, and Diabetes Among Different Weight Groups and Abdominal Obesity Groups (US Adults, NHANES, 2017-2018)

Characteristic	Diagnosed Diabetes Prevalence % (95% CI)	Undiagnosed Diabetes Prevalence % (95% CI)	Diabetes Prevalence % (95% CI)
Weight group (BMI range in kg/m²)			
Normal weight (18.5-24.9)	4.4 (2.7-6.2)	1.1 (0.4-1.9)	5.6 (3.7-7.4)
Overweight (25.0-29.9)	8.6 (6.9-10.4)	2.3 (0.7-3.9)	10.9 (8.7-13.2)
Class 1 obesity (30.0-34.9)	12.9 (10.5-15.3)	3.4 (2.3-4.5)	16.2 (13.7-18.7)
Class 2 obesity (35.0-39.9)	18.0 (13.5-22.6)	7.6 (3.7-11.5)	25.6 (18.6-32.6)
Class 3 obesity (≥40.0)	28.2 (18.1-38.2)	8.9 (4.5-13.3)	37.0 (25.8-48.2)
Abdominal obesity (waist circumference range, cm)			
No (≤102 cm men, ≤88 cm in women)	5.6 (3.9-7.3)	1.7 (0.6-2.8)	7.3 (5.0-9.6)
Yes (>102 cm men, >88 cm women)	13.8 (11.8-15.7)	4.5 (3.2-5.8)	18.3 (15.7-20.9)

Source: Adapted from Table 1, Wang et al, 2021.[62]

Table 7: Crude percentage of factors associated with prevention of diabetes-related complications among adults aged 18 years or older with diagnosed diabetes (US Adults, NHANES 2015-2018)

Preventive factors	Percentage (95% CI)
At least one usual source of diabetes care	78.5 (75.3–81.3)
At least 150 minutes per week of leisure-time physical activity	23.8 (19.7–28.5)
Managing or losing weight to lower their risk for developing certain diseases	77.3 (72.8–81.2)
Among adults aged 40–75 years, % on statin therapy	56.8 (52.8–60.7)

Source: Adapted from CDC Diabetes Statistic Report, accessed March 3, 2023[13]

Preventing Complications in those with Diagnosed Diabetes

In 2015-2018, only 21% of adults with diagnosed diabetes achieved all three critical biometric targets for HbA1c, BP <130/80 mm Hg, and low-density lipoprotein cholesterol levels <100 mg/dL, with each of the 3 targets being achieved by an age-standardized estimate of 66.8%, 48.2%, and 59.7% of people, respectively[62]. From 1999-2018, compared to adults 65+, young adults (age 18-44) were less likely to achieve the risk factor control goals[62]. **Table 7** indicates suboptimal levels of care management and lifestyle behaviors in adults with diabetes, including getting needed medications, usual diabetes medical care, and physical activity and nutritional changes to achieve weight loss, factors associated with better diabetes control and prevention of diabetes-related complications including CVD, CKD, and peripheral artery disease.

Cardiometabolic Comorbidities in those with Diabetes including lipid disorders

Abnormal Lipid Profiles in Diabetes can increase Cardiovascular Risk

Lipid disorders among those with T2DM contribute significantly to increased CV risk. Dyslipidemia in T2DM has a pattern characterized by elevated triglyceride (TG) levels, decreased high-density lipoprotein cholesterol (HDL-C) levels, and elevation in small, dense low-density lipoprotein cholesterol (sdLDL-C) particles, which is associated with higher risk of CVD. Among lipid abnormalities seen in T2DM, elevated TG levels are particularly concerning. Hypertriglyceridemia has been strongly linked to poor CV outcomes, including an increased risk of CAD, AMI, and stroke. Ethnicity also plays a role in the prevalence and patterns of lipid disorders in T2DM. A 2022 study highlighted the importance of understanding ethnic disparities in cardiometabolic risk factors, including lipids, indicating that certain ethnic groups, such as South Asians, have a higher predisposition for elevated TG levels (and as a result have reduced HDL-C levels, and a higher prevalence of sdLDL-C particles)[63]. These lipid abnormalities contribute to the increased CV risk observed in South Asians with T2DM (South Asian Brief). Understanding ethnic differences in lipid phenotypes is important for tailoring preventive and management strategies to optimize CV health outcomes in diverse populations with diabetes.

The role of Lipoprotein (a)

Lp(a) elevation is the most common lipid disorder in the U.S., ranging from 10% to 30% of people, with variation by race/ethnicity groups, and possibly higher in patients with established atherosclerotic cardiovascular disease (ASCVD), calcific aortic valve disease (CAVD), or chronic kidney disease (CKD). Genetic, epidemiologic, and pathophysiologic studies show Lp(a) is a causal factor for CAD, AMI, stroke, peripheral arterial disease (PAD), and heart failure (HF). Further research is needed to better understand the underlying mechanisms and ethnic-specific patterns of lipid disorders in individuals with diabetes. By gaining a comprehensive understanding of these associations, we can develop more targeted interventions and strategies to mitigate the CV risk posed by lipid abnormalities in diabetes, thereby improving

patient outcomes across different ethnic backgrounds. Recognizing variations in lipid disorders associated with diabetes, stratified by ethnicity, and with particular attention to high-risk women, e.g., those with polycystic ovary syndrome (PCOS), individuals with other risk factors such as smoking, and those with markers of higher risk, such as elevated liver enzymes, allows providers to assess CV risk more accurately and design personalized treatment plans.

Screening People with Diabetes for Non-alcoholic Fatty Liver Disease

Cardiometabolic changes lead to non-alcohol related fatty liver disease (NAFLD). Worldwide prevalence of NAFLD is rising in parallel with increasing rates of obesity. NAFLD is estimated to be prevalent in over 70% of people with T2DM[64] in the US, is a growing concern, and may warrant systematic screening[65,66]. It is estimated that about 1/4 of adults globally are affected by NAFLD; this is expected to rise to 1/3 in the next decade, posing significant public health challenges and economic burden[65]. NAFLD has become the most frequent disease on the liver transplant waiting list in the UNOS network, heightening needs for early detection and intervention. In addition to liver-related disease and mortality, NAFLD patients have increased CV mortality; together these cause great socioeconomic impact in industrialized countries[67]. Insulin resistance, a key driver of NAFLD, influences various processes including dyslipidemia, hyperglycemia, oxidative stress, inflammation, endothelial dysfunction, and ectopic lipid accumulation[68]. These factors collectively promote development of atherosclerosis and CVD. Given the frequency of patients with obesity, metabolic syndrome, and NAFLD, it is remarkable that NAFLD has been overlooked by clinicians and the pharmaceutical industry for so long; and no widely established algorithms for screening exist. Global increases in numbers of patients at risk raise an urgent need to establish clinical care structures and diagnostic algorithms to cope with the burden. Recognition of NAFLD as a metabolic-related disease has led to a proposed name change to "metabolic (dysfunction)-associated fatty liver disease (MAFLD)" aligning to underlying pathophysiological processes. Early management of modifiable risk factors for metabolic disorders holds promise to reduce risk of MAFLD. A recent global study estimated 55.5% of those with T2DM had NAFLD. This major diabetes risk can also progress to nonalcoholic steatohepatitis (NASH) which features inflammatory changes and fibrosis. Diabetes is a major risk for developing NASH and for progression of liver disease. A recent systematic review noted a rising global prevalence of NASH among individuals with T2DM at 37.3%[69].

Improving care through screening, guideline directed medical therapies (GDMT), and technology

There is an urgent need to better screen for pre-diabetes and diabetes, and to follow GDMT for people with diabetes. The recent ADA Standards of Care in Diabetes (2023) guideline summarizes recommendations[70] for routine screening for diabetes, monitoring prediabetes and diabetes, screening people with diabetes for complications and addressing them, and diabetes treatment. ADA also provides a Primary Care version of the guidelines, an app, and a pocket card.

Populations vary in risk for T2DM risk. WHO has longstanding recommendations to screen Asian populations at lower BMIs[71]. Asian Americans tend to have lower BMI than other US groups[72]. When BMI calculations were tailored for Asian adults, a study using US Behavioral Risk Factor Surveillance System data (2013 to 2020) estimated nearly twice the obesity prevalence, from 11.7% to 22.4%[72]. US obesity estimates for Asian subgroups varied substantially, estimating an adjusted obesity prevalence of 28.7% in Filipino, 26.7% in Japanese, 22.4% in Asian Indian, 17.4% in Korean, 13.6% in Vietnamese, and 13.2% in Chinese Americans adults 18+[72]. When BMI is >23 kg/m^2 (still below what CDC defines as overweight (BMI >25 kg/m^2))[73], Asian Americans have greater risks of dangerous metabolic changes compared to non-Hispanic white patients of the same BMI level[74]. Applying a tailored, proactive approach to screening may reduce rates of undiagnosed diabetes. A lean body habitus common in many South Asians is still accompanied by liver changes that elevate diabetes risk. Details on elevated CVD risk in diasporic South Asians are found here in this linked article[75].

Screening for diabetes during pregnancy is a USPSTF standard of care for all asymptomatic pregnant women 24 weeks+. American College of Obstetrics and Gynecology recommends a 2-step oral glucose tolerance test (OGTT) at 24-28 weeks. For abnormal screening, a confirmatory OGTT is recommended. Prenatal screenings help prevent poor infant outcomes (e.g., low birthweight (LBW), high birth weight (HBW), or macrosomia that can complicate delivery). Women diagnosed with GDM need close monitoring for fetal growth and complications, lifestyle counseling, and shared decision-making (SDM) when starting appropriate medical therapy during the pregnancy[76]. Diagnoses of gestational diabetes (GDM) also predict future risk for T2DM in those mothers with GDM and can add an "intergenerational" burden for LBW and HBW babies, increasing their risks for T2DM and CVD in later life as well. Earlier screening should be standard for women with a family history of DM (1st degree relative), prior GDM, BMI >25 kg/m^2, and those from high risk groups (African American, Asian American, Latino/Hispanic, Native American, or Pacific Islander)[77]. Routinely assess history of GDM.

Increase opportunistic screening – EDs, Diabetes Prevention Programs, & Community Events

Opportunities for screening can occur in clinical settings including emergency departments (ED). A pilot study used a diabetes risk screening tool to prompt ordering of HbA1c in the ED, demonstrating high rates of diabetes and prediabetes detection[78]. Other common clinical settings (e.g., preoperative) can also be explored for screening asymptomatic people.

Outside of clinical settings, screening can be incorporated into community events, or provided in DPP settings, including settings such as YMCAs. Similarly, faith-based settings can be leveraged to increase screening for diabetes in specific communities where diabetes prevention strategies have been tested (e.g., African American churches[79], Sikh gurdwaras[80]).

Deploy guideline-based medical therapies (GDMT) including lifestyle, and monitor for diabetes complications

It is essential that clinical teams follow GDMT for care (e.g., Guideline Directed Medical Therapy from ADA 2023 paper, broadly distribute the abridged version for PCPs). Patients should get counseling on critical behavior change that averts disabling complications,[81] and support to adopt healthy lifestyle change including daily physical activity[82]. It is important to monitor BP and control blood sugar, focusing on "time in range" for patients to make small adjustments according to their metabolism and type of treatment (e.g., insulin use), while avoiding hypoglycemia. Follow HbA1c and other labs like plasma glucose, and/or Continuous Glucose Monitoring, where indicated. A meta-analysis showed Black patients with T2DM were less likely to have HbA1c (OR = 0.67) or BP (OR = 0.68) controlled than were white and Hispanic patients[83]. Hispanic patients with T2DM were also less likely than whites to have HbA1c under control (OR – 0.68).

Monitoring microalbuminuria for kidney dysfunction and use of ACE inhibitors/ARBs

People with diabetes are at risk for CKD, which is disabling. Urinary albumin (e.g., spot urinary albumin-to-creatinine ratio) and estimated glomerular filtration rates (eGFR) should be assessed annually in people with T2DM regardless of treatment[70]. While annual monitoring of albuminuria is recommended, it should be more frequent for those with evidence of CKD[70]. A large 2019 study using EHR data on >200,000 people with diabetes and/or CKD showed only 20.1% of patients with T2DM received recommended tests, while 30.2% of those with CKD and T2DM received the test in a 12-month period[84]. The study also showed insufficient use of ACE inhibitors or ARBs that can reduce BP and protect kidney function from further progressing. ACEi or ARB medications up to maximally tolerated doses are strongly recommended for persons with urinary albumin-to-creatinine ratio of .300 mg/g creatinine and/or an eGFR of <60 mL/min/1.73 m^2 [70]. After maximal doses, SGLT2 inhibitors can be added to give additional protection for progression of CKD[85] (**Figure 4).**

Monitoring for neuropathy (monofilament testing)

All persons with T2DM should receive assessment for neuropathy once diagnosed with T2DM and annually afterwards. This includes a careful history, and assessment of temperature, pinprick sensations, and vibration. In primary care settings, all people with diabetes should have annual 10-g monofilament testing (and comprehensive foot exams) to assess if their feet are at risk for ulcers, which may predispose patients to amputation. Detection of neuropathy requires education on self-inspection of feet, how to look for infection or ulceration, and when to return for additional medical treatments for pain or infection. Patients with diabetes may have coexisting PAD, further compromising foot/lower extremity health.

Monitoring for diabetic retinopathy (annual vision care, early detection)

People with T2DM need initial dilated eye examinations by an ophthalmologist/optometrist when diabetes is diagnosed. If retinopathy is present, then annual dilated eye exams are needed to follow progression, plus recommended vision care.

Home Monitoring of Blood Pressure (BP) for Proactive Diabetes Self-Management

Healthy control of BP is critical for all patients to prevent heart attacks, strokes, and heart failure, and is significantly aided by use of inexpensive digital BP devices that enable informed lifestyle and medication adjustments that would not be achievable without the aid of technology. BP control is especially important for patients with diabetes in that it already places patients at high risk for CKD; concomitantly, poor BP control increases CKD and risks. Use of appropriate medical therapy for high BP is imperative. All patients with diabetes should be taught to use devices for self-monitoring of BP (SMBP), which can allow patients or caregivers to assess if BP is under control[86]. SMBP devices provide critical data to clinical teams who need BP readings for effective telehealth visits, and to patients, empowered with immediate feedback related to activities that support healthy BP (e.g., stress reduction, sleep, exercise, nutrition, cessation of tobacco, and moderation of alcohol use), as well as promoting adherence to anti-hypertensive medications supported by GDMT.

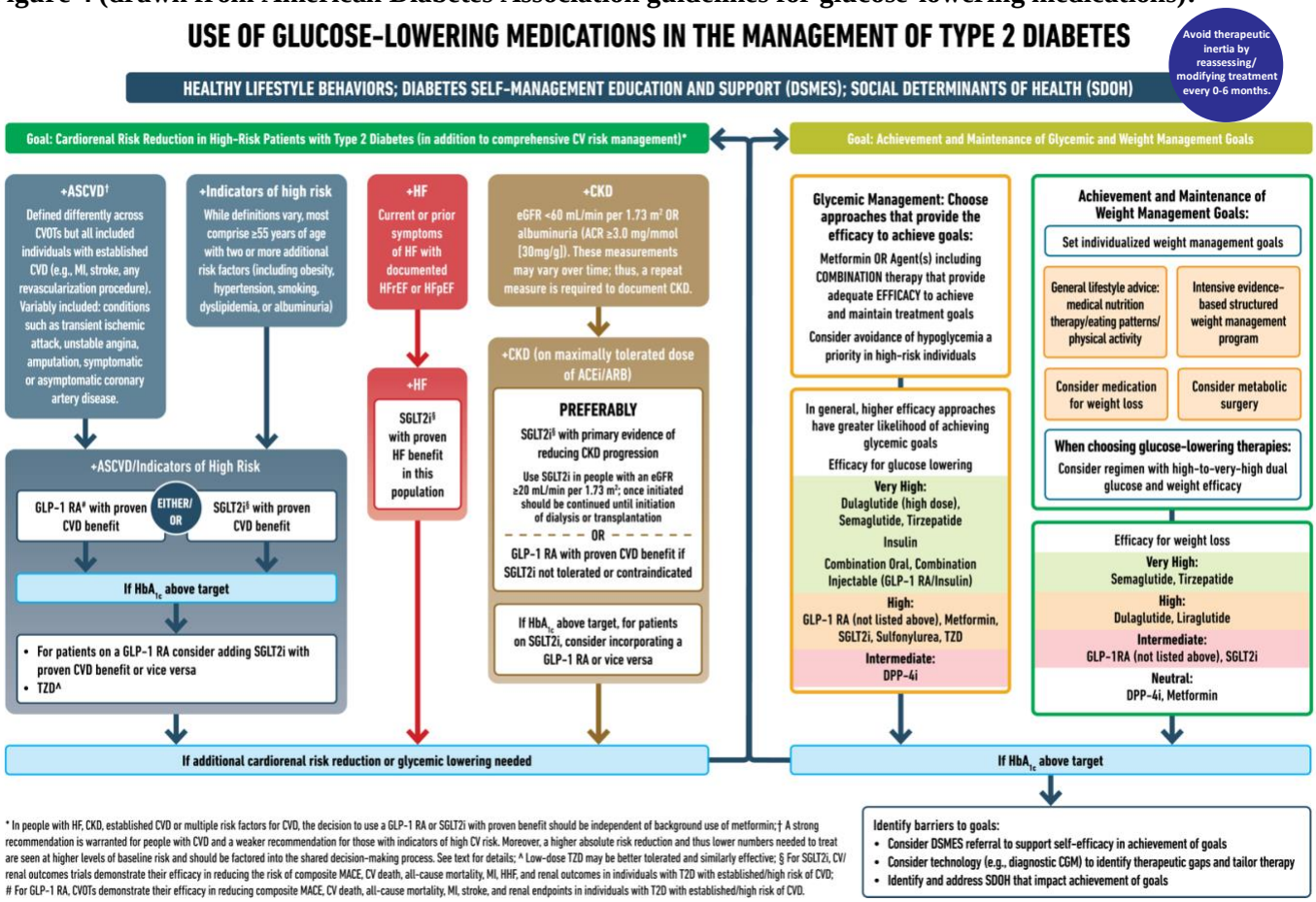
Use of home BP devices has been linked to improved systolic BP and better DM outcomes[87]. Uptake of these easy-to-use digital devices has been slowed by low health insurance coverage. There was progress on that front during the recent pandemic as physicians advocated for patients to provide home-based metrics to their EHR with attention to FDA processes for validation of devices and data interoperability, allowing a more seamless flow of home-based data to EHRs. Medicaid and Medicare coverage is being sought for digital BP devices which typically cost less than $100, but are out of reach for many, a critical health equity issue[88]. Dr. Rose Pavlokos, PharmD, of UCSF Division of Cardiology, presented compelling data to CMS on significantly better BP control with telemedicine enabled by SMBP, as documented here link.

Deploying Up-to-Date Medical Therapies for T2DM with a Team-Based Approach is Essential

Multi-faceted team-based care adhering to current GDMT under collaborative agreements improves outcomes for patients with T2DM including the California Right Meds Collaborative (Right Care Pharmacist on the Care Team Brief and CHW

brief). ADA provides updated guidance on medications for use in T2DM[70] (**Figure 4**). ADA's table guides primary care teams on effective medications. All T2DM patients receive guidance on healthy lifestyle behavior changes, education on diabetes self-management (or for their caregiver), and attention to social determinants of health (SDOH) that can compromise access to healthcare, healthy foods, necessary medical supplies, and safe communities for physical activity.

