



# 6 Impact of Health Care Policy on Quality, Outcomes, and Equity in Cardiovascular Disease

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## WHAT IS HEALTH POLICY?

Health policy is the collection of federal, state, and local statutes and regulations that determine the “rules of the game” in health care. Many of the major issues in health policy are driven by statute, also known as law. For example, in 1965, President Lyndon B. Johnson signed into law the Social Security Act Amendments, commonly referred to as the Medicare bill. This law established both Medicare, a health insurance program for older Americans, and Medicaid, a health insurance program for Americans living in poverty. More recently, U.S. health policy has been shaped by a number of provisions in the Affordable Care Act (ACA), signed into law by President Barack Obama in 2010.

While these laws, often hundreds or even thousands of pages in length, set specific provisions in place, they leave a great deal of detail to regulation. Regulation, in contrast to law, is not passed by Congress, but rather developed and implemented by government agencies. For example, while the ACA established a number of value-based payment (VBP) programs that will be explored in detail later in this chapter, regulatory guidance from the Centers for Medicare and Medicaid Services, commonly known as CMS, determines the annual collection of metrics, scoring systems, and payment modifications that puts them into practice.

The United States has much higher health care costs, but worse health outcomes, including cardiovascular outcomes, than other economically comparable countries. In 2018, the United States accounted for over \$3.6 trillion in health care spending. Of this total, 34% was funded by private insurance, 21% by Medicare, 16% by Medicaid, 3% by public health agencies and departments, 10% by individuals in the form of “out-of-pocket” spending, and the remaining 15% by other public sources including the Veterans Health Administration, Indian Health Service, and Department of Defense (Fig. 6.1).<sup>1</sup> In total, this spending comprised 17.7% of the U.S. gross domestic product (GDP) in 2018, or over \$11,000 per capita. Despite this spending, the United States has higher age-adjusted per-capita cardiovascular mortality and has seen fewer gains in these metrics over the past few decades than many other countries worldwide. Just as importantly, what successes the United States has had in reducing cardiovascular disease (CVD) incidence and prevalence over time have been uneven—major differences in CVD outcomes exist by race, ethnicity, income, and geography.

U.S. health policy fundamentally shapes how medicine is practiced, how care is delivered, and to some degree, the health outcomes that are achieved. A basic understanding of health policy is crucial for the practicing cardiologist as he or she works to deliver high-quality, cost-efficient care and achieve excellent outcomes for patients. Much of

health policy falls into two major “buckets”: coverage and access policy, and payment and delivery system policy, which will be explored in turn in this chapter. This chapter will focus primarily on public insurance (Medicaid and Medicare), because the federal and state governments largely set the norms in health policy, with private insurers often following their lead. The chapter will end with a section on health equity, since health policy also plays a major role, along with other social policies, in large and persistent cardiovascular and overall health disparities across the United States.

## INSURANCE COVERAGE AND ACCESS POLICY

The primary goal of health insurance is to offer financial protection against unexpected illness or injury. Prior studies suggest that CVD is commonly associated with financial hardship. For example, almost half of patients admitted for acute myocardial infarction (AMI) report some level of financial stress.<sup>2</sup> Similarly, about 45% of patients with atherosclerotic CVD report financial hardship due to their medical bills, particularly among those who lack insurance or have low income.<sup>3</sup> Insurance coverage is therefore a key policy area in cardiovascular medicine.

However, in the United States, insurance is variable and complex. In 2018, 55% of the population had private health insurance obtained through an employer, known as employer-sponsored insurance.<sup>4</sup> An additional 11% of the population purchased private insurance on the individual market, meaning directly from an insurance company. Eighteen percent of the U.S. population was covered by Medicaid, a state-administered public program for people living in poverty; 18% by Medicare, a federally administered public program for people over the age of 65, with disabilities, or with end-stage renal disease or other special qualifying conditions; and 1% by other public sources. Approximately 9% of the population was uninsured. Note that since people can have more than one source of insurance coverage, these numbers add up to greater than 100%.

The ACA had profound implications for coverage and access policy. Health insurers were prevented from denying coverage based on pre-existing conditions and from dropping people's coverage when they got sick. Annual and lifetime coverage caps were prohibited. Preventative care, vaccinations, and routine medical screening were required to be exempted from co-payments or deductibles. Children were allowed to stay on their parents' insurance plans until age 26. The profit insurance companies could earn on health insurance premiums was also capped, with insurers being required to spend 80% to 85% of premiums



on direct health care costs. The ACA expanded access to health insurance in two ways. First, it created insurance exchanges, which are online marketplaces that individuals and small businesses can use to compare and purchase insurance plans. States had the option to create their own state-based marketplace, but the majority rely on the federally facilitated marketplace on the [healthcare.gov](http://healthcare.gov) website. Individuals making between 100% and 400% of the federal poverty level (the FPL was \$12,760 for an individual and \$21,720 for a family of three in 2020)<sup>5</sup> and who purchase insurance through these exchanges are eligible for subsidies to lower the cost of their premiums.

