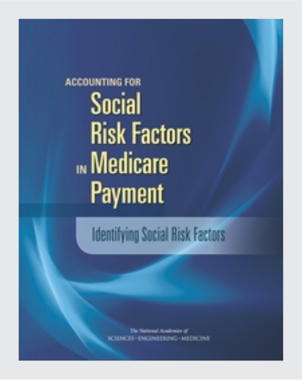

Accounting for Social Risk Factors in Medicare Payment: Identifying Social Risk Factors

DETAILS

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Social Risk Factors
IN
Medicare Payment

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Reviewers

This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. We wish to thank the following individuals for their review of this report:

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Although the reviewers listed above have provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations nor did they see the final draft of the report before its release. The review of this report was overseen by **GEORGES C. BENJAMIN,** American Public Health Association, and **CHARLES E. PHELPS,** University of Rochester. They were responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring committee and the institution.

Contents

Acronyms

ACA	Patient Protection and Affordable Care Act of 2010
ACO	accountable care organization
ADL	activity of daily living
AHRQ	Agency for Healthcare Research and Quality
AMI	acute myocardial infarction
APM	alternative payment model
BY	benchmark year
CAHPS	Consumer Assessment of Healthcare Providers and Systems
CAUTI	Catheter-Associated Urinary Tract Infection
CDC	Centers for Disease Control and Prevention
CHIP	Children's Health Insurance Program
CLABSI	Central-Line Associated Bloodstream Infection
CMS	Centers for Medicare & Medicaid Services
COPD	chronic obstructive pulmonary disease
CY	calendar year
ED	emergency department
ESRD	end-stage renal disease
FY	fiscal year
GAO	Government Accountability Office
HAC	hospital-acquired condition
HCAHPS	Hospital Consumer Assessment of Healthcare Providers and Suppliers
HCC	hierarchical condition categories
HF	heart failure
HHS	Department of Health and Human Services
HRRP	Hospital Readmission Reductions Program
IADL	instrumental activity of daily living
IMPACT Act	Improving Medicare Post-Acute Care Transformation Act of 2014
IOM	Institute of Medicine

IPPS	Inpatient Prospective Payment System
LEP	limited English proficiency
MA	Medicare Advantage/Medicare Part C
MIPS	Merit-Based Incentive Payment System
MedPAC	Medicare Payment Advisory Commission
MIPPA	Medicare Improvements for Patients and Providers Act
MLR	minimum loss rate
MSPB	Medicare spending per beneficiary
MSR	minimum savings rate
MSSP	Medicare Shared Savings Program
NHSN	National Healthcare Safety Network
NQF	National Quality Forum
PN	pneumonia
PQRS	Physician Quality Reporting System
PSA	prostate-specific antigen
PSI	patient safety indicator
SEP	socioeconomic position
SES	socioeconomic status
SNF	Skilled Nursing Facility
SSI	Surgical Site Infection
STEMI	ST-segment elevation myocardial infarction
VA	Department of Veterans Affairs
VBP	value-based payment

Summary

Medicare is the government's health care program for the elderly (individuals age 65 years and older), those with permanent kidney failure (end-stage renal disease [ESRD]), and some individuals with long-term disability. Recent health care payment reforms aim to improve the alignment of Medicare payment strategies with goals to improve the quality of care provided, patient experiences with health care, and health outcomes, while also controlling costs. These efforts move Medicare away from the volume-based payment of traditional fee-for-service models and toward value-based purchasing, in which cost control is an explicit goal in addition to clinical and quality goals (Rosenthal, 2008). Specific strategies include pay-for-performance and other quality incentive programs and risk-based alternative payment models, such as bundled payments and accountable care organizations. In this report, these types of strategies will be referred to broadly as "value-based payment" (VBP). The Patient Protection and Affordable Care Act of 2010 (Affordable Care Act) prompted widespread adoption of VBP at the federal level by directing the Centers for Medicare & Medicaid Services (CMS) to implement payment reforms in the Medicare program and by establishing a number of tools CMS can use to achieve VBP goals. The Institute of Medicine (IOM) was commissioned to provide input into whether socioeconomic status (SES) and other social risk factors could be accounted for in Medicare payment and quality programs. The IOM convened an ad hoc committee to conduct a series of five reports related to this task, of which this is the first report.