Figure 4 (drawn from American Diabetes Association guidelines for glucose-lowering medications):



Source: Adapted from Davies MJ, Aroda VR, Collins BS, et al. Diabetes Care 2022.[89]

Programs for Prevention of T2DM should include Shared Decision-making (SDM)

SDM can increase uptake of intensive lifestyle change (i.e., DPP) and adherence to metformin in overweight/obese prediabetic adults 18+, reducing risk of T2DM at 4-month follow-up (**Table 8**). This study also demonstrated that prediabetic patients who experienced SDM lost more weight at 1 year than did usual care patients (**Table 9**).

Table 8: Uptake of Diabetes Prevention Program (DPP), Metformin, or Both at 4-Month Follow-up in PRIDE Trial

Primary Outcome	SDM patients, N =351	Usual care patients, N = 1028	P value
Uptake DPP	23.4%	0.4%	< .001
Uptake metformin	18.8%	1.6%	< .001
Uptake DPP and/or metformin	38.2%	2.0%	< .001

Note: SDM – Shared Decision-making, DPP – Diabetes Prevention Program
Source: Adapted from Moin et al, JGIM 2019.[90]

Table 9: Change in Weight (lbs.) at 12-Month Follow-up in PRIDE Trial

Outcome	SDM patient, N = 351	Usual care patients, N = 1028	Difference	P value
Unadjusted weight change (SD)	- 5.2 lbs. (11.2)	- 0.2 lbs. (10.9)	- 5.0 lbs.	< .001
Adjusted weight change (CI) *	- 5.3 lbs. (-6.5, -4.1)	- 0.2 lbs. (-0.9, 0.5)	- 5.1 lbs. (-6.5, -3.7)	< .001

Note: lbs. – pounds; CI – Confidence interval; SDM – Shared Decision-making; SD = standard deviation. *adjusted estimates were generated via repeated measures mixed models that accounted for clinic clustering and controlled for days from baseline weight measurement to baseline data
Source: Adapted from Moin et al, JGIM 2019.

Continuous Glucose Monitoring Technology Supports Improved Diabetes Outcomes

Continuous glucose monitoring (CGM) has been successful for Type 1 diabetes for several years with demonstrated consistent benefits and reduces episodes of hypoglycemia and hospitalizations. With less expensive, compact, and easier

to use technology, CGM has become accessible to the subset of persons with T2DM, especially for those on multiple doses of insulin. CGM enables closer management of real-time blood sugar, reduces hypoglycemia, and improves HbA1c. A large literature review supports use of CGM/rt-CGM for T2DM patients on regimens that include insulin[91]. While there are fewer studies using CGM for T2DM patients who are not on injected insulin, some RCT studies have shown positive outcomes in behavior change, based on contingency of information on glucose level. Studies have begun to expand use of CGM for behavior/lifestyle change in T2DM patients who are not on insulin[92], and even in pre-diabetics. Generally, the 2023 ADA guidelines on technology suggest that physicians consider needs and goals of each person with diabetes, discuss blood glucose monitoring, and consider CGM use in that context for T2DM patients who are not on insulin[70].

Program and Policy Recommendations

Based on the evidence presented in this report, we highlight *key policy and program recommendations* for consideration:

Prevention and Early Detection

1) Promote policies and optimize lifestyles for all people to prevent diabetes. Promote healthy plant-centric diets, regular physical activity, not smoking, and equitable access to healthy food. Educate people on growing and cooking foods to support plant-based diets, and achieving healthy rest and exercise for a healthy circulatory system. Food as therapy is used by many high-performing health systems and should be standard of care for cardiometabolic conditions.
2) Medical prescriptions for fresh produce and 30 minutes per day of exercise (5 days/week) can improve cardiometabolic health for those at risk of T2DM, and may help in reversing prediabetes and T2DM.
3) Educate providers about the need for earlier and periodic screening for diabetes in specific higher risk groups (for instance for those with "lean metabolic risk", including Asian-specific screening at BMI of 23 kg/m^2) – this may also require insurance coverage for earlier screening for high risk people who have "normal weights/BMI".
4) Improve opportunistic screening for diabetes (e.g., blood work ahead of PCP check-ups, screening at ED visits or in pre-op surgery locations), and screening at DPP programs or faith-based locations for high risk groups.
5) Universal health insurance helps with access to evidence-based screening and early detection, and is critical for groups such as Latino/a/x populations with higher rates of uninsurance in CA, and higher rates of T2DM.
6) Importantly, dietary, exercise, and sleep patterns among youth contribute to the cardiometabolic trajectory over a lifetime, and should be an area of special focus among pediatricians, schools, and policymakers. Starting discussions early with parents and youth will likely help reduce diabetes rates and knowing about optimal lifestyle can also mitigate the burden and morbidity associated with T2DM should it appear in youth and young adults.

High Quality Diabetes Care Management

7) Cover use of continuous glucose monitors (CGMs) and home blood pressure (BP) monitors, prioritizing patients with diabetes who require insulin therapy. Research should continue on how CGM can be applied for non-insulin users. Research on CGM can include diverse individuals with pre-diabetes where a short duration of CGM use may help people learn behaviors to maintain healthy blood sugars to prevent prediabetes and diabetes.
8) Better control BP in people with diabetes, keeping levels less than 130/80 mm Hg[70] to prevent CVD and CKD. Hypertensive patients can routinely self-monitor blood pressure with affordable high-quality digital BP devices.
9) Develop evidence-based screening to assess for liver and lipid dysfunctions in all people with T2DM. Prescribe lipid-lowering statins to reduce risk for heart attacks and strokes among PWD who are at greater risk for CVD[70].
10) Ensure insulin availability/affordability as a model for expanding access to needed medications[93]. California recently acted to ensure available low cost insulin[94]. This can be a model for other states. In addition, policymakers should seek solutions for the high cost of and low access to newer medications such as GLP1 receptor agonists and SGLT2 inhibitors, which also reduce risk for CVD among people with diabetes. Policy and economic research is needed on access to medications that dramatically reduce weight while also reducing risk of diabetes in those with prediabetes as well as potentially reversing T2DM for some.

References: https://tinyurl.com/DM-Brief-Refs

Acknowledgements

Project Brief updated 7/3/23 by UC Berkeley School of Public Health (UCB SPH) Right Care Initiative team: Dr. Susan L. Ivey, MD, MHSA, Director of Research, Health Research for Action, Adjunct Professor, UCB SPH; Dr. Eveline Stock, MD, Associate Clinical Professor, UCSF School of Medicine; Hattie Rees Hanley, MPP, Director & Founder, Right Care Initiative, UCB SPH; Dr. Hector P. Rodriguez, PhD, Professor, UCB SPH; Dr. Catrina Taylor, PhD, MSPH, Chief, Surveillance & Research Section, Chronic Disease Surveillance and Research Branch, California Department of Public Health; Albert Yeam, BA, Lead Right Care Research Assistant, UCB.

Funding for this brief is from CDPH's Prevention Forward Program (contract # 20-10294A1 (PI: Ivey)).

Pharmacist on the Care Team

Patient Safety and Savings Brief

The role of the pharmacist has evolved beyond dispensing medication into active participation in disease management and prevention. By including pharmacists on the care team, published evidence and health system experience consistently demonstrate that mortality is reduced, disease outcomes improve, healthcare costs are reduced for high-risk patients, hospital readmission rates are reduced and patients are more satisfied with their healthcare. This evidence has been demonstrated in a broad range of conditions including cardiovascular diseases, diabetes management, asthma/COPD, oncology, and psychiatry[1].

A Need for Improved Medication Management

The cost of illness and death resulting from nonoptimized medication therapy reached $528.4 billion, equivalent to 16% of total U.S. health care expenditure, in 2016[2]. A pharmacist on the care team can help to optimize medication therapy outcomes and reduce cost.

Recognition of Pharmacists on the Clinical Care Team

The California Department of Public Health, U.S. Surgeon General, CDC, and Agency for Healthcare Research and Quality (AHRQ) all support the value of pharmacist on the care team interventions for proven improved quality of care and high return on investment[1,3,4]

Five Recent Studies Bolster Evidence for Clinical and Economic Benefits of Adding Pharmacist on the Care Team

Pharmacists Working in Los Angeles Barbershops Improved Hypertension (HTN) Control (Cedars-Sinai, California, 2018)[5]

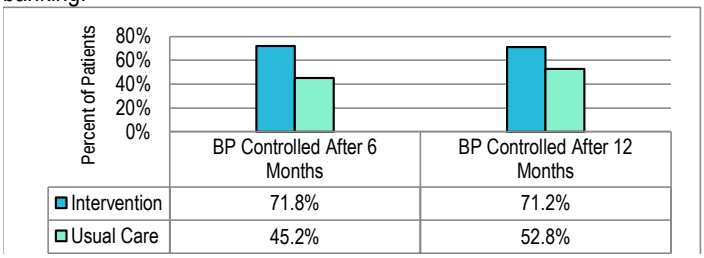
In a 2018 published NIH-funded study, a much larger percentage of patients who had their medications managed by a pharmacist in their barbershop achieved HTN control compared to those for whom the barber encouraged lifestyle modifications and regular doctor appointments. The difference in systolic blood pressure between pharmacist-managed patients and usual care was 21mmHg.

Patients with Uncontrolled Hypertension	Intervention Group	Control Group*
Hypertension Controlled at 6 months	118 (89.4%)	55 (32.2%)

(New England Journal of Medicine, 2018) * $p < 0.001$

Home Blood Pressure (BP) Telemonitoring and Pharmacist Management (HealthPartners Medical Group of Minnesota, 2013)[6,7]

Home BP telemonitors wirelessly transmitted patient measurements to clinic-based pharmacists, who then adjusted hypertensive therapy under a collaborative care agreement with physicians. This modern model of making hypertension management accessible and convenient was touted by a JAMA editorial board in 2013 as "*something patients, clinicians, and policy makers can take to the bank*", like ATMs are for banking.



Mortality Rate Declined Dramatically for Recently Hospitalized Coronary Artery Disease Patients (Kaiser Permanente, Colorado, 2007)[8]

CAD patients receiving comprehensive cardiac care from a collaborative practice of pharmacists and nurses soon after hospital discharge were 89% less likely to die as compared to patients not enrolled in the program.

Unadjusted Mortality by Comprehensive Cardiac Care Cohort[8]

Cardiac Care Cohort	Event Free	All-Cause Death
Early Comprehensive Cardiac Care	1094 (67.1%)	76 (4.7%)
No Comprehensive Cardiac Care	692 (44.0%)	737(46.9%)

(*Pharmacotherapy, 2007*)

Statewide Program Reduced Hospitalizations and Avoided Millions in Cost for Older Adults (Center for Medicare & Medicaid Innovation [CMMI] Project in Hawaii, 2016)[9]

Medication management services provided by specially trained hospital and community pharmacists were associated with:

- 36% reduction in the medication-related hospitalization rate
- $6.6 million of avoided costs compared to the $1.8 million of program cost: a $2.61:1 return on investment.

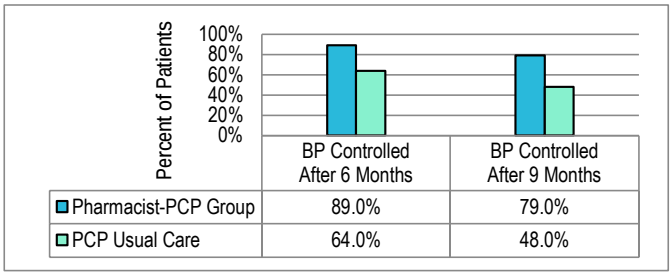
Insurer Based Transition of Care Program Reduced Hospital Readmissions for High Risk Patients (CVS Health, 2016)[10]

Recently hospitalized patients participating in a post-discharge pharmacist medication reconciliation program had a 50% relative risk reduction (11% absolute risk reduction) for hospital readmission within 30 days of discharge. The program more than paid for itself with savings of $2 for every $1 spent.

Right Care Initiative Pharmacy Collaboration— University of California NIH Demonstration Project:

Improved BP Control and Fewer PCP Visits in a Pharmacist-Primary Care Physician (PCP) Collaborative Practice[11]

Drug therapy problem identified for almost 50% of patients at first pharmacist visit. Larger percentage of patients receiving care in the pharmacist-PCP collaborative practice had their BP controlled and on average had two fewer PCP visits. (UCLA School of Medicine, UCSD School of Pharmacy)

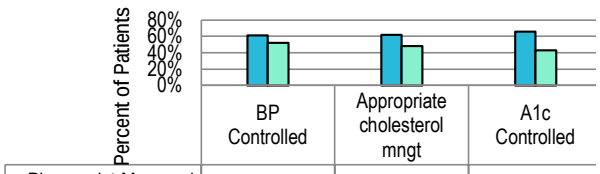


*These data are for patients continuing to see the pharmacist through 9 months.

Additional Evidence Supporting Pharmacy Care

Cardiovascular and Diabetes Outcomes Improve for High Risk Patients – University of Southern California (CMMI Project)

Pharmacists providing Comprehensive Medication Management (CMM) for ~6,000 high-risk patients improved blood pressure, cholesterol management, and A1c significantly more than a propensity score-matched usual care cohort. Patient and physician satisfaction were extremely high (manuscript in preparation, 2018)



	BP Controlled	Appropriate cholesterol mngt	A1c Controlled
Pharmacist-Managed Patients	61.0%	62.0%	66.0%
PCP Usual Care	52.0%	48.0%	43.0%

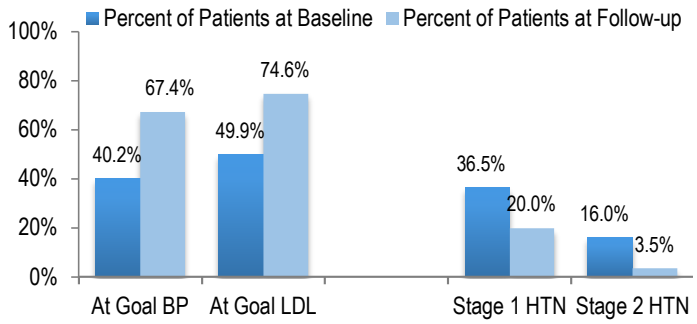
Large Employer Cardiovascular and Diabetes Program Improved Patient Health and Reduced Costs: The Asheville Project (City of Asheville, NC)

The Asheville quasi-experimental, longitudinal cohort studies provided early evidence of pharmacist on care team benefits.

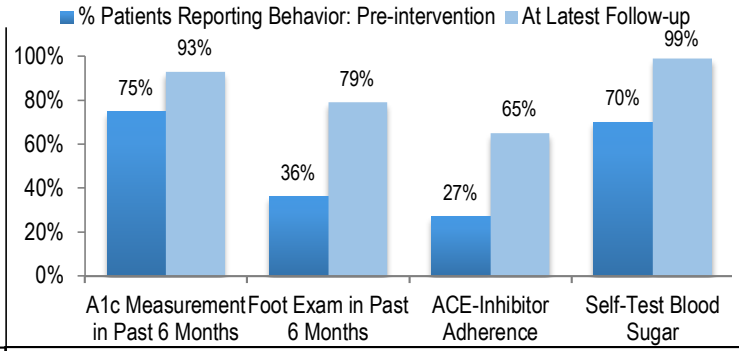
Asheville Cardiovascular (CV) Events and Costs:

Category	Before	After
Rate of CV events	77 per 1,000	38 per 1,000
CV-related medical costs	$1,362 PPPY	$734 PPPY

Outcomes for Cardiovascular Pharmacy Management from Asheville Project[12]



Outcomes for Diabetes Pharmacy Management from Asheville Project[13]



Typical "Pharmacist on the Care Team" Services

- 60-minute initial patient interview and counseling session (in-person or telephone) and 20-30 minute follow up sessions
- Comprehensive review of lab results and medications (including over-the-counter medications, supplements and herbal remedies)
- Point of care testing (e.g., blood sugar, blood pressure, blood thinner monitoring), vital sign measurement, depression screening
- Assessment of patients to monitor medication efficacy and safety
- Determination of drug interactions, how to improve medication therapy, and cost savings alternatives
- Interactive communication with physician and other members of the healthcare team (optimally through the electronic medical record)

Questions for a Pharmacist

- Is the medication selection and dose appropriate given the patient's age or other conditions and medications?
- Should medication therapy changes be considered that might improve patient adherence or address side effects?
- What time of day should patients take medications?
- Are all prescribed medications necessary and at optimum dosage?
- Are there additional medications that the patient should be taking?
- With what should (or should not) a medication be taken?
- Are less expensive, equivalent medications available?

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This program description was written by the California Right Care Initiative team at the University of California, Berkeley
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Effectiveness of Community Health Workers for Chronic Disease Care

Community health workers (CHWs), as defined by the American Public Health Association, are "frontline public health workers who are trusted members of … or have a close understanding of the community served." CHWs serve as intermediaries between healthcare services and communities, especially for underserved or minority populations, improving quality of care and access to services[1]. CHWs are also referred to as health navigators, health coaches, or community outreach workers. Promotores de salud (or promotoras) have traditionally served as CHWs for Spanish-speaking populations[2].

There is considerable interest in effectiveness of CHW interventions, especially as key stakeholders continue to search for patient-centered and cost-effective strategies to improve chronic care management. In an assessment conducted by the Centers for Disease Control and Prevention (CDC), CHWs' provision of chronic care services, including blood pressure (BP) testing and self-management education, had the strongest evidence base[3]. This issue brief summarizes the evidence for CHW interventions for chronic disease care management and the potential for disseminating CHW models to better support vulnerable patient populations.

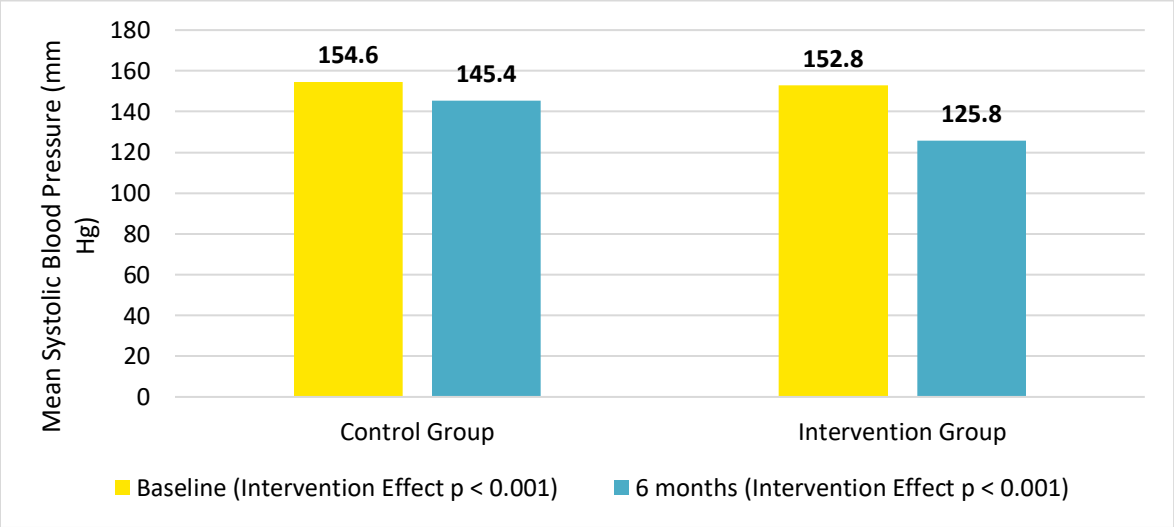
CHWs and Hypertension Management with and without Pharmacists

About half of adults in the United States (US) have diagnosed hypertension, with profound disparities in hypertension awareness, treatment, and control for non-Hispanic Black men[4,5]. A 2017 randomized controlled trial (RCT) conducted at two Massachusetts Community Health Centers examined CHW hypertension care management in English- and Spanish-speakers. CHWs were found to be effective for managing hypertension. Culturally-appropriate tools, like video patient narratives, were helpful and cost-effective[6].