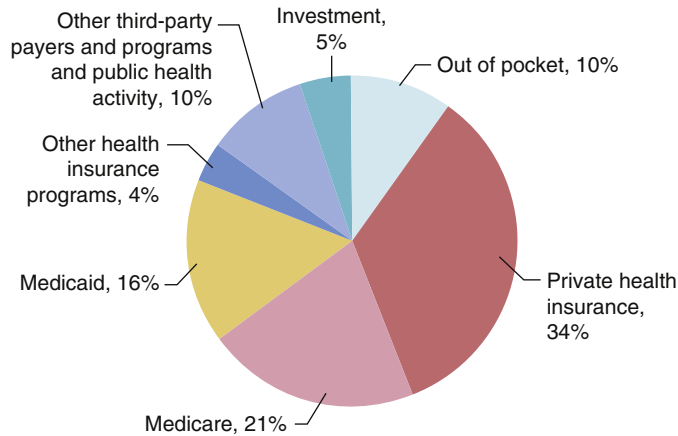
The second major way that the ACA expanded coverage was via Medicaid expansion. Medicaid is a state-administered health insurance program focused on providing coverage for individuals living in poverty, and covers 76 million beneficiaries, more than half of all births, and 60% of nursing home care nationwide. Prior to the ACA, all states covered pregnant women and children in households with incomes up to 200% to 300% of FPL, but coverage for other groups varied broadly. In many states, childless adults living in poverty were not eligible for Medicaid coverage at all. The ACA provided funding for states to extend Medicaid coverage to a broader group of eligible individuals, including for parents and childless adults with incomes at or below 138% of the FPL. However, the Supreme Court's ruling in

National Federation of Independent Business v. Sebelius (2012) effectively made Medicaid expansion voluntary, and as of 2020, 12 states have declined to expand (Fig. 6.2).<sup>6</sup>

States that have elected to expand Medicaid have seen a significant decrease in uninsurance rates, particularly among low-income populations, and a reduction in disparities in insurance coverage across major racial/ethnic categories.<sup>7</sup> From 2012 to 2016, the proportion of AMI admissions that were for individuals lacking insurance decreased from 18% to 8% in Medicaid expansion states, whereas it only decreased from 26% to 21% in nonexpansion states.<sup>8</sup>

A growing body of evidence demonstrates that health insurance coverage, and Medicaid expansion in particular, has positive effects that extend beyond financial security to improve health and well-being. Medicaid expansion has led to greater access to primary, preventative, and specialist care for low-income individuals.<sup>9,10</sup> Expansion states saw improvements in the identification and treatment of cardiovascular risk factors, such as diabetes, hypertension, and dyslipidemia.<sup>11-13</sup> Additionally, use and adherence of prescription cardiovascular medications have increased.<sup>9,14</sup> Medicaid expansion is also associated with better access to behavioral health services, a reduction in cigarette purchases, and an increase in smoking cessation attempts.<sup>15</sup>

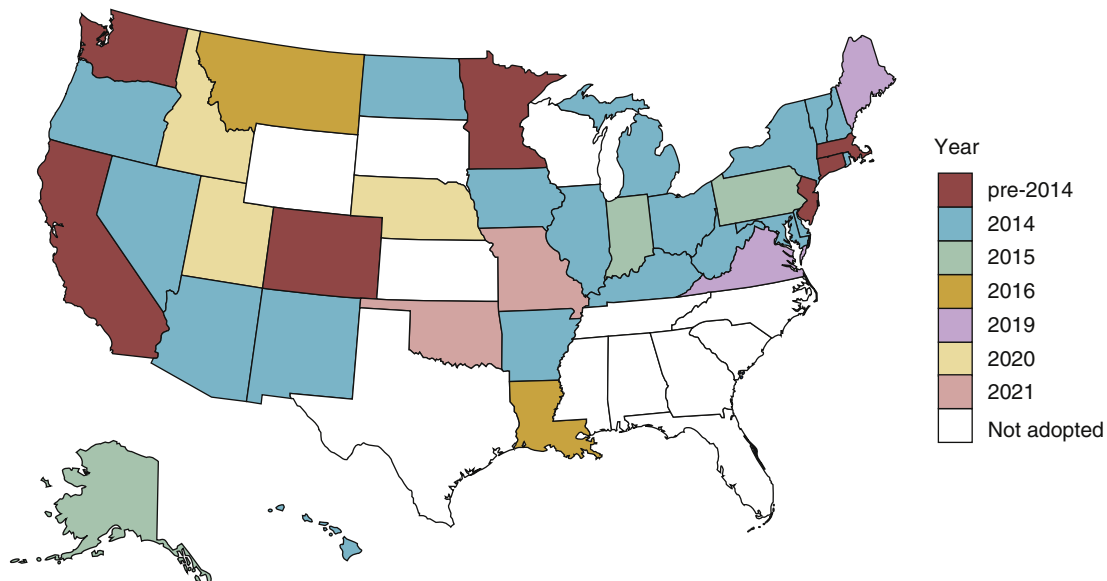
The increase in detection and treatment of chronic disease, behavioral health conditions, and addiction associated with Medicaid expansion has had an impact on health outcomes.<sup>9,10,16-21</sup> Expansion is associated with fewer preventable hospitalizations,<sup>22</sup> although evidence on its effects on emergency department use has been mixed.<sup>23</sup> One study showed that even accounting for demographic, clinical, and economic differences, counties in expansion states had 4.3 fewer deaths from cardiovascular causes per 100,000 residents per year after Medicaid expansion than if they had followed the same trends as counties in nonexpansion states (roughly a 2.5% difference).<sup>24</sup> Studies of early Medicaid expansions suggest that gains have particularly benefited racial and ethnic minorities, with all-cause mortality reductions greatest for nonwhites (41.0% relative reduction) and residents in poorer counties (22.2% relative reduction).<sup>16</sup>



**FIGURE 6.1** National health care expenditures. Pie chart of United States' national health care expenditures in 2018 broken down by payer type. Private insurance spending accounted for the largest proportion of expenditures. (Source: Centers for Medicare and Medicaid Services. NHE Fact Sheet. Available at: <https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/NHE-Fact-Sheet>. Accessed July 7, 2020.)