CURRENT STATUS OF VALUE-BASED PAYMENT IN MEDICARE

The Affordable Care Act and subsequent legislation, including the Improving Medicare Post-Acute Care Transformation Act of 2014 (IMPACT Act) and Medicare and CHIP [Children's Health Insurance Program] Reauthorization Act of 2015, require CMS to implement VBP programs for Medicare inpatient hospital care, ambulatory care, health plans, and post-acute care. Currently, there are eight VBP programs in Medicare, with two post-acute care programs in proposal or planning:

- Hospital Readmission Reductions Program
- Hospital-Acquired Condition Payment Reduction
- Hospital Value-Based Purchasing
- Medicare Shared Savings Program
- Physician Value-Based Modifier
- End-Stage Renal Disease Quality Incentive Program

- Medicare Advantage/Part C[1]
- Medicare Part D[1]
- Skilled Nursing Facility Value-Based Purchasing (in planning)
- Home Health Value-Based Purchasing (in planning)[2]

POTENTIAL UNINTENDED CONSEQUENCES OF VALUE-BASED PAYMENT ON VULNERABLE POPULATIONS AND HEALTH DISPARITIES

Improving Value-Based Payment to Address Unintended Consequences

While the impact of VBP strategies on providers serving vulnerable populations and on health disparities continues to be monitored both under Medicare and more widely, and because more VBP programs are being implemented and existing programs are expanding, some methods have been proposed to improve these payment programs to address the potential unintended consequences on vulnerable populations and disparities. Chief among methods to improve VBP to address these unintended consequences is accounting for differences in patient characteristics when measuring quality and calculating payments, sometimes referred to as risk adjustment or payment adjustment. Most emerging VBP strategies recognize that differences in patient characteristics may affect health care outcomes and costs independently of variations in the provision of care, and that these must be accounted for when measuring quality and calculating payments (Rosenthal, 2008). Currently, patient characteristics included in these adjustments typically only include certain demographic and clinical characteristics (e.g., age, sex, and clinical comorbidities).

Accounting for Social Risk Factors in Value-Based Payment

The primary method proposed to account for social risk factors in value-based payment has been to include them in risk adjustment of performance measures used as the basis for payment. Risk adjustment primarily aims to improve measurement accuracy, such as for the purposes of quality assessment and public reporting, but becomes a method of payment adjustment when measures that are risk adjusted are used as the basis for payment. In this context, proposed adjustments have implications for health equity and fairness of provider reimbursement, and the proposal has become controversial.

Critics of including social factors in risk adjustment argue that what may appear as differences by social groups may be genuinely attributed to quality differences and not the social factors themselves. In this case adjusting for the social factor would obscure genuine disparities

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[1] The committee included Medicare Part C and Part D because the study sponsor, the Office of the Assistant Secretary for Planning and Evaluation of the Department of Health and Human Services, included them as relevant payment models in its presentation to the committee at the first meeting (Epstein, 2015), and thus the program is of interest to them. Additionally, the committee considers Part C and Part D to have important design features through which quality and cost performance affect payment and market share. As described in more detail in Chapter 1, Part C and Part D are both risk-sharing models of payment, which necessitates consideration of risk adjustment for the capitation amount or global spending target, and also include other value-based payment mechanisms, such as bonus payments (Part C) and risk corridors (Part D).

[2] This report does not discuss innovation models conducted under the CMS Innovation Center and other demonstration programs, such as the Maryland all-payer model, the Nursing Home Value-Based Purchasing Demonstration, and the Bundled Payments for Care Improvement (BPCI) Initiative.

and make it more difficult to hold those providing lower-quality care accountable (Jha and Zaslavsky, 2014; Kertesz, 2014; Krumholz and Bernheim, 2014; O'Kane, 2015). They further argue that so doing implicitly accepts a lower standard for vulnerable patients (Bernheim, 2014; Jha and Zaslavsky, 2014). This would not only enable lower-quality care for disadvantaged persons, but it would also reduce incentives for improvement (Bernheim, 2014; Kertesz, 2014).