In a 2018 cluster-randomized trial, researchers studied blood pressure (BP) reduction through Black-owned barbershops (**Figure 1**). A cohort of 319 Black male patrons with systolic BPs of 140 mm Hg or more were recruited from 52 Black-owned barbershops. They were assigned to either a pharmacist-led intervention group, in which trained barbers worked with specialty-trained pharmacists who would prescribe drug therapy under a collaborative practice agreement with participants' doctors, or an active control group, in which trained barbers working as CHWs verbally encouraged lifestyle modification and medical appointment attendance[7].

This study demonstrated a clear reduction in systolic BP at 6 months for those in the pharmacist intervention group in the trusted setting of the barbershop (**Figure 1**). Mean BP reduction in the intervention group was 22 mm Hg, and 63.6% of participants in the intervention group achieved a BP of <130/80 mm Hg, in contrast to only 11.7% of comparison group participants ($p < 0.001$)[7].

Figure 1. Mean Systolic Blood Pressure Outcomes at Baseline and 6 months with and without pharmacist



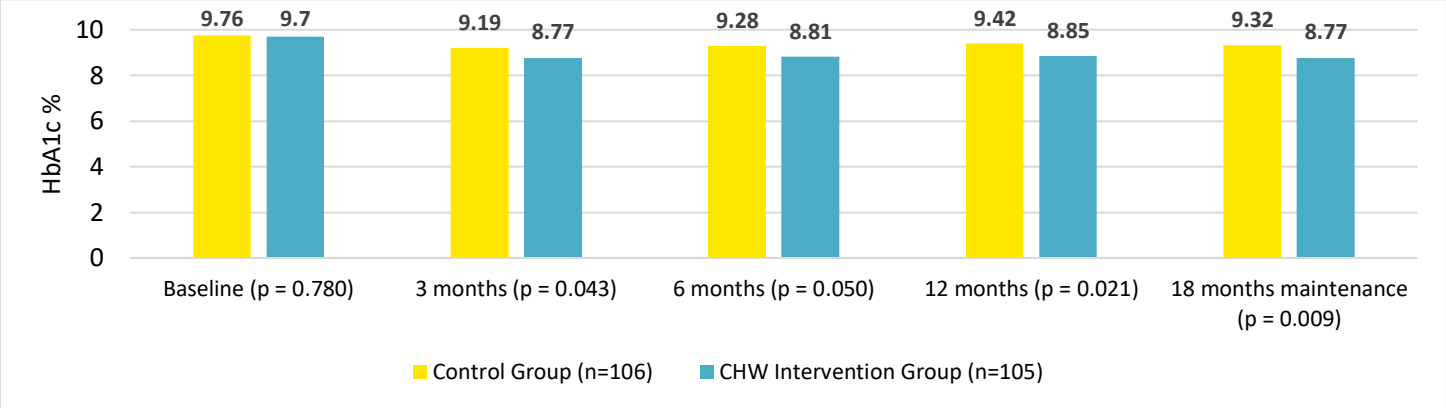
Adapted from Victor et al., 2018.

CHWs and Diabetes Management

Trained CHWs have successfully supported people with Type 2 Diabetes (T2DM)[8–10], and CDC's Diabetes Prevention Program (DPP) has been administered in settings such as YMCAs and churches[11–13]. Peer health coaching had greater effect on blood glucose control (decreasing HbA1c) in patients with low adherence to medication and self-management support than in patients with higher adherence levels; thus peer health coaching may be more effective if targeted to patients with less self-management support and lower medication adherence[14]. At 6 months, HbA1c levels had decreased more in the coached group than in the control group.

The DIABLEST (Diabetes Among Latinos Best Practices Trial) study enrolled 211 adult Latinos with T2DM who lacked access to healthcare and disease management services. The main objective was to evaluate the impact of CHW-led structured programs for blood glucose control. Participants were randomly assigned to either standard care or a CHW intervention. The CHW intervention included 17 individual at-home sessions with CHWs over 12 months. The sessions promoted healthy lifestyles, educated participants on nutrition and healthy food choices, supported blood glucose self-monitoring, and encouraged medication adherence. There was a sustained impact on blood sugar control (**Figure 2**) at 18 months (6 months post-intervention (p= 0.009)). There was a statistically significant repeat-measures group effect, with a mean HbA1c difference of -0.51%[15].

Figure 2. Primary HbA1c results at baseline; intervention period (3, 6, 12 months); post-intervention (18 mos.)



* Groups were equivalent at baseline. Adapted from Pérez-Escamilla et al., 2015.

A systematic review of CHW patient navigators (2021) found that CHW interventions improved aspects of chronic care management, including adherence to cancer screening and better primary care utilization. Some studies improved chronic disease management[16]**.** The review included articles from 1990 to 2020, and from multiple databases (PubMed, Medline, CINAHL). Reviewers identified 29 articles for review; 15 were RCTs. In 26 of 29 studies, CHWs were solely responsible for carrying out the interventions, while in 3 studies, CHWs were part of a healthcare team. While studies reported a variety of outcomes, this review solidifies evidence that CHW navigation interventions significantly improved care navigation (especially linkage to primary care).

Another systematic review of RCTs (2017) assessed CHW outcomes in diabetes care. Managing T2DM can be difficult for a number of reasons, including financial insecurity, emotional distress, low access to fresh fruits and vegetables, and limited access to care. Data were drawn from 17 total peer-reviewed articles published between 1997 and 2016. CHW interventions were reviewed with respect to intervention design, outcomes, and findings. Included studies were CHW-specific interventions; authors excluded team-based interventions to isolate CHW effects. A majority of included studies were conducted in the US. Several studies targeted rural populations and/or minority communities. Implementation of interventions occurred in primary care clinics, outpatient settings in clinical research centers, grocery stores, or via telephone[17]. The review found considerable variation in intervention specifics, including attrition rates and CHW training methods. However, there was substantial overlap, especially with respect to four types of services: patient education, patient care and management, care coordination, and providing support for patients' mental, emotional, and social health. The review findings (**Figure 3**) suggested that CHW interventions have significant positive impacts on physical health, diabetes knowledge, and self-care behaviors, and that CHWs promoted emotional well-being[17].

Figure 3. Positive Impacts demonstrated by CHW interventions

Theme	Articles Supporting Theme
Significant impact on physical health	Corkery et al., 1997; Gary et al., 2022; Heisler et al., 2014; Kenya et al., 2014; McDermott et al., 2015; Perez-Escamilla et al., 2015; Prezio et al., 2013; Rothschild et al., 2014; Spencer et al., 2011; Tang et al., 2014; & Wagner et al., 2016
Significant impact on diabetes management	Babamoto et al., 2009; Corkery et al., 1997; Kenya et al., 2014; & Wagner et al., 2015
Significant impact on self-care behaviors	Babamoto et al., 2009; Batts et al., 2001; Corkery et al., 1997; Gary et al., 2003; Heisler et al., 2014; Kollannoor-Samuel et al., 2016; Rothschild et al., 2014; & Spencer et al., 2011
Significant impact on mental health and well-being	Heisler et al., 2014; Rothschild et al., 2014; Spencer et al., 2013; Tang et al., 2014; & Wagner et al., 2016

Adapted from Trump, et al., 2017.

Interdisciplinary Collaborative Care

Beyond CHW interventions, collaborative or team-based care has been applied to improve patient outcomes. Interprofessional collaborative practice (ICP), as defined by the World Health Organization, is when "multiple health workers from different professional backgrounds work together with patients, families, caregivers, and communities to deliver the highest quality of care"[18]. A 2021 meta-analysis and systematic review assessed primary care ICP outcomes in adults with diabetes and hypertension. Standardized mean differences (SMD) were the key metrics to determine ICP outcomes. The review showed ICP was associated with reductions in HbA1c regardless of baseline levels, especially in patients with the highest HbA1c levels. Strong evidence existed for ICP reducing systolic and diastolic BPs. In addition to the evidence supporting ICP, ICP is also deemed important given global increases in prevalence of chronic diseases such as hypertension and T2DM. The aging of populations and increases in chronic conditions potentially leave physicians overworked, in need of a more interdisciplinary approach[19]. The evidence underscores that various team configurations of healthcare professionals and CHWs can aid with improving quality of care for diabetes and/or hypertension.

Pharmacists & CHWs: Success Reducing Barriers to Medication Adherence and Biometric Targets

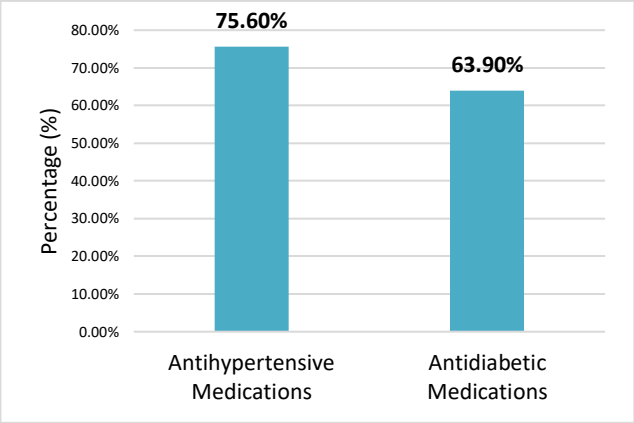
A 2020 study looked at collaborative care between pharmacists and CHWs to address medication adherence barriers that impact chronic disease care. In this study, CHWs received training in medication therapy management (MTM) support, and worked with pharmacists from the Center for Quality Medication Management at the University of Florida, serving predominantly Native American and Black patients with hypertension[20]. By the final pharmacist-CHW visits at 6 months, 75.6% and 63.9% of the barriers related to antihypertensive and antidiabetic medications, respectively, were resolved (**Figure 5**). Furthermore, a paired t-test indicated a significant difference in reduction in mean systolic (-5.9 mm Hg, p= 0.006) and diastolic (-4.5 mm Hg, p = 0.008) BPs over the 6-month intervention (**Figure 6**). The study's positive findings support the strength of pharmacist-CHW collaboration as a key collaborative model to improve medication adherence and overall patient outcomes[20].

Figure 4. Identified Medication Adherence Barriers improved by CHW-pharmacist care

Barrier type	Antihypertensive medications			Antidiabetic medications		
	No. barriers (initial encounter)	No. barriers (final encounter)	Percentage resolved	No. barriers (initial encounter)	No. barriers (final encounter)	Percentage resolved
Forgetfulness	35	10	71.4	12	4	66.7
Running out of refills	9	4	55.6	4	2	50
Knowledge	27	3	88.9	7	2	71.4
Adverse effects	13	3	76.9	10	3	70
Cost	6	2	66.7	3	2	33.3
Total	90	22	75.6	36	13	63.9

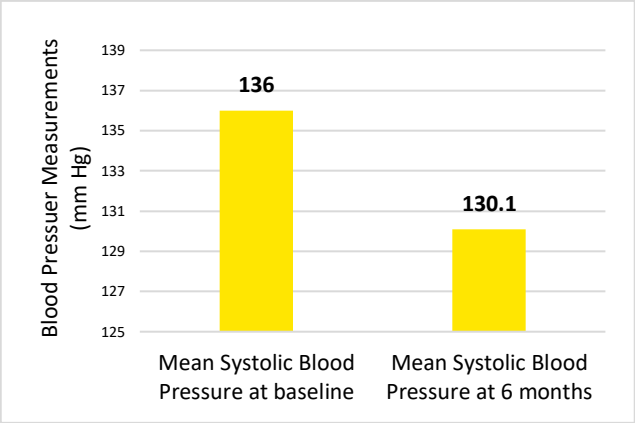
Adapted from Wheat et al., 2020.

Figure 5. Percentage of barriers resolved at 6 months for antihypertensive and antidiabetic medications



Adapted from Wheat et al., 2020.

Figure 6. Change in mean systolic blood pressure recorded at baseline and 6 months (final visit)



Clinically and statistically significant decrease in mean SBP (p=0.006). Adapted from Wheat et al., 2020.

CHWs Provide Support for Mental Health and Emotional Distress

While CHWs successfully provide care to chronic disease patients, they are also effective at supporting mental healthcare, an essential component for managing patients with chronic conditions. In a 2013 RCT, African American and Latino T2DM patients experienced significant reductions in diabetes-related emotional distress and symptoms of mental illness after participating in a lifestyle intervention led by CHWs. The intervention group enrolled in a 6-month program in which CHWs promoted healthy lifestyles and diabetes self-management activities through diabetes education classes, bimonthly home visits to support self-management goals, and support clinic visits with the participant and their primary care provider. Control group participants also received the intervention, after a 6-month delay. Diabetes-related emotional distress dropped significantly by 6.5 on a 100-point scale (p=0.05) for intervention participants, whereas the control group did not experience a significant reduction in that same period. Among patients with T2DM, diabetes-related emotional distress has been found to be associated with poor adherence to diabetes self-care recommendations, and leads to more severe complications and worse health outcomes. CHW-led interventions can help reduce emotional distress related to living with diabetes and mitigate exacerbations of diabetes in the future[21].

Cost-effectiveness of CHWs & Potential Cost Savings

Growing interest in CHWs has also stemmed from discussions regarding cost-effectiveness and expected cost savings. Kangovi et al. 2020 conducted a 2020 return-on-investment (ROI) analysis, finding that every dollar invested in a CHW intervention would return $2.47 to an average Medicaid payer within the fiscal year**.** The Individualized Management for Patient-Centered Targets (IMPaCT) study is a RCT of CHW care that addresses socioeconomic and behavioral barriers to health in low-income populations. IMPaCT enrolled 302 patients, 150 in the intervention arm and 152 controls. At baseline, there were no significant differences in hospitalizations between study arms. One-year post-enrollment, 31.6% of patients in the control arm had been hospitalized, versus 23.3% of patients in the intervention arm, which was promising but not significant (p=0.11). During follow-up, 98 admissions occurred in controls (0.64 admissions per patient-year), and 68 in the intervention arm (0.45 admissions per patient-year), a 30% relative reduction (p=0.17). Furthermore, the intervention group had fewer and lower-cost admissions (total inpatient costs of $2,267,900.10), compared to total inpatient costs in the control arm of $3,681,206.88. Factoring in outpatient costs, total care costs were $2,450,881.80 in the intervention group, and $3,852,189.78 in controls, a 38% reduction in care cost[22].

Integration of CHWs as care team members can be cost-effective and increases shared savings for hospitals/medical centers as part of risk-based payments. A 2011 qualitative study documented integration of CHWs into a Patient-Centered Medical Home (PCMH) in South Bronx, NY. CHWs received training, becoming full-time medical team members, responsible for home visits, outreach and follow-up of patients, and connecting patients with services. CHWs worked jointly with physicians in patient group meetings, helped

physicians forge better patient interactions, improved patient literacy, and facilitated conversations. CHWs were supervised and received regular feedback. After incorporating CHWs into their team, emergency department visits declined 5% and hospitalizations declined 12.6%. CHWs generated net savings of $1,135 per patient; each CHW generated a total of $170,213/yr in savings. The hospital's ROI was $2.30 for each $1 invested[23].

In a mixed-methods study conducted in 2018, researchers used data from claims and site visits to evaluate cost-effectiveness of CHW programs, specifically its impact on Medicare and Medicaid spending. Six intervention programs were included from nine states in rural, suburban, and urban areas. Each program employed between 5 and 34 CHWs, serving between 450 and 4,000 participants. After matching comparators, researchers documented participants' Medicare or Medicaid expenditures, number of hospitalizations, and ED visits from 2012 to 2016. Five of six programs showed a significant reduction in patient costs compared with controls, ranging from -$143 to -$2,044/patient per beneficiary quarter, most likely a result of the decreased numbers of ED visits and hospitalizations due to CHW services. Programs helped improve quality of patient healthcare and decreased spending up to $20,000/patient throughout the 4-year study, after accounting for the cost of CHW services. The overall findings suggest that implementation of CHW programs in hospitals can provide significant returns on investment for both Medicaid and Medicare payers, in addition to hospitals[24].

Medicaid Coverage and Pathways for CHW Services

As of July, 2022, the California Department of Health Care Services (DHCS) has added CHW services as a Medi-Cal benefit, including for individuals with multiple chronic or poorly managed conditions that may require intensive care coordination, under SPA 22-0001. Under CalAIM, enhanced care management (ECM) includes CHW provision of health education, health navigation, screening and assessment, and individual support for Medi-Cal beneficiaries, including parents or legal guardians of Medi-Cal patients under age 21[25].

Beginning July, 2023, the Department of Health Care Access and Information (HCAI) must develop and approve statewide requirements for CHW certification, approve the curriculum, and review certifications for evidence-based and community-defined curriculum and training. Currently, there are CHW certification programs, but there doesn't yet exist a standardized curriculum in the State of California. Organizations that want to approve or seek renewal of their CHW certificate programs must submit certification program plans, undergo reviews to ensure that their program meets state guidelines, and will then submit annual CHW certification program reports[26]. Experienced CHW program administrators highlight that CHWs need "career ladders" for CHWs that encourage professional development and job growth[27]. Given the low starting pay for most CHWs, opportunities exist to expand skills in patient self-management education, advocacy, patient navigation, and supervision of CHWs through job classifications that promote job satisfaction and retention.

Private Insurance Responses to Medi-Cal Coverage of CHWs

Medi-Cal has recently begun covering CHW services as part of Medi-Cal healthcare plans, prompting some private insurers to include CHW benefits as well. One example is Blue Shield of California, which offers both private health insurance and Medicare Advantage options. As part of their Health Reimagined Initiative, Blue Shield has provided underprivileged patients with community health advocates, to better help people access the resources they need[28]. Another example is Anthem Blue Cross (Anthem), which has contracted and collaborated with DHCS to implement the California Advancing and Innovating Medi-Cal (CalAIM) program, a program that strives to make Medi-Cal services more equitable and focused on integrated medical, behavioral, and social care[29,30]. CalAIM includes ECM, intensive care coordination services, as part of its CHW benefit while also including other social supports. Several private insurance companies are beginning to cover CHW services, indicating that CHW services may begin to play a more vital role in promoting preventive care, potentially addressing health disparities, and improving overall population health outcomes[30].