## PAYMENT AND DELIVERY SYSTEM POLICY TO IMPROVE QUALITY AND REDUCE COSTS

Another key area of health policy refers to the group of policies that together dictate how care is reimbursed, as well as the quality metrics on which it will be measured and rewarded. Until the early 2000s, the vast majority of cardiovascular care was covered under "fee-for-service" arrangements. For the most part, such arrangements did not



**FIGURE 6.2** Map of states that have and have not expanded Medicaid. A majority of states have implemented Medicaid expansion, with only 12 states declining to expand as of 2020.



include any payment adjustments for quality or outcomes. A fixed payment was simply rendered for services provided, irrespective of the quality of care that was delivered.

However, consensus grew that cardiovascular care delivery was suboptimal. While clinical trials had made it clear which medications and procedures should be used in which situations, and guidelines began to codify those findings into statements aimed at facilitating optimal care delivery, the reality of clinical practice did not always match the guidelines. The Institute of Medicine, now known as the National Academy of Medicine, released *Crossing the Quality Chasm* in 2001, calling attention to the wide gap between scientific knowledge and the implementation of high-quality care.<sup>25</sup> A subsequent study published in 2004 demonstrated that appropriate quality of care was only being delivered 54.9% of the time, including in the acute, chronic, and preventive care domains.<sup>26</sup> Performance varied across cardiovascular conditions, from 68.0% guideline-concordant care for coronary artery disease, to 64.7% for hypertension, 63.9% for congestive heart failure (HF), 59.1% for cerebrovascular disease, 48.6% for hyperlipidemia, 45.4% for diabetes, and 24.7% for atrial fibrillation. A number of follow-up studies across care settings (e.g., inpatient, outpatient) and specialties (e.g., cardiovascular specialists, primary care clinicians) broadly documented suboptimal adherence to quality indicators.

As a result, several different types of health policy reform initiatives were introduced to address quality issues in cardiovascular care, many in the ACA. The majority of the changes to Medicare under the ACA were focused on moving the program away from simply paying for the volume of services rendered, and toward paying more explicitly for the quality and costs, collectively the “value,” of care delivered. The sections below will outline some of these key changes and review the strength of evidence for their efficacy. Additionally, just like any evaluation of a new drug or treatment strategy in cardiovascular medicine, these policies needed to be evaluated not only in terms of their efficacy, but also in terms of their impact on patient safety. For policies, adverse “safety” events typically take the form of unintended adverse consequences, like reducing access to care, unduly

penalizing clinicians for serving high-risk patients, or worsening clinical outcomes.

## Public Reporting

The earliest move toward value was public reporting. In 2004, a consortium of payers and quality organizations, led by Medicare, created Hospital Compare as the first national public reporting program (Table 6.1). While participation was voluntary, hospitals that did not participate experienced a payment reduction, so nearly all hospitals joined the program within a few months of its inception. Program developers hoped that publicly posting hospitals’ performance online would encourage health systems and clinicians to improve their performance through peer pressure, and allow patients the opportunity to select where to receive care based on performance. Initially, Hospital Compare only included processes of care, such as giving aspirin to patients with AMI. It later expanded to include clinical outcomes such as mortality and readmission rates for AMI and HF, added in 2008 and 2011, respectively.

Beyond these national efforts, some states implemented their own public reporting, typically focused more narrowly on mortality following cardiac procedures. In the 1990s, New York State began publicly reporting hospitals’ outcomes for coronary artery bypass grafting (CABG) and percutaneous coronary intervention (PCI), as well as for individual surgeons and interventional cardiologists. Other states including Massachusetts, Pennsylvania, New Jersey, California, and Washington subsequently implemented public reporting programs as well, though some only temporarily.

Evaluations of the efficacy of public reporting programs have been underwhelming. Patients have been unlikely to utilize publicly reported information, with many preferring to rely on advice from friends or family.<sup>27</sup> Public reporting on Hospital Compare—either of processes or of outcomes—was not associated with improvements in mortality rates above and beyond secular trends.<sup>28</sup> Public reporting for PCI has similarly failed to show a consistent association with improvements in clinical outcomes. While studies have demonstrated

**TABLE 6.1** Payment and Delivery System Policy Overview for Cardiovascular Conditions

POLICY	YEAR IMPLEMENTED	OVERVIEW
<b>Public Reporting</b>		
Hospital Compare	2004	Public reporting of clinical outcomes and processes
<b>Value-Based Purchasing Programs</b>		
Hospital Readmissions Reduction Program	2012	Hospitals are penalized up to 3% of their Medicare reimbursements for HF, AMI, pneumonia, COPD, joint replacement, and CABG
Hospital Value-Based Purchasing	2012	Hospitals receive bonuses or penalties based on their performance on a set of quality metrics in four core domains: safety, clinical care, efficiency and cost reduction, and patient/caregiver-centered experience
Physician Quality Reporting System	2006, 2011	Initially a public reporting program, but it transitioned into a penalty program in 2011, where physicians and group practices faced negative payment adjustments for failing to report performance data
Physician Value-Based Modifier	2015	Physicians are assigned bonuses and penalties based on performance on quality, outcome, and cost measures
Quality Payment Program	2015	Physicians must choose one of two tracks:  Merit-Based Incentive Program, which consists of four domains: clinical quality measures, measures of electronic medical record use, measures of costs of care, and measures of practice improvement activities  Alternative payment models, including accountable care organizations and bundled payment models
<b>Alternative Payment Models</b>		
Medicare Shared Savings Program	2012	Participants are paid on a fee-for-service basis, but are held accountable for their beneficiaries’ quality and costs each year.
Bundled Payments for Care Improvement (and BPCI-Advanced)	2011, 2018	Quality and costs are evaluated over the course of an “episode,” triggered by a hospitalization and typically 30, 60, or 90 days in length. If Medicare payments for an episode of care are less than the target, then the participant is eligible to keep a portion of the savings; however, if payments exceed the target, the participant must reimburse Medicare some of the difference.