Proponents argue that certain social factors lie outside the control of providers and thus hospitals should not be accountable for them (Jha and Zaslavsky, 2014; Joynt and Jha, 2013; Pollack, 2013; Renacci, 2014). In this way of thinking, social factors are confounders masking true performance and adjusting for them provides more accurate measurement (Fiscella et al., 2014; Jha and Zaslavsky, 2014). If this is the case, risk adjusting for social factors would ensure that hospitals are being fairly assessed and that providers caring for more disadvantaged patients are not punished precisely for caring for these patients (Girotti et al., 2014). Indeed, if serving disadvantaged patients results in disproportionate penalties, this may disincentivize providers from caring for them (Joynt and Jha, 2013). Others also raise concerns that because disproportionate penalties will further reduce the already limited resources of providers serving greater shares of disadvantaged patients with even fewer financial resources, quality in these providers will likely worsen (Grealy, 2014; Ryan, 2013), and the organizations could potentially fail, leaving fewer providers to care for disadvantaged patients (Lipstein and Dunagan, 2014). In both cases, this would widen disparities.

In light of this debate, two expert panels have previously examined whether to include social risk factors in risk adjustment for Medicare payment models and offered recommendations. In its June 2013 *Report to the Congress*, the Medicare Payment Advisory Commission (MedPAC) recommended that CMS use two methods of adjustment, one for public reporting (i.e., quality measurement) and another for financial incentives. Readmissions rates for public reporting would remain unadjusted for socioeconomic disparities so as not to mask potential disparities in quality of care. However, when calculating penalties, hospitals would be compared not to all other hospitals as is currently done, but to hospitals with a similar patient mix (MedPAC, 2013). In 2014, an expert panel convened by the National Quality Forum (NQF) released a technical report reversing the NQF's previous position to exclude "sociodemographic factors"[3] in risk-adjustment of performance measures used in "accountability applications" (i.e., as a basis of payment or public reporting). The panel recommended that sociodemographic factors should be included in risk adjustment if there is a conceptual relationship between a given factor and specific quality metrics as well as empirical evidence of that association (NQF, 2014).

Congress has also taken up the issue. While authorizing the establishment of several VBP programs in Medicare, the IMPACT Act also required that the Secretary of Health and Human Services submit a report to Congress by October 2016 that assesses the impact of SES on quality and resource use in Medicare using measures such as poverty and rurality from existing Medicare data. It also required a report to Congress by October 2019 on the impact of SES on quality and resource use in Medicare using measures (e.g., education and health literacy) from other data sources. It also required qualitative analysis of potential SES data sources and Secretarial recommendations on obtaining access to necessary data on SES and accounting for SES in determining payment adjustments (Epstein, 2015).

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[3] Sociodemographic factors are defined as a "variety of socioeconomic (e.g. income, education, occupation) and demographic factors (e.g. age, race, ethnicity, primary language."

STATEMENT OF TASK

As input to the analyses to be included in the 2016 and 2019 reports to Congress, the Department of Health and Human Services (HHS), acting through the Office of the Assistant Secretary for Planning and Evaluation, asked the IOM to convene an ad hoc committee to provide a definition of SES for the purposes of application to Medicare quality measurement and payment programs; to identify the social factors that have been shown to impact health outcomes of Medicare beneficiaries; and to specify criteria that could be used in determining which social factors should be accounted for in Medicare quality measurement and payment programs. Further, the committee will identify methods that could be used in the application of these social factors to quality measurement and/or payment methodologies. Finally, the committee will recommend existing or new sources of data and/or strategies for data collection. The committee's work will be conducted in phases and produce five brief reports (see Box 1-1 in Chapter 1). In this first report, the committee will focus on the definition of SES and other social factors that have been shown to influence health outcomes of Medicare beneficiaries, as reflected in current Medicare payment and quality programs.