Recommendations

This brief reviewed the evidence for feasibility and effectiveness of CHW interventions in improving medical outcomes for people with chronic conditions, and the potential for cost savings. These studies demonstrate clear evidence for the benefits of integrating CHWs into care teams to help prevent and manage

hypertension, T2DM, CV risks, and mental health. Primary roles and competencies of CHWs include health education, promoting medication adherence, helping patients navigate complex health systems, and ensuring cultural competency for marginalized communities. CHWs can directly address various barriers to care that prevent patients, especially those from under-resourced communities, from receiving support to manage chronic conditions. CHWs are cost-effective and are likely to generate positive ROI for payers, provider groups, and hospitals. With Medi-Cal now covering CHW services, private insurance companies may increasingly include CHW services within their scope of services to advance health equity. Payers are incentivizing the delivery of integrated care to address medical, behavioral, and social risk factors for adults with chronic conditions. Many organizations have prioritized CHWs as central to the workforce that will help integrate care delivery across the continuum. It is important for policymakers and healthcare organizations to increase investments in the education, training, and career advancement of CHWs to ensure that the workforce is prepared to provide integrated medical, behavioral and social care to populations that historically have been hard to reach.

Figure 7: Community Health Work

Adapted from California Department of Public Health, Prevention Forward. "Comprehensive Medication Management (CMM) Webinar." June 14, 2023.[31]

All references for this brief can be found at the following URL: https://tinyurl.com/rightcareCHWref

Acknowledgements

Project Brief updated 6/26/23 by UC Berkeley School of Public Health team: Dr. Susan L. Ivey, MD, MHSA, Director of Research, Health Research for Action, Adjunct Professor, UC Berkeley School of Public Health; Professor Hector P. Rodriguez, PhD, Professor, UC Berkeley School of Public Health; Hattie Rees Hanley, MPP, Director & Co-Founder, Right Care Initiative, UC Berkeley School of Public Health; Albert Yeam, BA, Lead Right Care Research Assistant, UC Berkeley; Sarah Epstein, PhD, Project Policy Analyst, Right Care Initiative, UC Berkeley School of Public Health; and Caroline Kim, UC Berkeley Student Assistant. Earlier versions were contributed to by Emily Gu, UC Berkeley Student Assistant; Jenny Woo, Senior Right Care Research Assistant, UC Berkeley; and Margae Knox, PhD, prior Right Care Initiative staff.

Funding for this brief was provided by the California Department of Public Health Prevention Forward Program under contract # 20-10294A1 (PI: Ivey).

Right Care Initiative

Promising Intervention Brief

The Power of Home Blood Pressure Monitoring

"Home blood pressure monitoring should become a routine component of blood pressure measurement in the majority of patients with known or suspected hypertension…. [It] has the potential to improve the quality of care while reducing costs…."

Joint call to action by the American Heart Association, the American Society of Hypertension, and the Preventive Cardiovascular Nurses Association[3]

More than 7 million California adults (about 27%) have hypertension.[1] Approximately 69% of people who had a first heart attack, 77% who had a first stroke, and 74% of those with congestive heart failure had blood pressure greater than 140/90 mmHg.[2] Home blood pressure monitoring is a readily accessible, evidence-based and cost-effective strategy for improving hypertension treatment and control.

Improved Health and Cost Outcomes with Home Blood Pressure Monitoring

- Home monitoring in one study reduced the medication needed for blood pressure control, saving $1198 per 100 patients per month.[4]
- A meta-analysis of 18 randomized controlled trials found that hypertensive people using home monitoring had blood pressure 4.2/2.4 mmHg lower than those with standard office monitoring. Risk of blood pressure above target was also lower in people with home monitoring.[5]
- Home monitoring identifies whether blood pressure is different outside the doctor's office, which is common for as many as 20% of Americans. These patients are at higher risk for developing sustained high blood pressure (Harvard Newsletter).
- 95% of physicians agreed that home blood pressure measurements were useful in making treatment decisions to manage hypertension patients' condition.[6]

Home Monitoring Benefits [8]

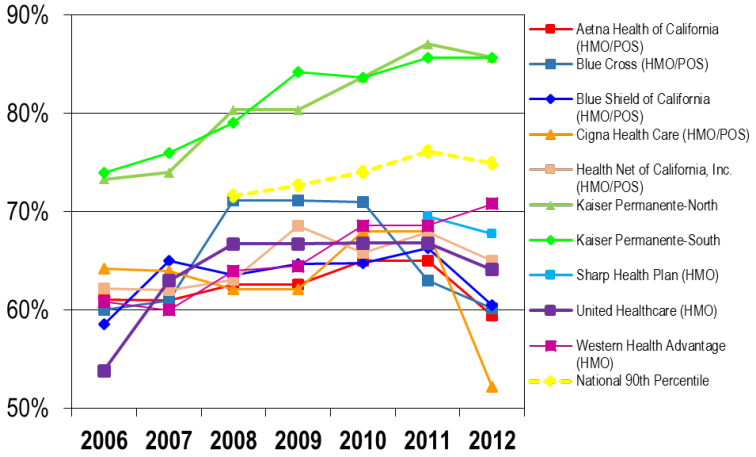
- Promotes better blood pressure control by engaging patients and motivating proactive behaviors—healthy eating, physical activity, proper medication use.
- Cuts healthcare costs—may reduce medications, the total number of doctor or clinic visits, and patients' travel expenses and lost wages.
- Tracks treatment effects between doctor visits.
- Helps doctors confirm hypertension diagnosis earlier.

Blood Pressure Control among Critical Right Care Goals

- The Right Care goal for all California health plans and medical groups is to achieve the national "A grade" of performance on cardiovascular disease and diabetes prevention and treatment measures, particularly for blood pressure and cholesterol control.
- The National Committee for Quality Assurance (NCQA) estimates that controlling high blood pressure alone is estimated to save 619-1,057 lives annually and avoid $4.5 million in hospitalization costs.

Blood Pressure Control Trends: Most California Health Plans are Making Progress

Percent patients with hypertension with blood pressure controlled (<140/90mmHg)



Home Monitors Increasingly Accurate and Affordable

- Machines can be purchased over-the-counter at most drugstores and pharmacies.
- Prices range from less than $50 to about $100.
- Validated machines are listed at http://www.dableducational.org/
- New technology is continually improving the ease and convenience of home monitoring.

Patient-Directed Blood Pressure Control with Home Monitoring Featured in the American Medical Group Association's *Best Practices in Hypertension Compendium*[11]

This demonstration project showed that patient participation in the control of blood pressure through home monitoring is feasible, effective, requires few extra clinic resources, and leads to better goal achievement.

Target Population

- Patients with high blood pressure and high risk for adverse cardiovascular outcomes

Intervention

- Each patient was given a blood pressure goal, a 30-60 minute educational session about blood pressure control importance, information about treatment options, and a home blood pressure monitor.
- Patients measured and recorded their blood pressure and pulse two times per day until blood pressure was at goal or after changes in treatment. Blood pressure readings were phoned/faxed/e-mailed to a clinic nurse. (Wireless versions now available make reporting even easier).
- Patients also evaluated blood pressure personally and, if not at goal, contacted clinic for instructions to improve blood pressure control.

Outcomes

- 31% of patients in the patient-directed care (home monitoring) group achieved goal in 6 months compared to 13% of patients in the usual care group.

Lessons Learned

- Physicians committed as a group to implement home monitoring when the project plan was presented at unit meetings.
- Questionnaires, blood pressure tracking sheets and educational materials helped patients better understand their blood pressure goal.

U.S. & International Guidelines Support Home Blood Pressure Monitoring

- Joint National Committee on Prevention Detection, Evaluation and Treatment of High Blood Pressure
- A Joint Call to Action by the American Heart Association, American Society of Hypertension and Preventive Cardiovascular Nurses Association
- European Society of Hypertension/European Society of Cardiology
- Canadian Hypertension Education Program
- Japanese Society of Hypertension
- British Hypertension Society

Blood Pressure Categories

American Heart Association | American Stroke Association

BLOOD PRESSURE CATEGORY	SYSTOLIC mm Hg (upper number)		DIASTOLIC mm Hg (lower number)
NORMAL	LESS THAN 120	and	LESS THAN 80
ELEVATED	120 – 129	and	LESS THAN 80
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 1	130 – 139	or	80 – 89
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 2	140 OR HIGHER	or	90 OR HIGHER
HYPERTENSIVE CRISIS (consult your doctor immediately)	HIGHER THAN 180	and/or	HIGHER THAN 120

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This promising intervention brief was written by the Right Care Initiative team at the University of California, Berkeley with support from the California Office of the Patient Advocate—Last Updated August 2019. For questions or comments, please visit RightCare.Berkeley.edu

Recommended Lifestyle Changes for Hypertension Management 2017

Distributed by Clinicians Group Capital Region Right Care Initiative

Lifestyle Changes for Hypertension Control[1]

Modification	Recommendation	Approximate SBP Reduction (Range)*
Reduce Weight	Maintain normal body weight (body mass index 18.5–24.9 kg/m2)	5–20 mmHg/10 kg
Adopt DASH eating plan[2]	Consume a diet rich in fruits, vegetables, and low-fat dairy products with a reduced content of saturated and total fat	8–14 mm Hg
Lower sodium intake	a. Consume no more than 2,400 mg of sodium/day; b. Further reduction of sodium intake to 1,500 mg/day is desirable, since it is associated with even greater reduction in BP; and c. Reduce sodium intake by at least 1,000 mg/day since that will lower BP, even if the desired daily sodium intake is not achieved	2–8 mm Hg
Physical activity	Engage in regular aerobic physical activity such as brisk walking (at least 30 min per day, most days of the week)	4–9 mm Hg
Moderation of alcohol consumption	Limit consumption to no more than 2 drinks± (e.g., 24 oz beer, 10 oz wine, or 3 oz 80-proof whiskey) ±± per day in most men, and to no more than 1 drink per day± (e.g., 12 oz beer, 4-5 oz wine, or 1.5 oz 80-proof whiskey) ±± in women and lighter weight persons	2–4 mm Hg
Tobacco cessation	Use Motivational Interviewing (MI) techniques versus usual care for smoking cessation to demonstrate a significant increase in quitting. MI delivered by primary care physicians nearly 4 times more effective than usual care but delivery by counselors closer to 1.25 (still a significantly higher quit rate than usual care).[4,5]	0–5 mm Hg[3]

Components of the Dietary Approaches to Stop Hypertension Diet[6]

Dietary Component	Amount
Total fat	27% of calories
Saturated fat	6% of calories
Cholesterol	150 mg
Carbohydrates	55% of calories
Fiber	30 g
Protein	18% of calories
Sodium	1,500 mg
Potassium	4,700 mg
Calcium	1,250 mg
Magnesium	500 mg

[1] American Heart Association/American College of Cardiology. Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults. 2017. http://hyper.ahajournals.org/content/early/2017/11/10/HYP.0000000000000065

*The effects of implementing these modifications are dose and time dependent, and could be greater for some individuals.

[2] National Heart, Lung, and Blood Insitute (NHLBI). What is the DASH Eating Plan? 6 June 2014. http://www.nhlbi.nih.gov/health/health-topics/topics/dash/

Note: DASH, Dietary Approaches to Stop Hypertension. DASH-sodium has a greater effect than DASH alone.

±http://www.mayoclinic.org/diseases-conditions/high-blood-pressure/expert-answers/blood-pressure/faq-20058254

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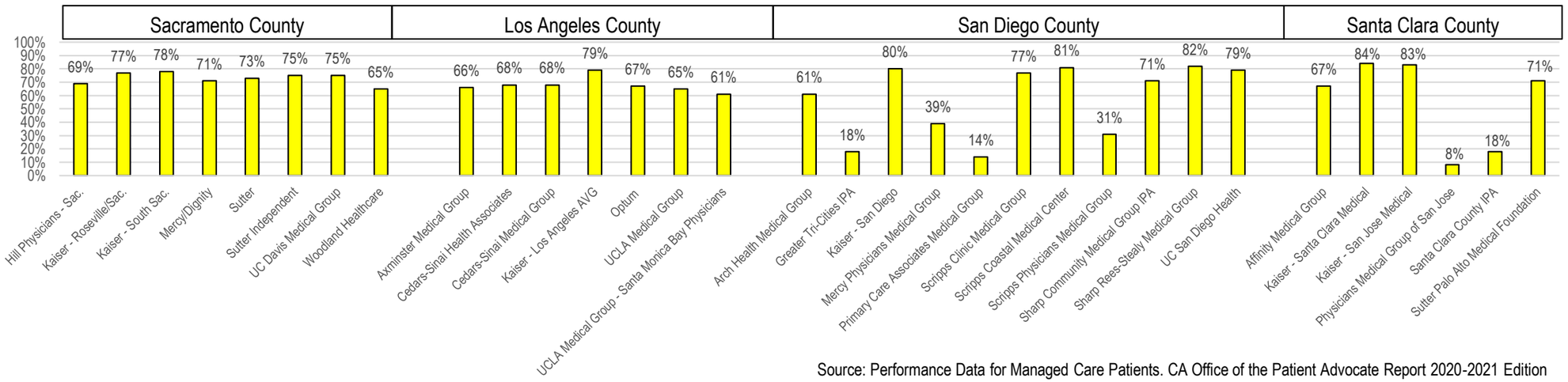
California Office of the Patient Advocate Performance Gold Bar Charts

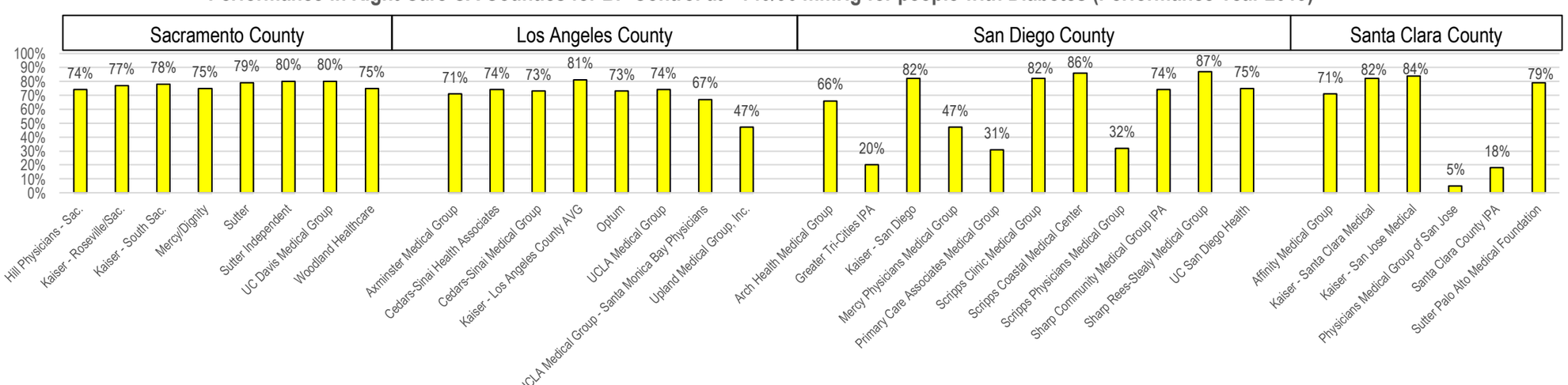
(Right Care Target Measures for Medical Groups in Sacramento, Los Angeles, San Diego and Santa Clara County)

Performance in Right Care CA Counties for Blood Pressure (BP) Control at <140/90 mmHg (Performance Year 2019)



Source: Performance Data for Managed Care Patients. CA Office of the Patient Advocate Report 2020-2021 Edition

Performance in Right Care CA Counties for BP Control at <140/90 mmHg for people with Diabetes (Performance Year 2019)



Source: Performance Data for Managed Care Patients. CA Office of the Patient Advocate Report 2020-2021 Edition

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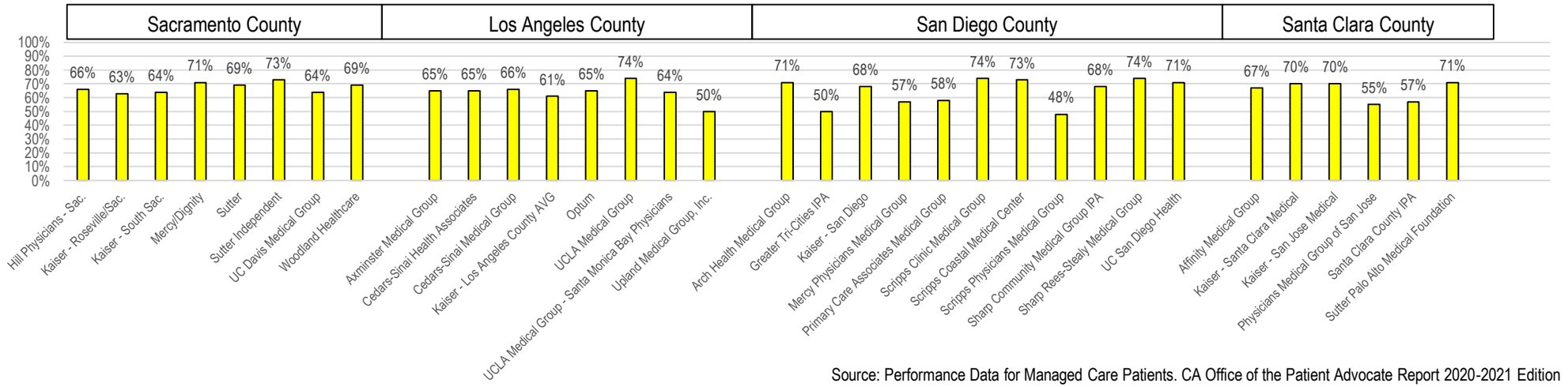
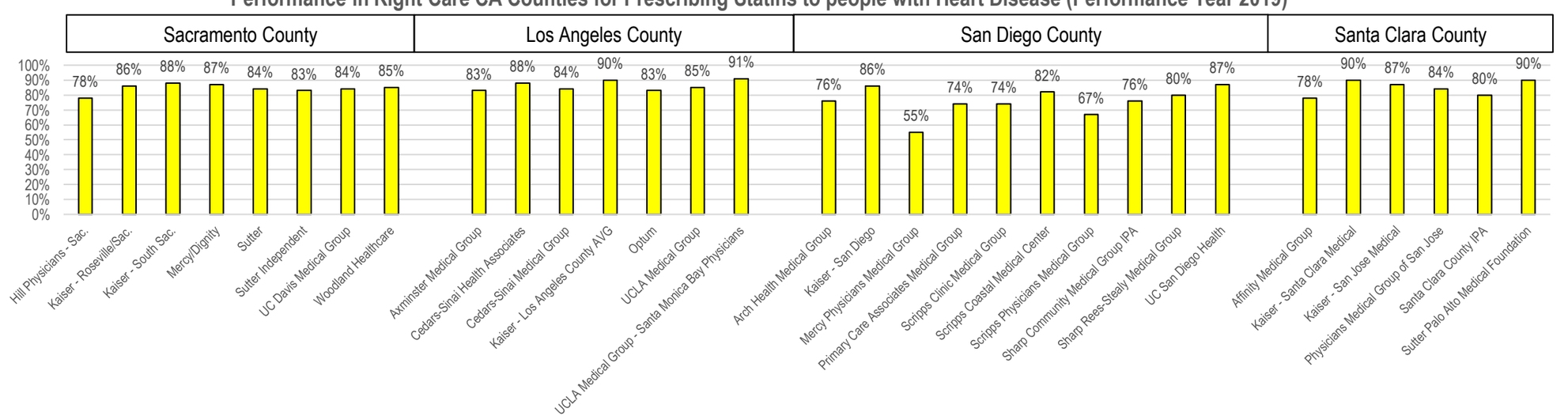
(Right Care Target Measures for Medical Groups in Sacramento, Los Angeles, San Diego and Santa Clara County)