AMI, Acute myocardial infarction; COPD, chronic obstructive pulmonary disease; CABG, coronary artery bypass grafting; HF, heart failure.

lower mortality among patients undergoing PCI in reporting versus nonreporting states, overall outcomes for AMI have been, if anything, worse in reporting states, suggesting that selection bias has driven the apparent improvements in procedural mortality.<sup>29</sup>

Public reporting for hospital processes and outcomes has not been associated with unintended consequences, but public reporting for PCI has been associated with a negative safety signal. Use of coronary angiograms and PCI for AMI are lower in reporting states compared to nonreporting states, and these differences are highest among critically ill patients, such as those in cardiogenic shock, who may benefit most from the procedure. This is likely due to risk aversion; the majority of surveyed interventional cardiologists admit to avoiding high risk but indicated PCIs due to concern that a bad outcome might negatively impact their publicly reported performance outcomes.<sup>30</sup> Data for CABG have been more mixed but have raised concerns about reductions in access to care for racial and ethnic minorities and clinically high-risk individuals.<sup>29</sup>

Concern that public reporting may lead to risk-averse behavior and impede access to care, particularly for critically ill patients with cardiogenic shock, has prompted some states (New York, Massachusetts) to begin excluding these patients from their public reports. These policy changes have been associated with a substantial increase in the use of PCI for patients with cardiogenic shock and a reduction in associated in-hospital mortality, although PCI rates in this population still remain lower in reporting states compared with nonreporting states.<sup>31</sup>

## Value-Based Payment Programs: Hospitals

More recently, Medicare and other payers have begun linking clinician and hospital reimbursement to performance on quality and outcome metrics through VBP programs. The premise of VBP is that paying hospitals and clinicians more if they deliver higher-quality care, or achieve better patient outcomes, will lead to quality improvement.

As part of the ACA, many hospitals across the United States were required to participate in major VBP programs. One of the first mandatory VBP programs, launched in 2012, was the Hospital Readmissions Reduction Program (HRRP). In the HRRP, hospitals are penalized up to 3% of their Medicare reimbursements based on 30-day readmission rates for HF, AMI, pneumonia, chronic obstructive pulmonary disease, joint replacement, and CABG. Hospital Value-Based Purchasing (HVBP) is another hospital VBP program that was introduced by the ACA. In this program, hospitals receive bonuses or penalties based on their performance on a set of quality metrics in four domains: safety, clinical outcomes, efficiency and cost reduction, and person and community engagement. CVD is included in each category, including specific measures for HF mortality, AMI mortality, and, most recently, condition-specific cost measures for these two conditions.

Evaluations of the HRRP and HVBP have demonstrated mixed findings in terms of their associations with improvements in care quality or patient outcomes. The HRRP has been associated with a decrease in readmission rates for Medicare beneficiaries,<sup>32</sup> though subsequent analyses have suggested that a significant portion of the reported improvements may have been due to changes in coding of comorbidities or regression to the mean rather than actual improvements in clinical care.<sup>33,34</sup> Studies have failed to find any association between the implementation of HVBP and improvement in the patient outcomes measured in the program, such as mortality for AMI and HF, or patient experience.<sup>35–37</sup>

In terms of potential adverse consequences, concerns have been raised that the HRRP was associated with an increase in mortality for HF patients, though findings have been mixed.<sup>38</sup> It is possible that the incentives put in place to reduce readmissions led to clinical interventions that ultimately did not benefit patients, such as efforts to treat and release, rather than readmit, patients from the emergency department who return within 30 days of a HF admission. However, the true underlying mechanism for these mortality patterns remains unclear.

Another unintended consequence of current VBP programs has been their disproportionate impact on hospitals that serve medically and/or socially high-risk populations. Most current claims-based risk adjustment models do not include information on frailty, cognitive

function, or social determinants of health (SDOH), all of which strongly influence clinical outcomes. Consequently, models may be inequitable when used to evaluate and compare hospital performance under VBP programs. For example, the HRRP has disproportionately penalized safety-net hospitals that care for clinically and socially high-risk populations, despite data suggesting that roughly half of these hospitals' worse performance is due to the complexity of the population they serve. Similar patterns have been seen in other inpatient programs such as the Hospital-Acquired Conditions Reduction Program, as well as in VBP programs for dialysis facilities and nursing facilities.<sup>39</sup> Adding adjustment for social risk, and better adjustment for medical risk, to these programs could improve their ability to accurately identify high-quality and low-quality clinicians and facilities, and reduce inappropriate penalties for the safety net.