Source: Performance Data for Managed Care Patients. CA Office of the Patient Advocate Report 2020-2021 Edition



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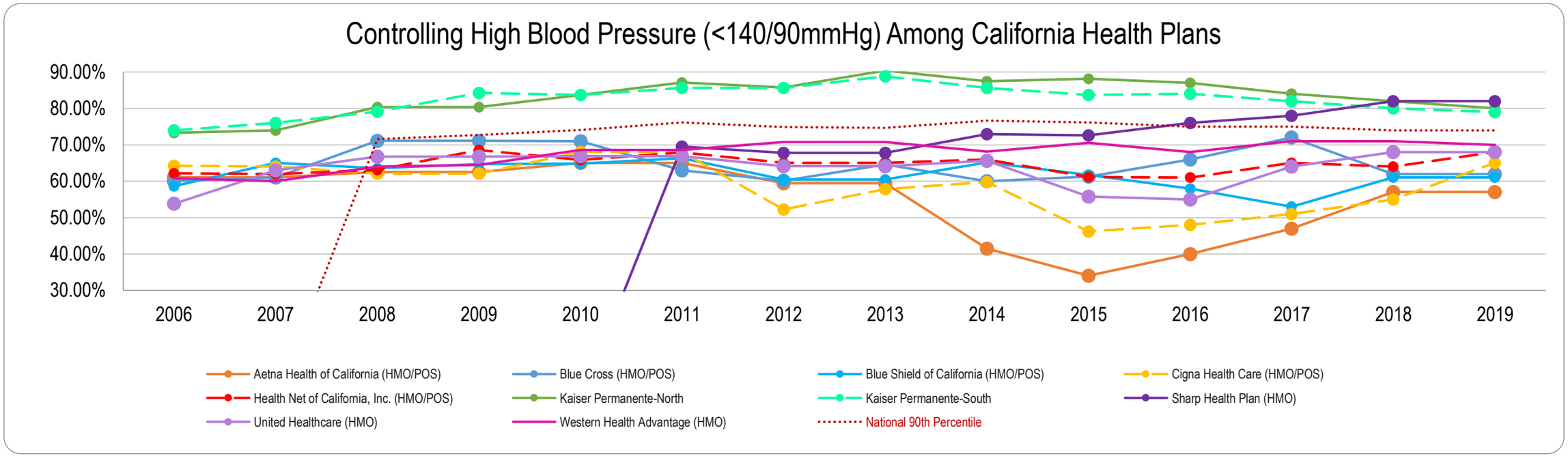
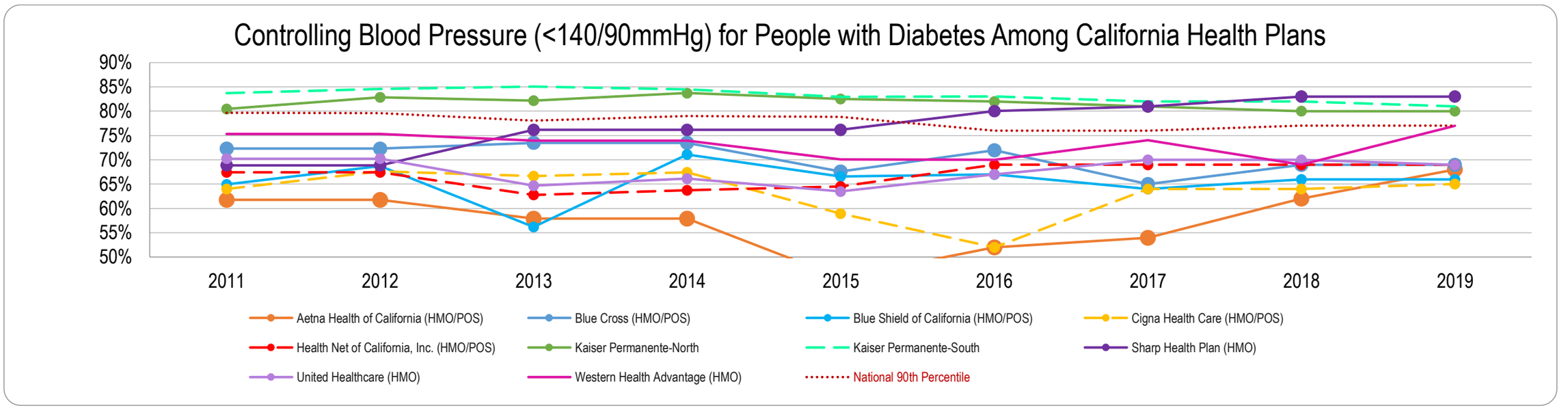


	2006¥	2007¥	2008¥	2009¥	2010¥	2011¥	2012¥	2013¥	2014¥	2015¥	2016*	2017*	2018*	2019	Δ Since 2006
Aetna Health of California (HMO/POS)	61.06%	61.00%	62.59%	62.59%	65.04%	65.04%	59.43%	59.43%	41.46%	34.06%	40.00%	47.00%	57.00%	57.00%	**-4.06%**
Blue Cross (HMO/POS)	60.04%	61.00%	71.16%	71.16%	71.00%	63.02%	60.16%	64.56%	60.00%	61.27%	66.00%	72.00%	62.00%	62.00%	**1.96%**
Blue Shield of California (HMO/POS)	58.60%	65.00%	63.55%	64.73%	64.79%	66.33%	60.50%	60.50%	65.20%	61.70%	58.00%	53.00%	61.00%	61.00%	**2.40%**
Cigna Health Care (HMO/POS)	64.23%	64.00%	62.11%	62.11%	68.04%	68.04%	52.22%	57.80%	59.80%	46.23%	48.00%	51.00%	55.00%	65.00%	**0.77%**
Health Net of California, Inc. (HMO/POS)	62.23%	62.00%	63.11%	68.56%	65.82%	67.93%	65.03%	65.03%	65.96%	61.17%	61.00%	65.00%	64.00%	68.00%	**5.77%**
Kaiser Permanente-North	73.31%	74.00%	80.37%	80.37%	83.70%	87.08%	85.71%	90.41%	87.44%	88.13%	87.00%	84.00%	**82.00%**	**80.00%**	**6.69%**
Kaiser Permanente-South	73.97%	76.00%	79.08%	84.23%	83.70%	85.64%	85.64%	88.81%	85.64%	83.70%	84.00%	82.00%	**80.00%**	**79.00%**	**5.03%**
Sharp Health Plan (HMO)						69.54%	67.78%	67.78%	72.98%	72.56%	76.00%	78.00%	**82.00%**	**82.00%**	**12.46%***
United Healthcare (HMO)	53.81%	63.00%	66.75%	66.75%	66.83%	66.83%	64.10%	64.10%	65.63%	55.80%	55.00%	64.00%	68.00%	68.00%	**14.19%**
Western Health Advantage (HMO)	60.83%	60.00%	63.99%	64.48%	68.61%	68.61%	70.80%	70.80%	68.13%	70.56%	68.00%	71.00%	71.00%	70.00%	**9.17%**
National 90th Percentile			**71.61%**	**72.68%**	**74.09%**	**76.16%**	**74.94%**	**74.65%**	**76.64%**	**76.16%**	**75.00%**	**75.00%**	74.00%	74.00%	**2.39%****
California Average			*63.64%*	*69.44%*	*70.30%*	*70.81%*	*68.93%*	*68.16%*	*67.22%*	*63.35%*	*64.30%*	*66.70%*	*68.20%*	*69.20%*	**5.56%**
National Average			*63.37%*	*64.09%*	*63.43%*	*65.36%*	*63.04%*	*63.30%*	*63.98%*	*60.51%*					

¥ Data collected is from National Committee for Quality Assurance (NCQA) *Data collected is from Office of the Patient Advocate (OPA) *Δ Since 2011 for Sharp Health Plan **Δ Since 2008 for National 90th Percentile

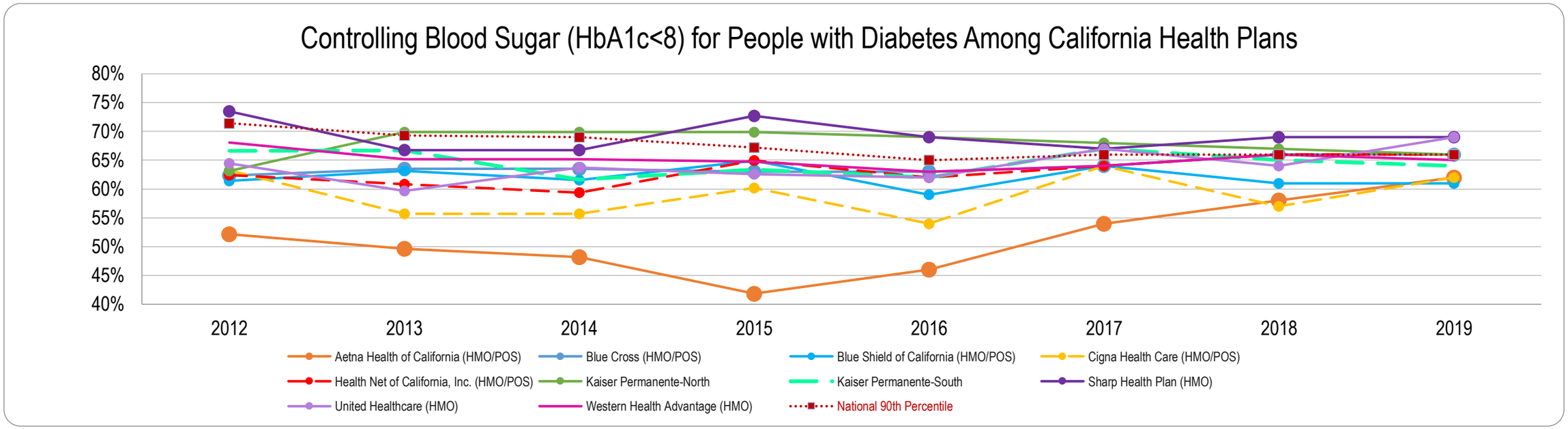
California Office of the Patient Advocate Performance Gold Bar Charts



	2011¥	2012¥	2013¥	2014¥	2015¥	2016*	2017*	2018	2019	*Δ Since 2011*
Aetna Health of California (HMO/POS)	61.76%	61.76%	57.92%	57.92%	45.74%	52.00%	54.00%	62.00%	68.00%	**6.24%**
Blue Cross (HMO/POS)	72.33%	72.33%	73.48%	73.48%	67.64%	72.00%	65.00%	69.00%	69.00%	**-3.33%**
Blue Shield of California (HMO/POS)	64.97%	68.73%	56.20%	71.09%	66.61%	67.00%	64.00%	66.00%	66.00%	**1.03%**
Cigna Health Care (HMO/POS)	63.96%	67.64%	66.67%	67.40%	58.97%	52.00%	64.00%	64.00%	65.00%	**1.04%**
Health Net of California, Inc. (HMO/POS)	67.41%	67.41%	62.77%	63.75%	64.48%	69.00%	69.00%	69.00%	69.00%	**1.59%**
Kaiser Permanente-North	80.47%	82.85%	82.18%	83.76%	82.55%	82.00%	81.00%	**80.00%**	**80.00%**	**-0.47%**
Kaiser Permanente-South	83.72%	84.60%	85.07%	84.50%	82.96%	83.00%	82.00%	**82.00%**	**81.00%**	**-2.72%**
Sharp Health Plan (HMO)	68.86%	68.86%	76.21%	76.21%	76.17%	80.00%	81.00%	**83.00%**	**83.00%**	**14.14%**
United Healthcare (HMO)	70.22%	70.22%	64.68%	66.11%	63.51%	67.00%	70.00%	70.00%	69.00%	**-1.22%**
Western Health Advantage (HMO)	75.36%	75.36%	73.97%	73.97%	70.07%	70.00%	74.00%	69.00%	**77.00%**	**1.64%**
National 90th Percentile	**79.68%**	**79.60%**	**78.08%**	**79.02%**	**78.83%**	**76.00%**	**76.00%**	77.00%	77.00%	**-2.68%**
California Average	*67.16%*	*72.86%*	*63.62%*	*72.01%*	*67.62%*	*69.40%*	*70.40%*	*71.40%*	*72.70%*	**5.54%**
National Average	*65.83%*	*66.48%*	*64.97%*	*64.64%*	60.18%					

¥ Data collected is from National Committee for Quality Assurance (NCQA) *Data collected is from Office of the Patient Advocate (OPA)

California Office of the Patient Advocate Performance Gold Bar Charts

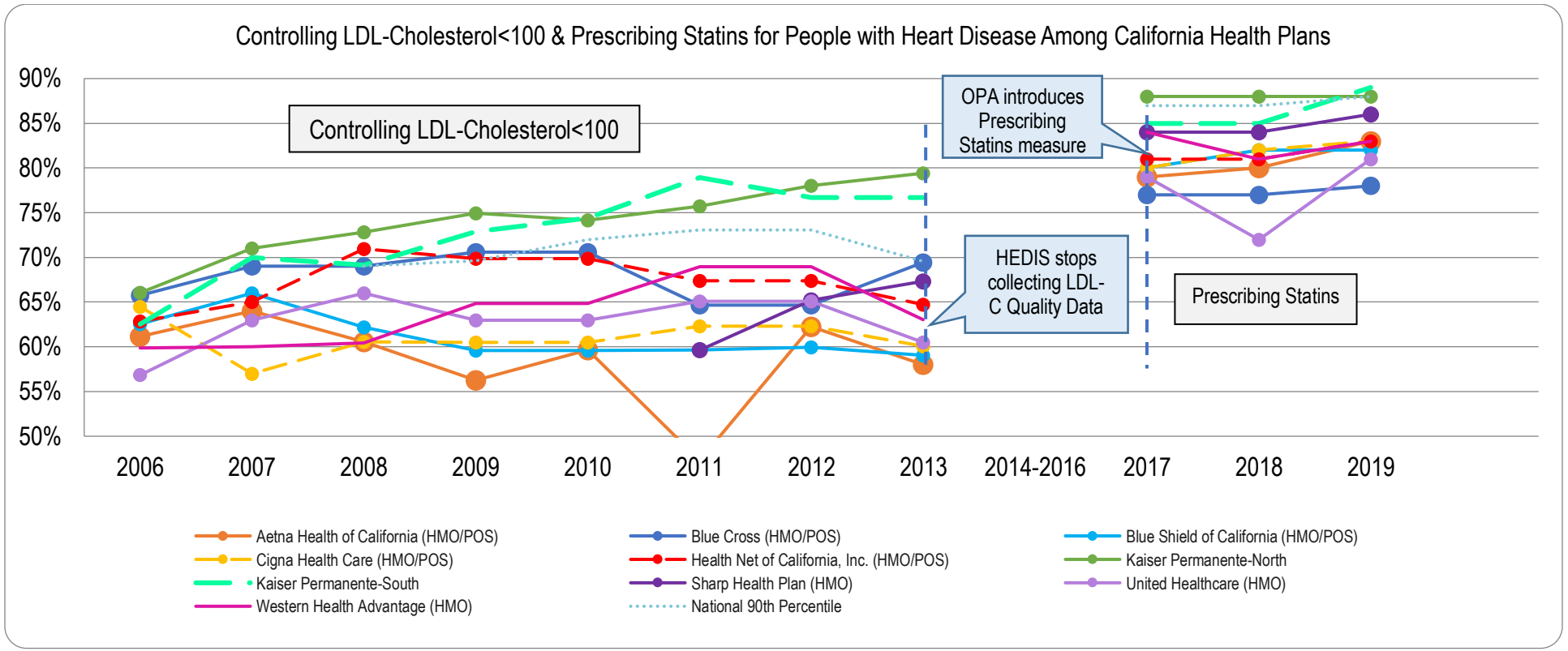


	2012¥	2013¥	2014¥	2015¥	2016*	2017*	2018	2019	*Δ Since 2012*
Aetna Health of California (HMO/POS)	52.13%	49.65%	48.18%	41.85%	46.00%	54.00%	58.00%	62.00%	**9.87%**
Blue Cross (HMO/POS)	62.33%	63.50%	63.50%	63.02%	63.00%	64.00%	**66.00%**	66.00%	**3.67%**
Blue Shield of California (HMO/POS)	61.45%	63.14%	61.56%	64.92%	59.00%	64.00%	61.00%	61.00%	**-0.45%**
Cigna Health Care (HMO/POS)	63.26%	55.72%	55.72%	60.20%	54.00%	64.00%	57.00%	62.00%	**-1.26%**
Health Net of California, Inc. (HMO/POS)	62.44%	60.83%	59.37%	64.96%	62.00%	64.00%	**66.00%**	66.00%	**3.56%**
Kaiser Permanente-North	63.14%	69.89%	69.89%	69.89%	69.00%	68.00%	**67.00%**	66.00%	**2.86%**
Kaiser Permanente-South	66.59%	66.69%	61.64%	63.35%	62.00%	67.00%	65.00%	64.00%	**-2.59%**
Sharp Health Plan (HMO)	73.48%	66.75%	66.75%	72.73%	69.00%	67.00%	**69.00%**	69.00%	**-4.48%**
United Healthcare (HMO)	64.44%	59.67%	63.74%	62.56%	62.00%	67.00%	64.00%	69.00%	**4.56%**
Western Health Advantage (HMO)	68.07%	65.21%	65.21%	64.72%	63.00%	64.00%	**66.00%**	65.00%	**-3.07%**
National 90th Percentile	**71.43%**	**69.33%**	**68.98%**	**67.22%**	**65.00%**	**66.00%**	**66.00%**	66.00%	**-5.43%**
California Average	*64.69%*	*59.56%*	*63.03%*	62.75%	60.60%	64.30%	63.90%	65.00%	**0.31%**
National Average	*61.32%*	*58.90%*	*57.47%*	55.34%					

¥ Data collected is from National Committee for Quality Assurance (NCQA) *Data collected is from Office of the Patient Advocate (OPA)

California Office of the Patient Advocate Performance Gold Bar Charts

Trend analysis provided by the UC Berkeley School of Public Health Right Care Research Team, November 2019



	2006¥	2007¥	2008¥	2009¥	2010¥	2011¥	2012¥	2013¥	2014-2016	2017*	2018*	2019*
Aetna Health of California (HMO/POS)	*61.16%*	*64.00%*	*60.53%*	*56.27%*	*59.62%*	*47.30%*	*62.26%*	*58.00%*	*N/A*	*79.00%*	*80.00%*	*80.00%*
Blue Cross (HMO/POS)	*65.74%*	*69.00%*	*69.00%*	***70.56%***	*70.56%*	*64.66%*	*64.66%*	*69.47%*	*N/A*	*77.00%*	*77.00%*	*78.00%*
Blue Shield of California (HMO/POS)	*62.58%*	*66.00%*	*62.16%*	*59.56%*	*59.56%*	*59.62%*	*59.95%*	*59.05%*	*N/A*	*80.00%*	*82.00%*	*82.00%*
Cigna Health Care (HMO/POS)	*64.48%*	*57.00%*	*60.55%*	*60.51%*	*60.51%*	*62.28%*	*62.28%*	*60.05%*	*N/A*	*80.00%*	*82.00%*	*83.00%*
Health Net of California, Inc. (HMO/POS)	*62.84%*	*65.00%*	***70.98%***	***69.87%***	*69.87%*	*67.40%*	*67.40%*	*64.75%*	*N/A*	*81.00%*	*81.00%*	*83.00%*
Kaiser Permanente-North	*66.04%*	*71.00%*	***72.84%***	***74.97%***	***74.17%***	***75.74%***	***78.04%***	***79.42%***	*N/A*	***88.00%***	***88.00%***	***88.00%***
Kaiser Permanente-South	*62.53%*	*70.00%*	***69.13%***	***72.87%***	***74.41%***	***78.94%***	***76.72%***	***76.72%***	*N/A*	*85.00%*	*85.00%*	***89.00%***
Sharp Health Plan (HMO)						*59.62%*	*65.23%*	*67.30%*	*N/A*	*84.00%*	*84.00%*	*86.00%*
United Healthcare (HMO)	*56.84%*	*63.00%*	*66.01%*	*62.98%*	*62.98%*	*65.11%*	*65.11%*	*60.51%*	*N/A*	*79.00%*	*72.00%*	*70.00%*
Western Health Advantage (HMO)	*59.87%*	*60.00%*	*60.44%*	*64.86%*	*64.86%*	*68.95%*	*68.95%*	*63.06%*	*N/A*	*84.00%*	*81.00%*	*83.00%*
National 90th Percentile			***69.04%***	***69.63%***	***71.97%***	***73.06%***	***73.06%***	***69.59%***	***N/A***	***87.00%***	***87.00%***	***88.00%***

¥ Data directly from National Committee for Quality Assurance (NCQA) *Data from NCQA, prepared by the CA Office of the Patient Advocate (OPA)

Key Data for Sacramento County

Cardiovascular Disease and Diabetes

The Right Care Initiative (RCI) is dedicated to improving cardiovascular and diabetes outcomes by catalyzing uptake of patient-centered, evidence-based practices using performance data to drive improvement among health systems, medical groups, clinics, and health plans. Based at UC Berkeley School of Public Health, this public-private partnership was launched in 2008 by the UC Berkeley and UCLA Schools of Public Health with encouragement from the CA Department of Managed Health Care. RCI includes health system leaders, patient groups, the University of California (multiple campuses), USC, Stanford, Health Services Advisory Group (CMS QIO), CA Chronic Care Coalition, and RAND. We collaborate intensively with local leaders in 4 major metro areas: San Diego, Sacramento, Los Angeles and Silicon Valley. Right Care's first University of Best Practices (UBP) launched in San Diego in February of 2011; the 2nd in Sacramento 2012. UBP gathers health leaders for top performers to teach proven strategies, practices, and breakthrough ideas to prevent heart attacks, strokes, and diabetic complications.

University of Best Practices: Right Care's Translational Model to Implement Evidence-Based Innovations

- Monthly 2-hour convenings are held with leaders from the major regional health care delivery systems in each region.
- Leaders from successful organizations or experts present for 1 hour.
- A break-out session or discussion involving all participants follows in the second hour to consider how to apply the speaker's ideas in the local setting and to problem-solve how to overcome barriers to better uptake of evidence-based protocols and practices.
- Trusted performance data are the bedrock of the UBP model.

Key Statistics

- **Mortality rates in Sacramento County** for diabetes, coronary heart disease, and stroke are **higher** compared to the state. Figure 1.
- Sacramento has **higher hospitalization rates** for acute myocardial infarction (MI) and stroke compared with California overall (OSHPD).
- **Sacramento County has the 2nd worst rate of MIs in CA**.
- There are **large disparities by race** for cardiovascular hospitalizations and risk factors. Figs. 5, 6 and 8.
- Many counties are leading Sacramento on lowering risks. Table 1.

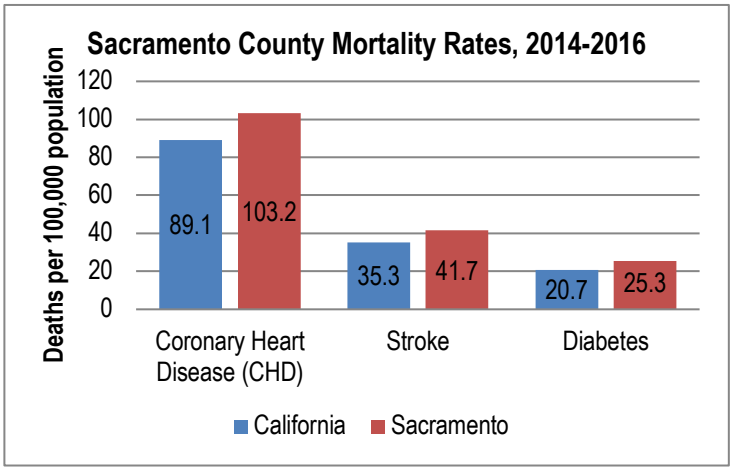


Figure 1: Average age-adjusted death rate (2014-2016). Source: California Department of Public Health. County Health Status Profiles 2018

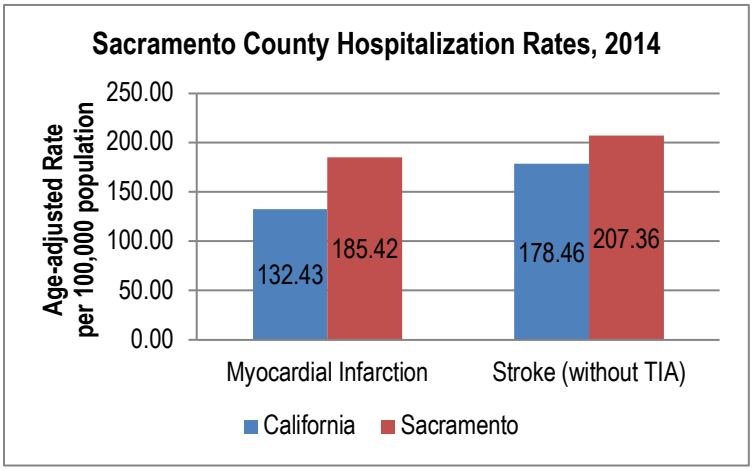


Figure 2: 2014 Age-adjusted hospitalization rate of myocardial infarction and stroke without TIA Source: California Office of Statewide Health Planning and Development's Patient Hospitalization Discharge Data

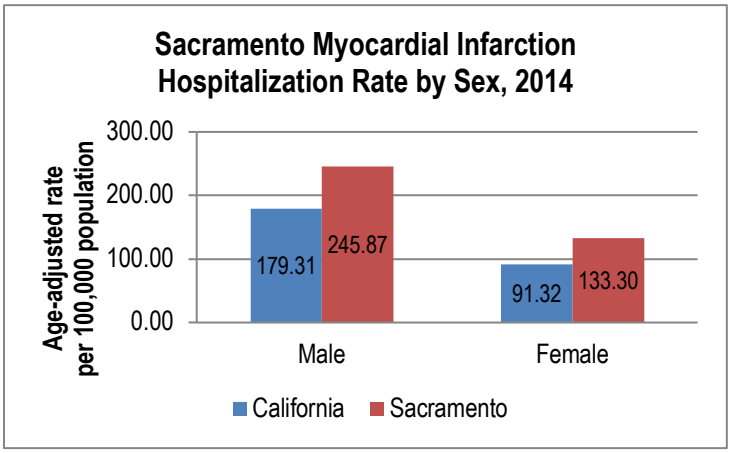


Figure 3: 2014 Age-adjusted MI Hospitalization rate in Sacramento stratified by sex Source: California Office of Statewide Health Planning and Development's Patient Hospitalization Discharge Data

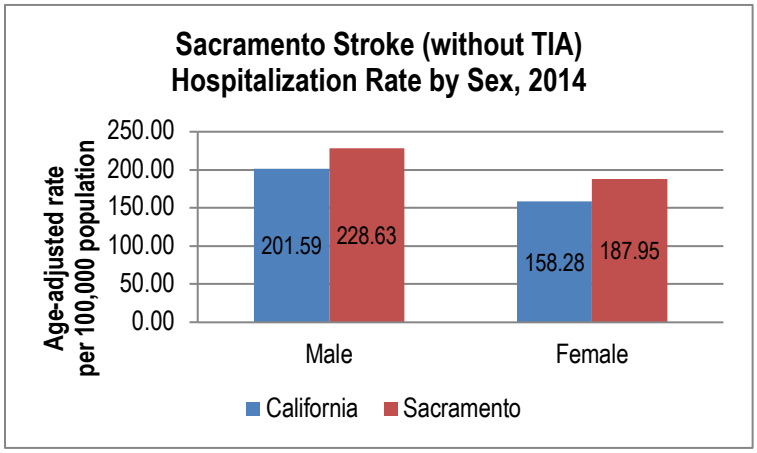


Figure 4: 2014 Age-adjusted Stroke Hospitalization rate in Sacramento stratified by sex Source: California Office of Statewide Health Planning and Development's Patient Hospitalization Discharge Data

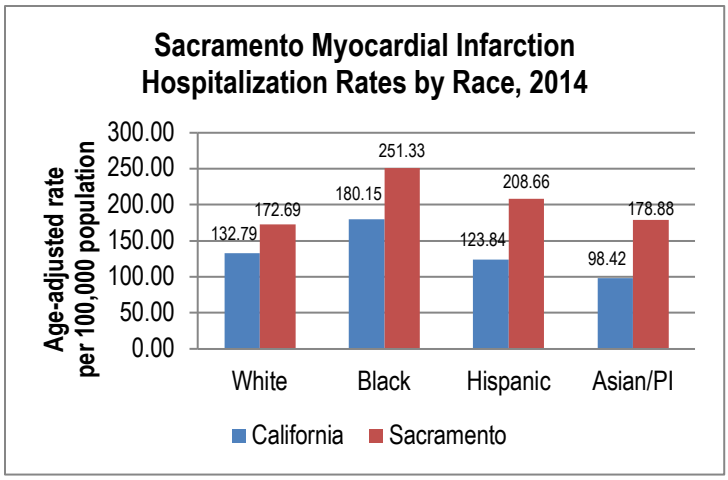


Figure 5: 2014 Age-adjusted MI Hospitalization rate in Sacramento stratified by race
Source: California Office of Statewide Health Planning and Development's Patient Hospitalization Discharge Data

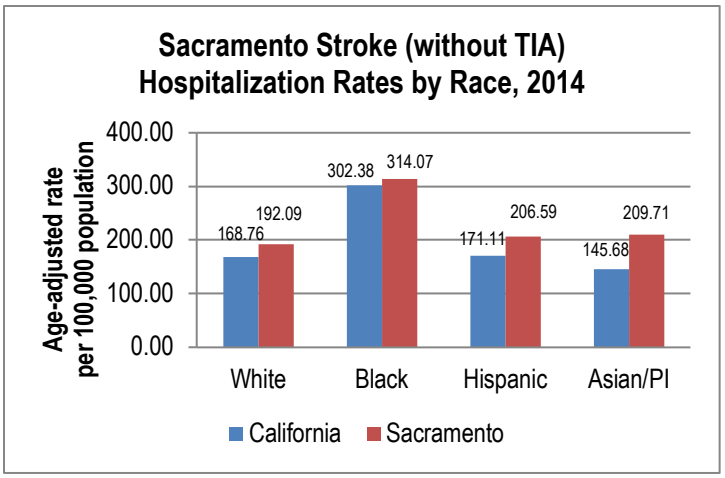


Figure 6: 2014 Age-adjusted Stroke Hospitalization rate in Sacramento stratified by race
Source: California Office of Statewide Health Planning and Development's Patient Hospitalization Discharge Data

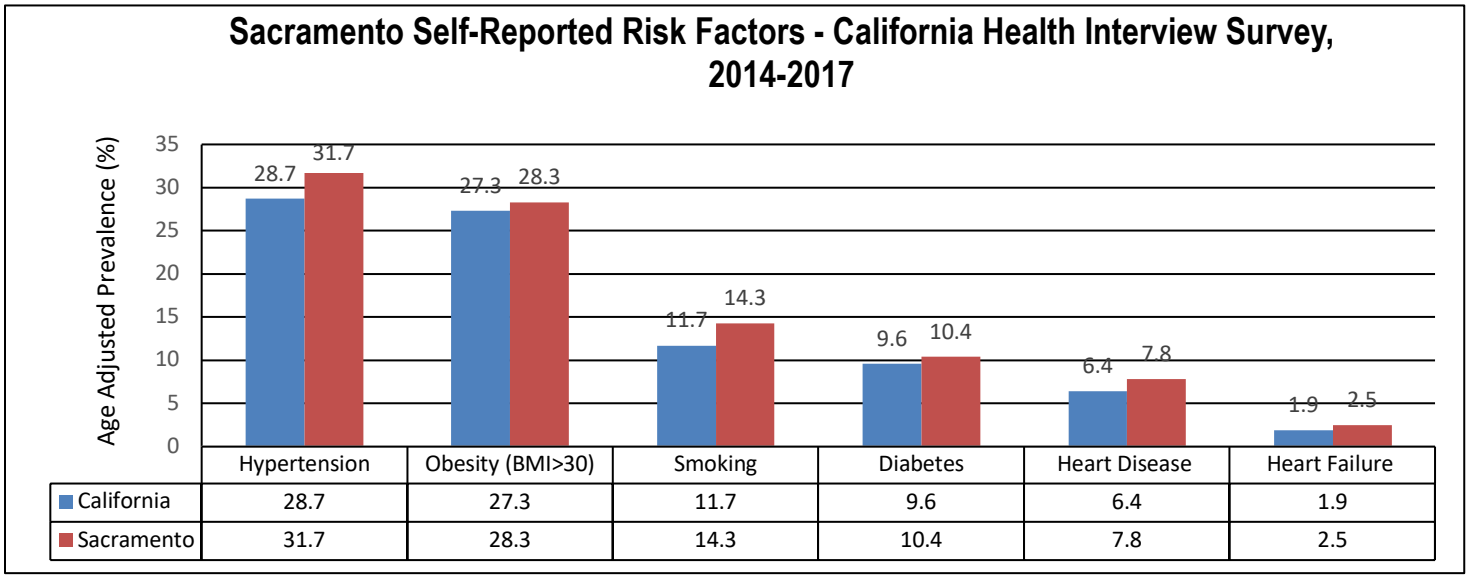


Figure 7: Self-reported Cardiovascular Risk Factors from 2014-2017 California Health Interview Survey
Source: Self-reported, publicly available telephone survey data, California Health Interview Survey (CHIS) UCLA Center for Health

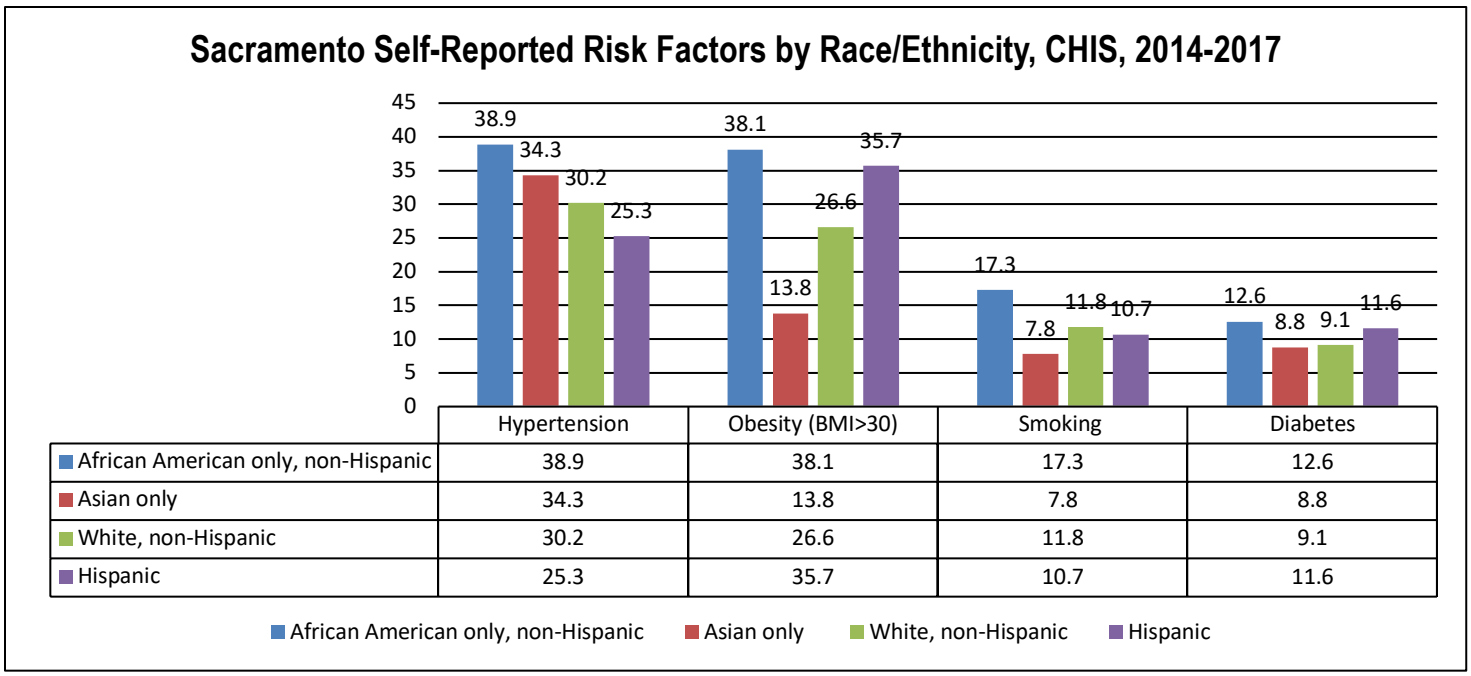


Figure 8: Self-reported Cardiovascular Risk Factors by race from 2014-2017 California Health Interview Survey
Source: Self-reported, publicly available telephone survey data, California Health Interview Survey (CHIS) UCLA Center for Health

Age-Adjusted Prevalence of Self-Reported Cardiometabolic and Other Risk Factors for Adults in California Counties (Percent (rank)) 2014-2017					
County	**Diabetes (% (rank))**	**Obesity (% (rank))**	**Hypertension (% (rank))**	**Heart Disease (% (rank))**	**Smoking Status (% (rank))**
Los Angeles	10.3 (36)	28.3 (27)	28.7 (20)	5.8 (10)	11.0 (15)
Sacramento	10.4 (41)	29.9 (32)	31.7 (28)	7.8 (27)	14.3 (25)
San Diego	8.5 (23)	24 (13)	27.1 (9)	6.2 (16)	10.8 (12)
Santa Clara	8.8 (27)	19.4 (4)	28.3 (15)	5.1 (4)	8.1 (3)

Table 1: Data are age adjusted from pooled CHIS 2014-2017. Ranks are from 1-44 with 1 having the lowest prevalence, and 44 having the highest; small counties were pooled to create stable estimates. All estimates reported are stable. Source: Dingbaum, Darsie, Ivey et al., CA Department of Public Health Analysis, 2017 (CHIS 2014-2017 Adult Public Use File).