## Value-Based Purchasing: Outpatient

A similar sequence of events, moving from public reporting to pay-for-performance, has occurred in clinician payment. The Physician Quality Reporting System (PQRS) was a public reporting program established in 2006. It was initially a voluntary system, but transitioned into a payment penalty program in 2011, when physicians and group practices faced negative payment adjustments for failing to report their performance data. Subsequently, a VBP program for physicians, the Physician Value-Based Modifier, created a series of bonuses and penalties that were assigned based on performance on quality, outcome, and cost measures. Building on this program, the Medicare Access and CHIP Reauthorization Act (MACRA) was passed in 2015 and created the related mandatory nationwide Quality Payment Program (QPP). The QPP consists of two "tracks" for clinicians: (1) the Merit-Based Incentive Program (MIPS) and (2) advanced Alternative Payment Models (APMs). MIPS, the default program for practicing clinicians, has four domains: clinical quality measures, measures of electronic medical record use, measures of costs of care, and measures of practice improvement activities (such as using patient portals and participating in quality improvement programs and registries). Clinicians can opt out of MIPS if they participate in a qualifying APM, which is discussed at more length later.

There has been no evidence that public reporting or VBP programs in the outpatient setting have been associated with improvements in quality or outcomes in the United States, although many of these programs were too small or short-lived to be broadly evaluated. A similar program in the UK was associated with modest improvements in quality.<sup>40</sup> However, early evidence suggests that MIPS has disproportionately penalized physicians and practices serving patients with high levels of social or medical risk.<sup>41–43</sup>

## Alternative Payment Models

APMs are models that move beyond the traditional fee-for-service payment structure in order to incent high-value care delivery. The two most relevant APMs to cardiovascular care include accountable care organizations (ACOs) and episode-based or "bundled" payments.

ACOs are groups of hospitals and clinicians that assume risk for their attributed patients' quality, clinical outcomes, and total costs of care, typically on an annual basis. In Medicare's largest ACO program, the Medicare Shared Savings Program (MSSP), participants are paid on a fee-for-service basis but are held accountable for their beneficiaries' quality and costs each year. If participants' total annual spending on care for beneficiaries is below a preset target, and performance on quality is high, participants are eligible to keep a portion of the savings. A number of cardiovascular quality measures are included in the MSSP, such as preventable hospitalizations for HF, readmission rates, and the use of certain medications for patients with ischemic heart disease or HF. Thus, cardiovascular specialists can play an important role in improving quality and outcomes under this and other similar programs.

Studies examining the effectiveness of ACOs such as the MSSP have generally found that they are associated with modest savings that grow with longer participation as well as small improvements in quality or





outcomes.<sup>44,45</sup> Specific to CVD, one study showed that participating in an ACO improved HF admission rates and all-cause unplanned admissions for patients with HF over time.<sup>46</sup> Another demonstrated that ACOs that included cardiologists had lower spending on beneficiaries with CVD, while achieving similar HF quality measure scores.<sup>47</sup> However, another found that ACOs did not improve medication adherence for patients with CVD.<sup>48</sup>

Another relevant APM to cardiovascular care is bundled payments, which are currently being tested by Medicare through the Bundled Payments for Care Improvement-Advanced (BPCI-A) program. Bundled payment arrangements are similar to ACOs, except that quality and costs are evaluated for an episode of care, triggered by a hospitalization for a specific condition (e.g., AMI, HF). Episodes are typically 30, 60, or 90 days in length, rather than an entire year. Similar to ACOs, if Medicare payments for an episode of care are less than a preset target, the participant can keep some of the savings; if payments exceed the target, the participant must reimburse Medicare some of the difference.

Early studies examining BPCI-A's predecessor, BPCI, have not found improvements in quality, outcomes, or costs for medical conditions including HF or AMI,<sup>49</sup> though longer-term follow-up has suggested that savings may begin to emerge around 2 to 3 years of participation.<sup>50</sup> There has been no evidence that the bundled payment programs have unintended consequences such as adverse selection or worsening patient outcomes.

Overall, there is a lack of cardiology-focused payment models. ACOs focus on primary care and population health; bundled payments focus on acute episodes. Many private health insurance plans track physician performance on cost and quality measures for 365-day episodes of care for chronic conditions such as HF, diabetes, and ischemic heart disease, but novel payment models are relatively rare in private insurance as well. There is currently no national model focused on longitudinal care for chronic CVD, such as HF, ischemic heart disease, peripheral arterial disease, or arrhythmias, all of which often require lifelong care and management by a specialist clinician. This is an area of active policy development.<sup>51</sup>

## INEQUITIES IN CARDIOVASCULAR DISEASE RISK, CARE, AND OUTCOMES

There are clear inequities in cardiovascular risk factors, incident CVD, and cardiovascular outcomes for racial and ethnic minorities, individuals living in poverty, and those in rural areas. Yet, there is no clear evidence of a biological basis for these differences. Instead, the best evidence suggests that structural and systemic factors such as access