Comparing Counties – Coronary Heart Disease Three Year Averaged, Age-adjusted Mortality Rates (2014-2016)			
County (rank)	**Age-adjusted Death Rate**	**95% Confidence Interval**	
		Lower	**Upper**
Santa Clara (6)	58.2*	54.9	61.6
San Diego (24)	81.2*	78.2	84.2
State Rate	89.1	88.2	90.0
Sacramento (42)	103.9*	98.1	108.2
Los Angeles (43)	103.9*	102.0	105.9

*Statistically significant relative to the state mean

Table 2: Age-adjusted Mortality Rates for Coronary Heart Disease. Source: County Health Status Profiles 2018 Report, California Department of Public Health

Comparing Counties – Stroke (without TIA) Three Year Averaged, Age-adjusted Mortality Rates (2014-2016)			
County (rank)	**Age-adjusted Death Rate**	**95% Confidence Interval**	
		Lower	**Upper**
Santa Clara (5)	26.6*	24.3	28.8
Los Angeles (21)	33.2	32.1	34.3
San Diego (27)	34.3	32.4	36.3
State Rate	34.7	34.2	35.3
Sacramento (47)	41.7*	38.4	45.0

*Statistically significant relative to the state mean

Table 3: Age-adjusted Mortality Rates for Stroke. Source: County Health Status Profiles 2018 Report, California Department of Public Health

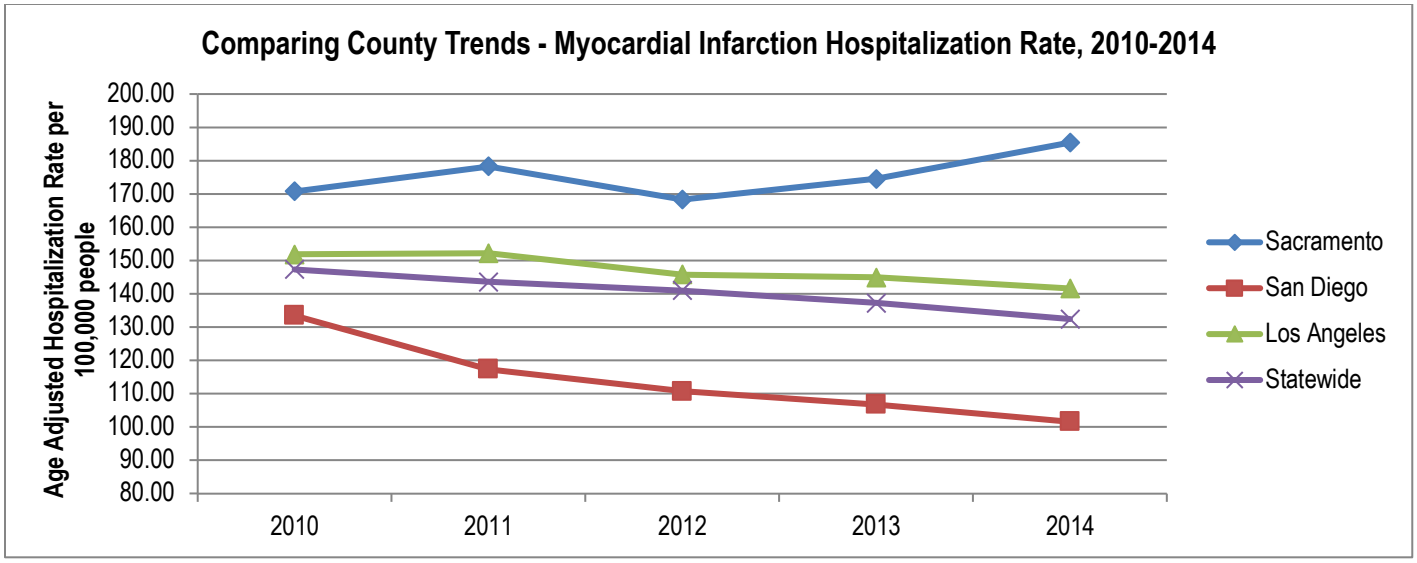


Figure 9: Age-Adjusted Hospitalization Rate for Myocardial Infarction (2010-2014 Office of Statewide Health Planning and Development)

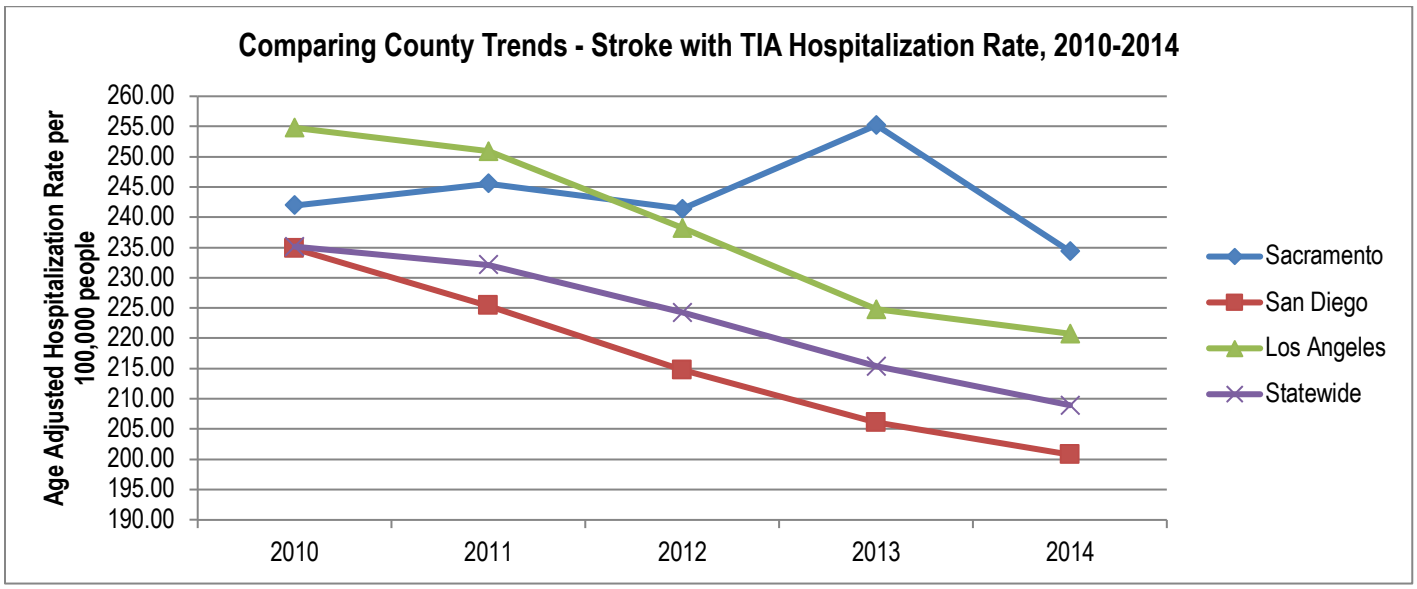


Figure 10: Age-Adjusted Hospitalization Rate for Stroke with TIA (2010-2014 Office of Statewide Health Planning and Development)

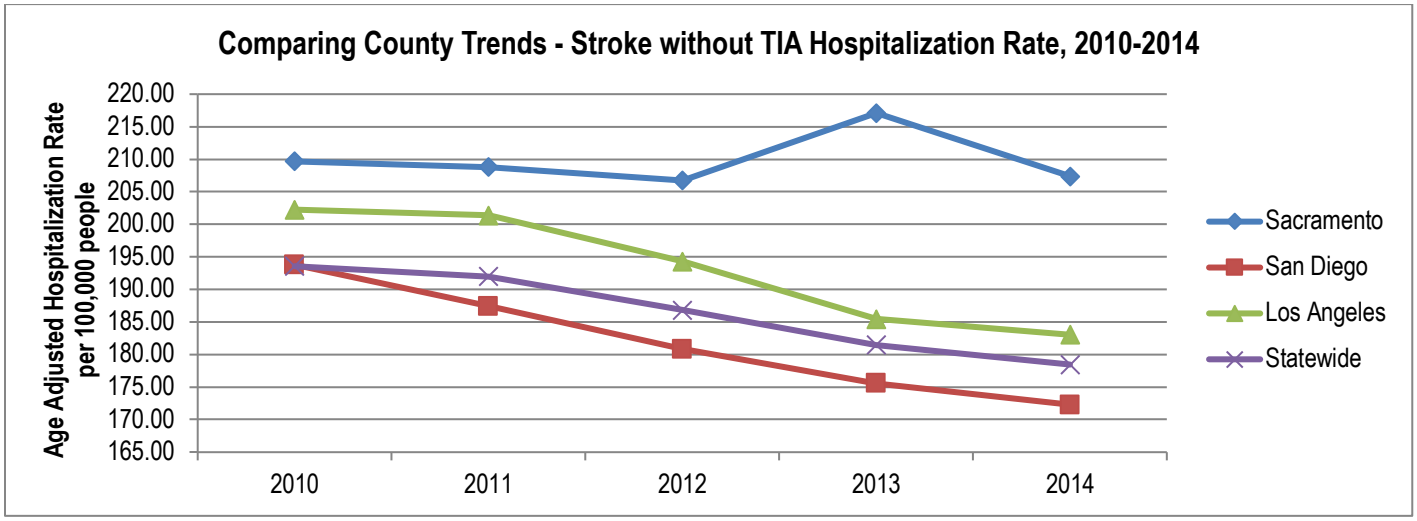


Figure 11: Age-Adjusted Hospitalization Rate for Stroke without TIA (2010-2014 Office of Statewide Health Planning and Development)

Sacramento County Mortality Hot Spots for Diabetes, Heart Disease, Hypertension, and Stroke (2007-2011)

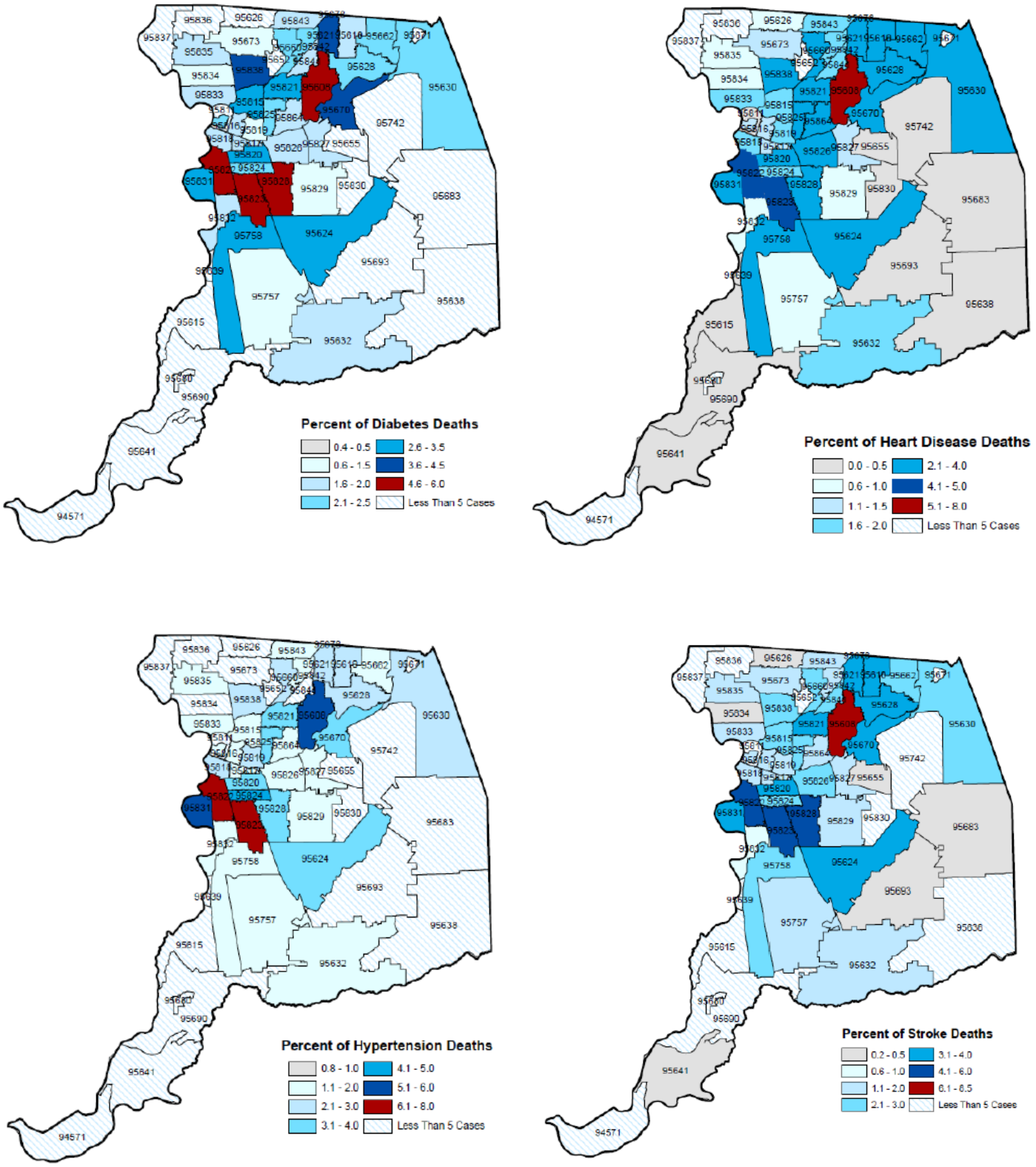


Figure 12: Sacramento County Hot Spots for Diabetes, Heart Disease, Hypertension and Stroke Mortality Rates (2007-2011)
Source: California Department of Public Health, Map 3,4,5,6. Community Health Status Report 2014

Proposed Action Plan for Sacramento County

Sacramento County has:

- **Higher rates of smoking than the state average**
  - Encourage primary care physicians to ask about smoking as a vital sign during every visit.
  - Provide brief cessation counseling for smokers which also helps meet meaningful use[1].
- **Higher rates of obesity than the state average**
  - Encourage measurement of BMI regularly in primary care; ensure patients are aware of obesity-related health risks[2].
  - Develop a plan with patients for addressing obesity; provide solid evidence to promote diet and physical activity changes.
  - Work to ensure all communities have access to safe, affordable options for healthy diets and physical activity in their neighborhoods.[3]
- **Higher rates of hypertension than the state; high rates of uncontrolled hypertension, especially for African Americans**
  - Improve community outreach about hypertension as a silent killer.
  - Improve medication adherence by utilizing health coaches to activate patients via motivational interviewing and evidence-based media messaging.
  - Provide information about best practices for treating hypertension to local primary care providers.
  - Ensure that physicians are made aware of the most recent medication protocols and guidelines for hypertension and guidelines are actively being upheld by all care team members.
- **Disparities in self-reported hypertension, smoking, and obesity exist among different race/ ethnicities in Sacramento County**
  - Utilize health coaches for evidence-based patient education and motivational interviewing on nutrition and physical activity and for counseling on smoking cessation.
  - Use culturally aligned, linguistically appropriate health coaches to bridge the gaps.
  - Ask your patients about social determinants of health including whether medication costs are within budget.

Other Interventions may include:

- Clinical pharmacists on the care team to integrate comprehensive medication management to improve quality of health care.
- Community-based screenings, patient education, and referrals into care, such as in faith-based settings and barbershops to "meet patients where they are."
- Referring smokers to tobacco tax funded smoking cessation programs.
- Creating a public messaging campaign such as on bill-boards and on social media to encourage patients to adopt healthy lifestyles such as 30 minutes of walking a day, and moving to a plant-centric eating pattern.
- Adopting culturally appropriate messaging to enhance education for high risk populations.
- Deploy evidence-based, culturally appropriate video training materials for high risk patients and their families to be prescribed before an appointment of motivational interviewing. High risk patients & families need to learn the importance of home blood pressure monitoring, that time is of the essence when CVD symptoms strike, and to call 911 rather than self transport to ensure prompt treatment at a hospital with capacity to treat quickly.

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Stroke, Heart Attack & Diabetes Context: Santa Clara County, CA and USA

Heart disease and stroke still account for 26% of deaths among Santa Clara county residents, despite strong local progress in the past 15 years across the state and Santa Clara County, and remain the #1 and #5 killers nationally.[1,2,3] Given Santa Clara County's substantially lower death rates than the rest of the state from Strokes and Heart Attacks, combined with a critical mass of resourceful innovators, Santa Clara County and the SF Bay Area region have the unique opportunity to show what is possible in pressing Towards Zero Preventable Heart Attacks, Strokes, and Diabetes Deaths & Disabilities. Focused, collaborative efforts to address clinical performance gaps among delivery systems and medical groups for the critical risk factors of control of cholesterol, blood pressure and blood sugar can reduce risk of death and disability from strokes, heart attacks and diabetes. In addition to managing these cardiovascular indicators among patients already engaged with the health care system, we must redouble our efforts to find and treat the vulnerable through proactive screening and outreach to help close the disparities in cardiovascular health that exist particularly for high risk racial and ethnic groups such as African Americans and those from India/South Asia.

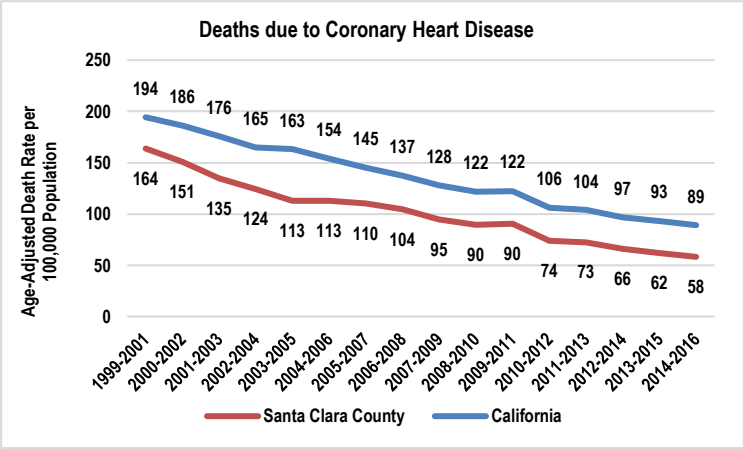


Figure 1: Three-year average age-adjusted death rate due to coronary heart disease (1999-2016). Source: California Department of Public Health. County Health Status Profiles

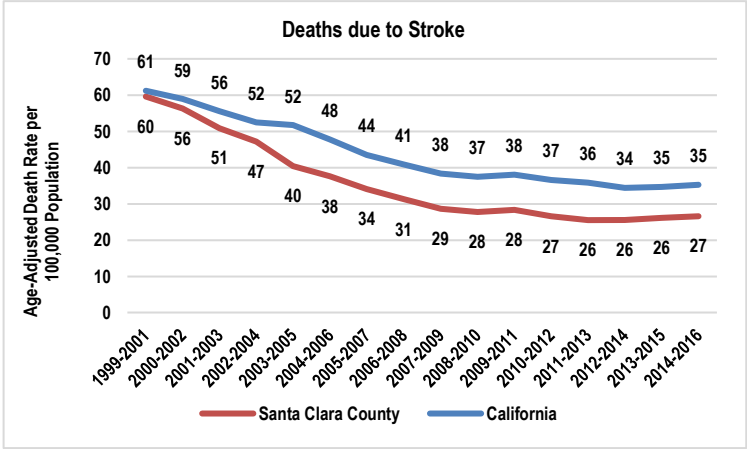
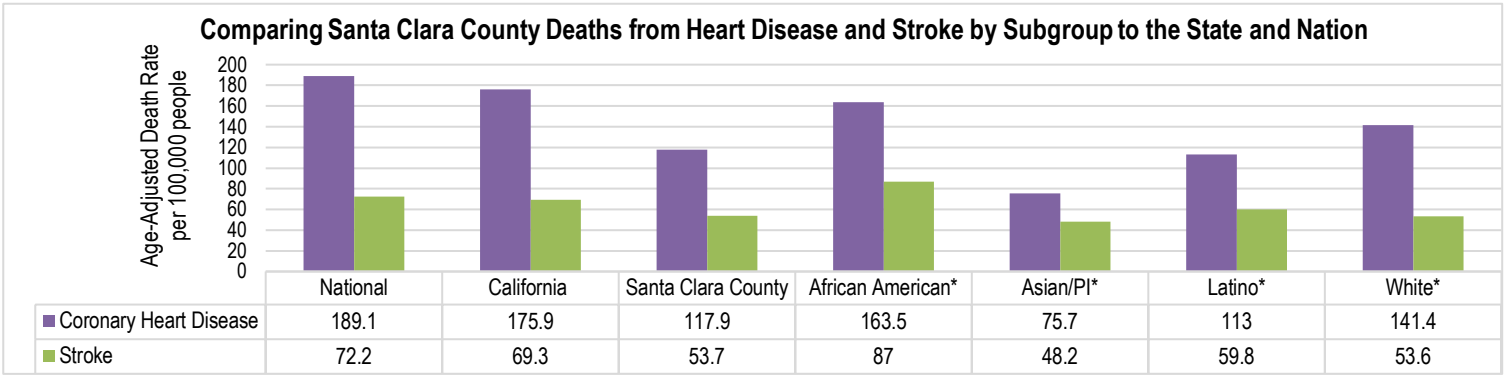


Figure 2: Three-year average age-adjusted death rate due to stroke (1999-2016). Source: California Department of Public Health. County Health Status Profiles



	National	California	Santa Clara County	African American*	Asian/PI*	Latino*	White*
Coronary Heart Disease	189.1	175.9	117.9	163.5	75.7	113	141.4
Stroke	72.2	69.3	53.7	87	48.2	59.8	53.6

Figure 3: Age-Adjusted Death Rate in people over 35 from Heart Disease and Stroke per 100,000 people in Santa Clara County by subgroup, state and nation (2014-2016). Note: * Subgroup from Santa Clara County. Source: Centers for Disease Control and Prevention. National Center for Chronic Disease Prevention and Health Promotion, Interactive Atlas of Heart Disease and Stroke

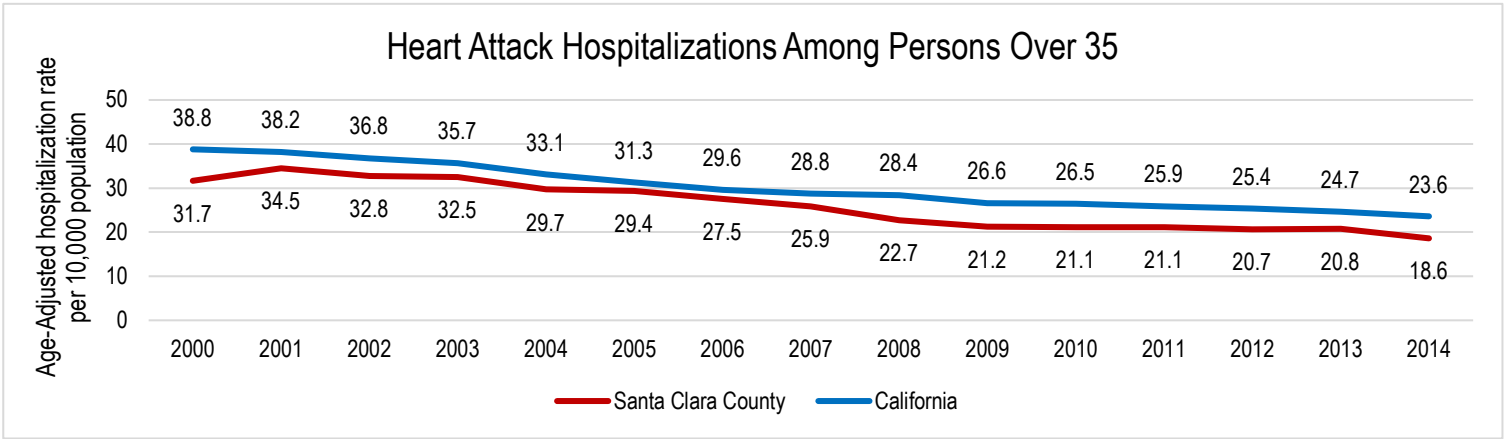


Figure 4: Age-adjusted heart attack hospitalization rate among persons 35 and over per 10,000 population, Santa Clara County compared to California (2000-2014). Source: Centers for Disease Control and Prevention. Environmental Public Health Tracking Network. Hospitalizations for Heart Attack.

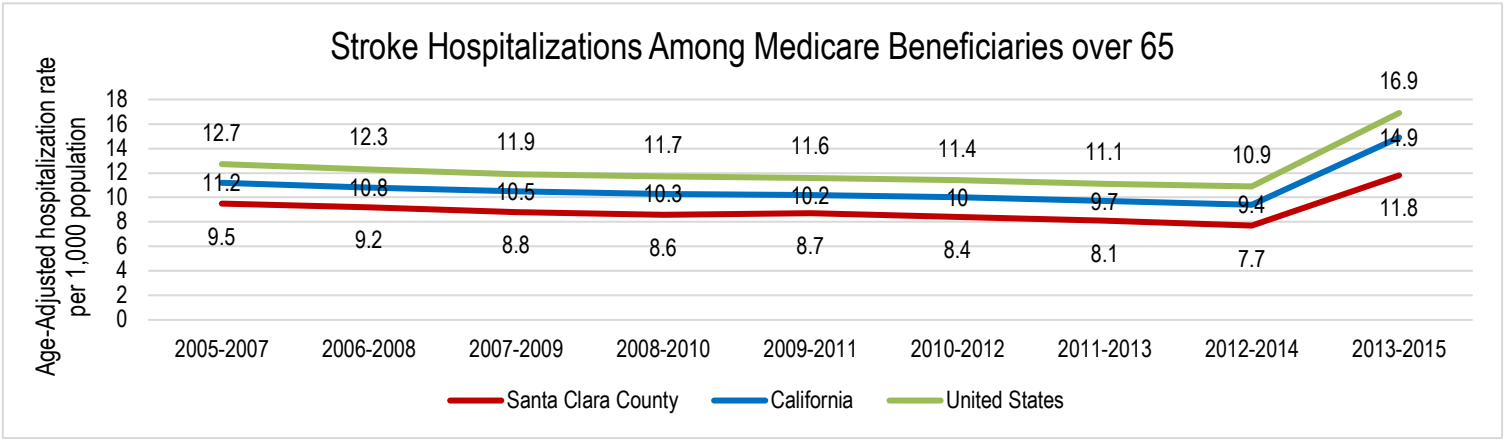


Figure 5: Age-adjusted stroke hospitalization rate among Medicare beneficiaries 65 and over per 1,000 population, Santa Clara County compared to California and Nationally (2005-2015). Source: Centers for Disease Control and Prevention. National Center for Chronic Disease Prevention and Health Promotion, Interactive Atlas of Heart Disease and Stroke

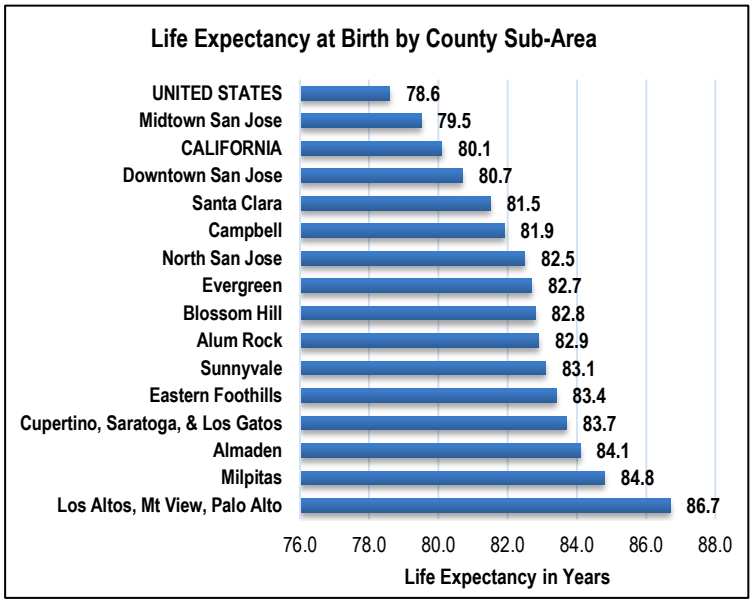


Figure 6: Life Expectancy at Birth by County Sub-Area. Source: Santa Clara County Community Health Existing Conditions Report, 2013

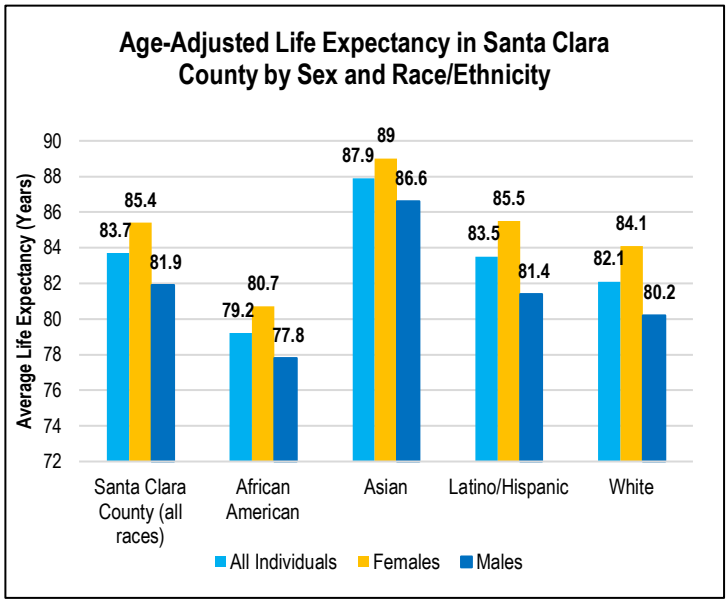


Figure 7: Age-Adjusted Life Expectancy in Santa Clara County by Sex and Race/ Ethnicity. Source: Santa Clara County 2010 Health Profile Report; 2010 Vital Statistics

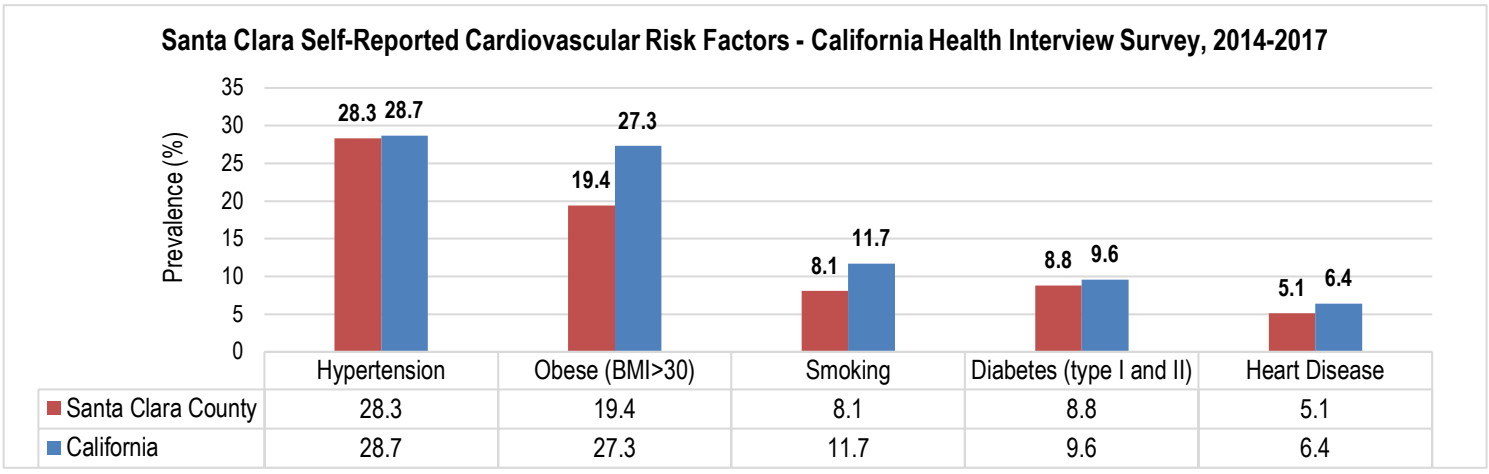
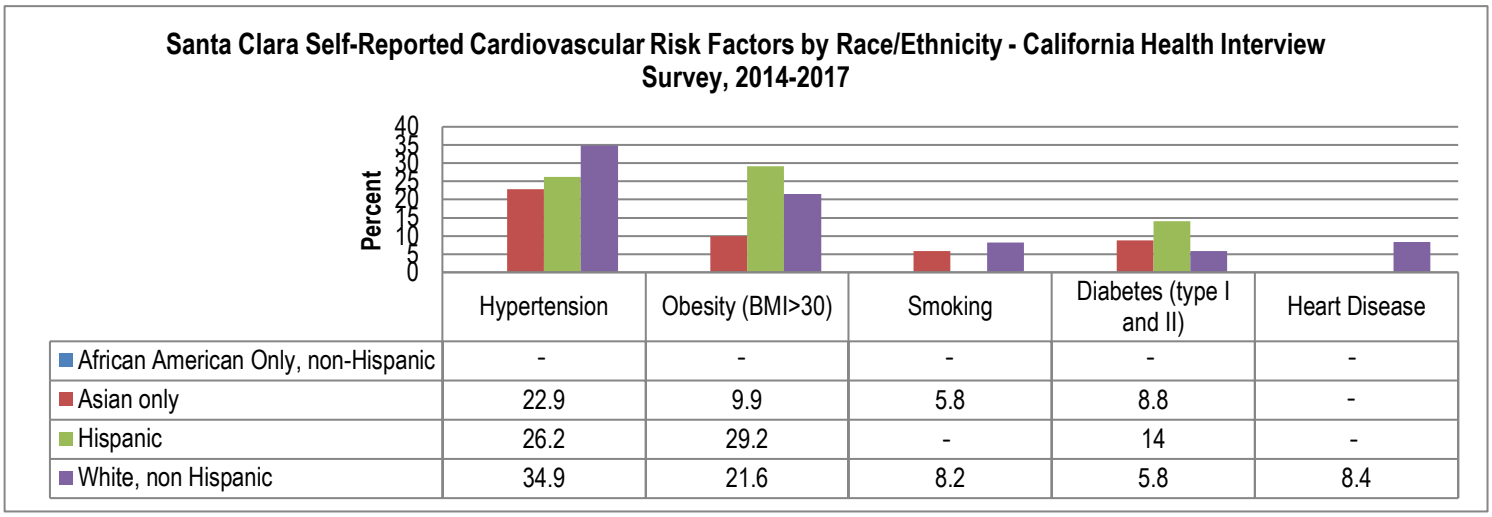


Figure 8: Self-Reported Cardiovascular Risk Factors, 2014-2017
Source: Source: Self-reported, publicly available telephone survey data, California Health Interview Survey (CHIS) UCLA Center for Health Policy Research



	Hypertension	Obesity (BMI>30)	Smoking	Diabetes (type I and II)	Heart Disease
African American Only, non-Hispanic	-	-	-	-	-
Asian only	22.9	9.9	5.8	8.8	-
Hispanic	26.2	29.2	-	14	-
White, non Hispanic	34.9	21.6	8.2	5.8	8.4

Figure 9: Self-Reported Cardiovascular Risk Factors by Race/Ethnicity, 2014-2017
Note: Results for African Americans, Asian/Pacific Islanders and Hispanic for some outcomes not reported due to small sample size and/or statistical instability.
Source: Self-reported, publicly available telephone survey data, California Health Interview Survey (CHIS) UCLA Center for Health Policy Research

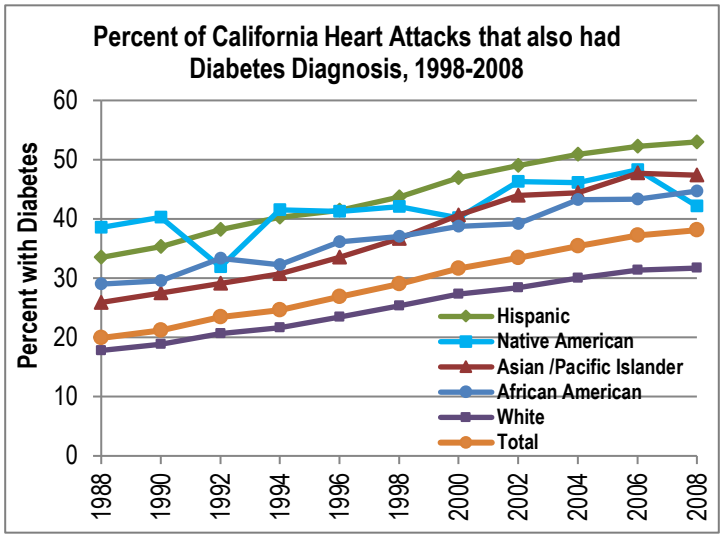
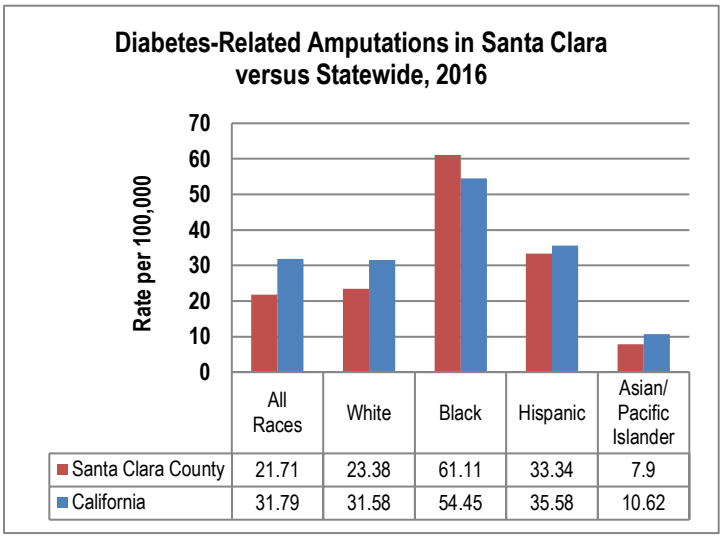


Figure 10: Percent of California Heart Attacks that also had Diabetes Diagnosis 1998-2008. Source: California Office of Statewide Health Planning and Development



	All Races	White	Black	Hispanic	Asian/ Pacific Islander
Santa Clara County	21.71	23.38	61.11	33.34	7.9
California	31.79	31.58	54.45	35.58	10.62

Figure 11: Diabetes-related Lower Extremity Amputation rate per 100,000 for different race/ethnicity groups in Santa Clara County compared to California (2016) Source: Office of Statewide Health Planning and Development (OSHPD) 2016 Dataset

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