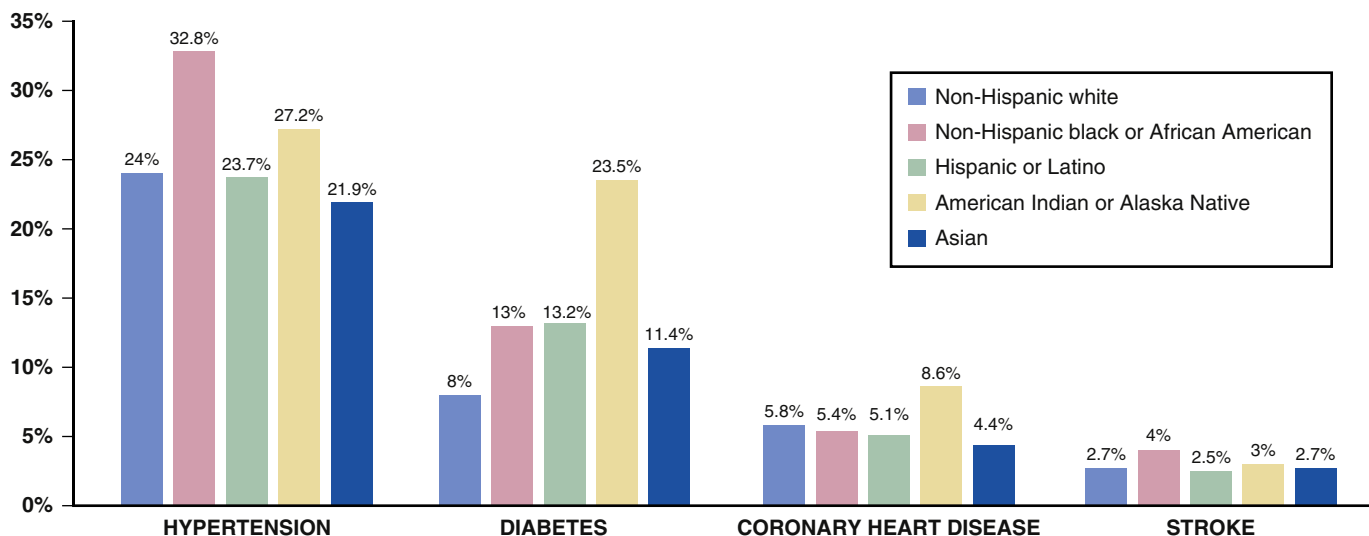
to high-quality care, the environments and neighborhoods in which people are born, work, and live, as well as education, income, the lived experience of racism and discrimination—collectively the SDOH—drive the patterns we see. It is through this lens that these inequities are best examined, and best addressed.

### Racial and Ethnic Minorities (see Chapter 93)

Black individuals have higher rates of hypertension and diabetes than their white counterparts (Fig. 6.3). Incidence rates of heart attacks, HF, stroke, and other cardiovascular events are also higher among Black people.<sup>52</sup> Compared to white people, Black individuals are about twice as likely to develop HF (4.6 vs. 2.4 per 1000),<sup>53</sup> twice as likely to experience sudden cardiac death, and have almost three times the relative risk of stroke (relative risk 2.77).<sup>54</sup> Black patients also have higher rates of fatal coronary heart disease compared to white patients, particularly among men (hazard ratio for Black men: 2.18, for Black women: 1.63).<sup>54</sup> Despite improvements in care and technology, Black patients continue to face higher rates of avoidable deaths due to heart disease, stroke, and hypertensive disease.<sup>53</sup> Recent evidence suggests that disparities in cardiovascular mortality for Black patients have persisted over the last two decades, and that mortality rates for some conditions (e.g., HF) are now worsening among younger Black adults.<sup>55–57</sup>

Latinx patients face similar inequities in cardiovascular care, although these differences are more variable and less well-studied compared to Black patients.<sup>52</sup> Cardiovascular risk factors are more prevalent among Latinx people. Compared to their white counterparts, Latinx individuals have a 35% higher prevalence of diabetes, and 61% of Latinx individuals report physical inactivity compared to 52% of white individuals.<sup>53</sup> Studies report higher rates of HF (3.5 versus 2.4 per 1000 person-years) for Latinx people compared to white and Black populations, but lower overall CVD prevalence and lower all-cause and cardiovascular-specific mortality.<sup>58</sup> These paradoxical findings of higher CVD risk but better CVD outcomes remain poorly understood.

Cardiovascular risk factors and outcomes are also markedly worse among Native American populations in the United States. These populations have high rates of obesity, diabetes, and hypertension, although trends vary by region and tribe.<sup>59</sup> In 2017, Native American individuals had the highest rate of diagnosed diabetes (14.7%) among U.S. ethnic or racial groups.<sup>60</sup> Additionally, Native American populations have 20% higher CVD mortality rates compared to the overall population.<sup>59</sup> The limited amount of available research, especially more current research, on Latinx and Native populations warrants further effort to better understand cardiovascular health in these populations.



**FIGURE 6.3** Racial and ethnic disparities in CVD and CVD risk factors, 2018. Minorities have higher rates of risk and incidence compared to white individuals. CVD, Cardiovascular disease. (Source: Centers for Disease Control and Prevention. Summary Health Statistics Tables: National Health Interview Survey. 2019. Available at: <https://www.cdc.gov/nchs/nhis/shs/tables.htm>. Accessed July 7, 2020.)

The reasons for these inequities are multifactorial. For example, as a result of a long history of structural and systemic racism in the United States, Black individuals are more likely to live in neighborhoods that are burdened with adverse social risk factors, and lack healthy food options, safe places to exercise, and even clean air. Long-standing discriminatory practices in housing have resulted in a disproportionate number of Black people living in areas and housing with high levels of air pollution and toxins, and this has been linked to the development of coronary artery plaque.<sup>61</sup>

The lived individual experience of racism and discrimination also likely play a role in the development of CVD, given the association between the experience of racism, elevated stress hormones such as cortisol and C-reactive protein, and increased blood pressure, all of which have adverse cardiovascular effects.<sup>62</sup> Other studies have also found associations between discrimination and preclinical atherosclerosis and coronary artery calcification for Black women and greater coronary artery obstruction for Black men.<sup>62</sup> Additionally, discrimination is also associated with greater risk for MI, cardiac arrest, and stroke.<sup>62</sup> Racial and ethnic minorities also have higher rates of adverse childhood experiences, including experiences of racism as well as other traumas, which are predictive of worse health outcomes in adulthood.<sup>63</sup>

Lack of access to health care, including preventive care, cardiovascular specialty care, and high-quality hospital care among Black and Latinx patients as well as Native Americans also contributes to these disparities. Racial and ethnic minority individuals are more likely to live in poverty, to be uninsured, and to face financial barriers to care.<sup>64</sup> Compared to white people, racial and ethnic minority patients are less likely to be treated by cardiologists versus general medicine practitioners for HF despite studies reporting lower mortality for patients treated by cardiologists.<sup>65,66</sup> Black patients are more likely to receive care from lower-quality surgeons for CABG procedures, and Black patients with AMI are more likely to be admitted to lower-quality hospitals that use fewer evidence-based medical treatments and have worse risk-adjusted mortality.<sup>67</sup>

Lack of access does not on its own explain persistent differences in care for heart transplantation, non-ST-segment-elevation myocardial infarction (NSTEMI), and other conditions.<sup>53,68</sup> Even within the same hospitals, where access should be similar, Black patients are less likely to receive effective cardiac procedures such as thrombolytics, PCI, CABG, cardiac resynchronization therapy, and left ventricular assist devices.<sup>53,69</sup> For patients with NSTEMI, Black patients are 24% less likely to receive nonaspirin antiplatelets, 29% less likely to receive angiography, and 45% less likely to receive revascularization.<sup>68</sup>

While most studies do not measure racial discrimination per se, it is likely that racism contributes to these differences in access and procedure use among Black, Latinx, and Native American patients. Studies have shown that some physicians perceive differences in personal characteristics based on patients' race.<sup>70,71</sup> And interestingly, despite overwhelming evidence to the contrary, a 2004 study found that only 34% of cardiologists believed that racial disparities in care existed.<sup>72</sup> Although this study may be outdated, both implicit and explicit bias have implications for clinician assessment of patients' candidacy for cardiac procedures. More work is necessary to understand and improve clinician decision-making and address the impact of racism on CVD care and outcomes.

## Income

Cardiovascular and overall health outcomes are worse among individuals living in poverty compared to wealthier people. At the population level, poor counties have about 10% higher rates of hypertension, obesity, and physical inactivity compared to richer counties in the United States.<sup>73</sup> While the overall prevalence of these CVD risk factors has declined over time, trends vary by income: cardiovascular risk decreased from 1999 to 2014 for middle- and high-income adults, but did not change for adults with incomes at or below the FPL.<sup>74</sup> Adolescents show similar trends over time, with low- to middle-income adolescents showing increases in obesity rates, greater physical inactivity, and slower declines in CVD risk compared to high-income adolescents.<sup>75</sup>

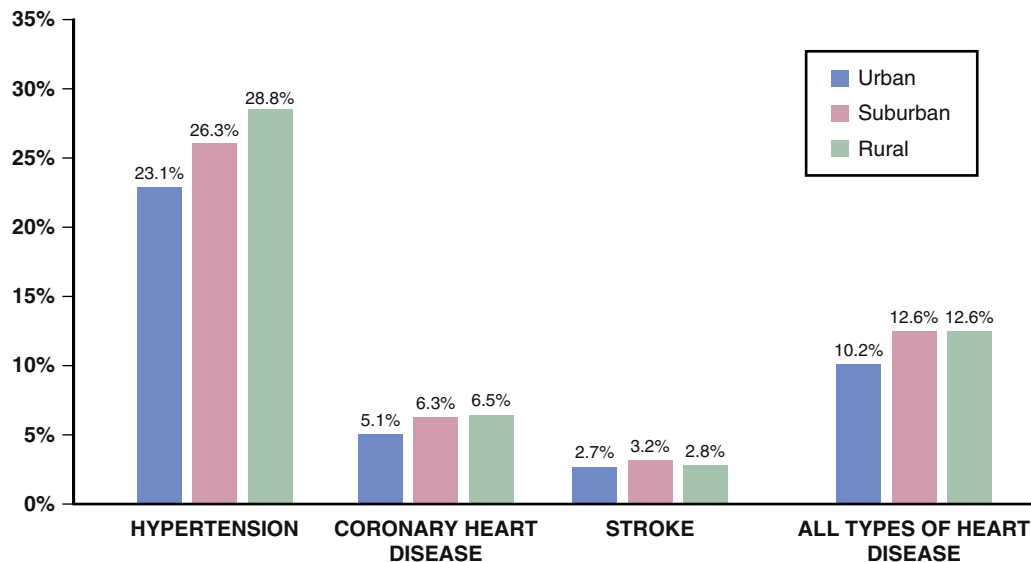
Low income and poverty are also associated with greater CVD incidence and worse outcomes. Compared to high-income individuals, low-income individuals had higher incidence rates of coronary heart disease (6.24 versus 5.67 per 1000 person-years) and HF (10.43 vs. 6.97 per 1000 person-years).<sup>76</sup> Despite higher disease incidence, low-income patients are less likely to receive effective treatment for these conditions, such as left heart catheterization for MI or cardiac rehabilitation after hospitalization for a qualifying condition.<sup>77</sup> They are also less likely to start statin medications following AMI compared to high-income patients.<sup>77</sup> These disparities translate into worse outcomes even after adjusting for other sociodemographic factors. At the county level, HF mortality is strongly correlated with poverty ( $r = 0.48$ ), and increases by 5.2 deaths per 100,000 persons for each percentage increase in county poverty.<sup>78</sup> Individuals living in low-income areas have a higher risk of inpatient mortality for acute stroke compared to patients living in higher-income areas (OR 1.08),<sup>79</sup> and higher family income is associated with a 40% to 50% decrease in all-cause and cardiovascular mortality.<sup>80</sup>

Income is one component of an individual's socioeconomic status, and other factors such as insurance status, employment status, and neighborhood characteristics likely contribute to low-income individuals' CVD disease risk. For example, in 2018, 84% of the uninsured population had incomes less than 400% FPL.<sup>81</sup> Low-income patients who lack insurance face greater financial barriers to care, which is associated with fewer annual medical exams, postponing care, and lower likelihoods of receiving preventive care.<sup>77,81</sup> Low-income individuals are more likely to live in food deserts, have difficulty accessing healthy food, and live in communities with fewer sidewalks and parks. This adverse environment is associated with higher rates of CVD risk factors, such as obesity and physical inactivity.<sup>77,82</sup> Chronic stressors driven by income and affordability barriers contribute to higher cortisol and adrenaline levels, which further increases low-income individuals' risk of chronic disease and CVD.<sup>82</sup>

## Urban-Rural Geography

Roughly 20% of the U.S. population lives in rural areas. Rural residents tend to be older, and have higher rates of cardiovascular risk factors like diabetes, obesity, and hypertension, as well as tobacco use and physical inactivity.<sup>83</sup> Data from the 2018 Centers for Disease Control and Prevention (CDC) National Health Interview Survey showed a higher prevalence of heart disease among rural residents compared with their counterparts in small metropolitan and urban areas, a gap that has grown over the past decade (Fig 6.4).<sup>84</sup> Rural areas have higher death rates for CVD and stroke than urban areas, and gaps are widening here too. Rural residents have a 30% higher risk for stroke mortality compared with urban residents,<sup>85</sup> and recent national increases in stroke mortality are steepest in the rural South.<sup>86</sup> Rural women face higher maternal mortality rates compared to urban women, largely driven by excess cardiovascular deaths.<sup>87</sup>

The reasons for these differences are again manifold. In rural areas, there are major issues in terms of access to physical facilities and medical personnel. Primary care providers (PCPs) play an important role in cardiovascular risk factor management, and rural areas have fewer PCPs per capita than urban areas. A lower supply of PCPs is associated with higher CVD mortality.<sup>88</sup> In addition, the average rural resident lives 10.5 miles away from a hospital, compared with 4.4 miles for urban individuals.<sup>89</sup> Differential outcomes related to AMI in rural regions result from lower capabilities of ambulance services, less access to timely, life-saving specialty procedures, and high reliance on transfers to definitive care.<sup>90</sup> Similarly, while treatment at designated stroke centers is associated with higher thrombolytic therapy rates and lower mortality, rural residents are less likely to have access to such centers than their urban counterparts.<sup>91</sup> As the use of endovascular therapy for stroke grows, such geographic differences have become more pronounced.<sup>92</sup> For less common cardiovascular conditions such as congenital heart disease, as well as procedures such as heart transplantation, left ventricular assist device implantation, and advanced mechanical circulatory support for cardiogenic shock, these issues are even more stark, as people living in rural areas may need to travel tens or even hundreds of miles to access advanced technologies.<sup>93</sup>



**FIGURE 6.4** Urban-rural disparities in CVD, 2018. Rural areas have higher rates of CVD incidence compared to urban and suburban areas. CVD, Cardiovascular disease. (Source: Centers for Disease Control and Prevention. Summary Health Statistics Tables: National Health Interview Survey. 2019. Available at: <https://www.cdc.gov/nchs/nhis/shs/tables.htm>. Accessed July 7, 2020.)

Access continues to worsen as hospital closures have accelerated nationwide; more than 100 rural hospitals have closed since 2010,<sup>94</sup> and this is especially pronounced for hospitals in states which did not expand Medicaid through the ACA.<sup>95</sup> Studies have shown an increase in stroke and acute MI mortality associated with rural closures,<sup>96</sup> both in the areas with closures as well as in high-occupancy hospitals that absorb new volume; one study found that when a high-occupancy ED was exposed to a closure, 1-year mortality and 30-day readmission rates increased for acute MI, while the likelihood of receiving PCI declined.<sup>97</sup>

Access to high-quality care also matters for cardiovascular outcomes. Quality of care and outcomes for cardiovascular conditions in rural hospitals may be worse than urban hospitals, at least in some domains. For example, prior studies have shown higher mortality for patients with acute MI, HF, atrial fibrillation, and stroke in rural hospitals compared with urban ones.<sup>83</sup> Transportation challenges and long distances to services in rural areas can also result in fewer preventive or chronic care visits, which can impact cardiovascular health.<sup>98</sup> Rurality also poses challenges in access to, and participation in, post-acute care and rehabilitation services. For example, patients living at a distance from a cardiac or stroke rehabilitation program are less likely to participate.<sup>99,100</sup>

## CONCLUSIONS

Health policy, while unfamiliar for many clinicians, impacts the day-to-day delivery of cardiovascular care in many ways, including access and coverage, as well as quality, costs, and reimbursement. There is also a strong relationship between health policy and equity. The evidence to date suggests that health insurance coverage is crucial for achieving optimal cardiovascular and overall health, and improvements to insurance markets as well as Medicaid expansion under the ACA have led to higher rates of coverage nationwide. The payment models introduced in the ACA have been, overall, suboptimally effective at improving outcomes or reducing costs, and may have had unintended consequences for access and equity. Major inequities in care and outcomes for racial and ethnic minorities, people living in poverty, and those in rural areas exist, despite growing recognition of their magnitude. Further research and efforts are needed to build on successful policies such as insurance expansion, improve those that have been less successful, and drive toward better and more equitable health for all.

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