The statement of task for this report includes several key words that drove the committee's work. The task refers to identifying "SES factors" that "have been shown" to "impact" "health outcomes" of "Medicare beneficiaries." This project is intended to provide very practical and targeted input to HHS and Congress as they consider whether to adjust Medicare payment programs for social risk factors. This project builds on decades of research assessing the social determinants of health; it does not reinvent or redefine that field of scholarship. The committee is narrowly focused on how social risk factors affect health care use and outcomes of a specific group of people—Medicare beneficiaries—in response to encounters with the health care system, not how social factors affect health status generally.

The committee identified five social risk factors that are conceptually likely to be of importance to health outcomes of Medicare beneficiaries:

1. Socioeconomic position;
2. Race, ethnicity, and cultural context;
3. Gender;
4. Social relationships; and
5. Residential and community context.

Although an independent risk factor and not a social factor, the committee included health literacy as another important factor.

Although the statement of task specifies only examining the impact of these social risk factors on "health outcomes," it also specifies that the social risk factors should be targeted "for the purpose of application to quality, resource use, or other measures used for Medicare payment programs." Thus, given the importance that Medicare VBP programs have placed on this broader set of measures and given that Medicare applies these measures when calculating payments, the committee interpreted "health outcomes" as encompassing measures of health care use, health care outcomes, and resource use. Hence, the committee included the following domains of measures: health care utilization, clinical processes of care, health (clinical care) outcomes, patient experience, patient safety, and cost.

Figure S-1 illustrates the committee's conceptual framework, which illustrates the primary hypothesized relationships by which social risk factors may affect the broad set of health outcomes at issue. The framework is not intended to illustrate the entire universe of potential causes and risks. The framework applies to all Medicare beneficiaries, including disabled beneficiaries and beneficiaries with ESRD, because although the committee acknowledges that the Medicare population is heterogeneous (even among beneficiaries age 65 and older), the committee expects the effect of social risk factors to be similar for all Medicare subpopulations (beneficiaries with disabilities, those with ESRD, and older adults). The committee will revisit this assumption in subsequent reports. Additionally, Medicare coverage and the measures used to assess health care quality and outcomes do not differ for Medicare beneficiaries by origin of entitlement, except for certain measures of ESRD care and outcomes, and thus the health outcomes in the framework are also equally applicable.

Current Medicare quality measures fall within each of the domains embraced by the committee in the expanded definition of "health outcomes." Table S-1 contains examples of Medicare quality measures currently in use in each of the health care use and outcome domains embraced by the committee in the expanded definition of "health outcomes."

COMMITTEE PROCESS AND OVERVIEW OF THIS REPORT

The committee comprises expertise in health disparities, social determinants of health, risk adjustment, Medicare programs, health care quality, health system administration, clinical medicine, and health services research. The committee will meet five times over 12 months and issue five brief, consensus reports. In this report, the committee outlines a conceptual framework for how social risk factors could influence health care outcomes and quality measures of relevance to Medicare programs. The committee then presents the results of a literature search to identify those social risk factors that have been shown to influence broad categories of relevant health care outcomes and quality measures. The relevant literature is described generally without an assessment of the quality of each individual study and with no attempt at data integration, such as in a meta-analysis. The identification and description of the literature should not be mistaken for a systematic review that uses a formal system for weighing and describing evidence, such as those used in clinical or public health guideline development. In its findings, the committee uses the term "influence" to describe an association between a social risk factor and a health care use or outcome measure without implying a causal association. Future work of the committee will address the question of whether a specific social factor could be incorporated into Medicare payment programs, the methods to do so, and data needs to accomplish the task.

DEFINITIONS AND FINDINGS FROM THE LITERATURE SEARCH

In this section, the committee defines each of the five social factor domains, as well as health literacy, and summarizes the results of the literature search linking effects of each domain on health care outcomes and quality measures.

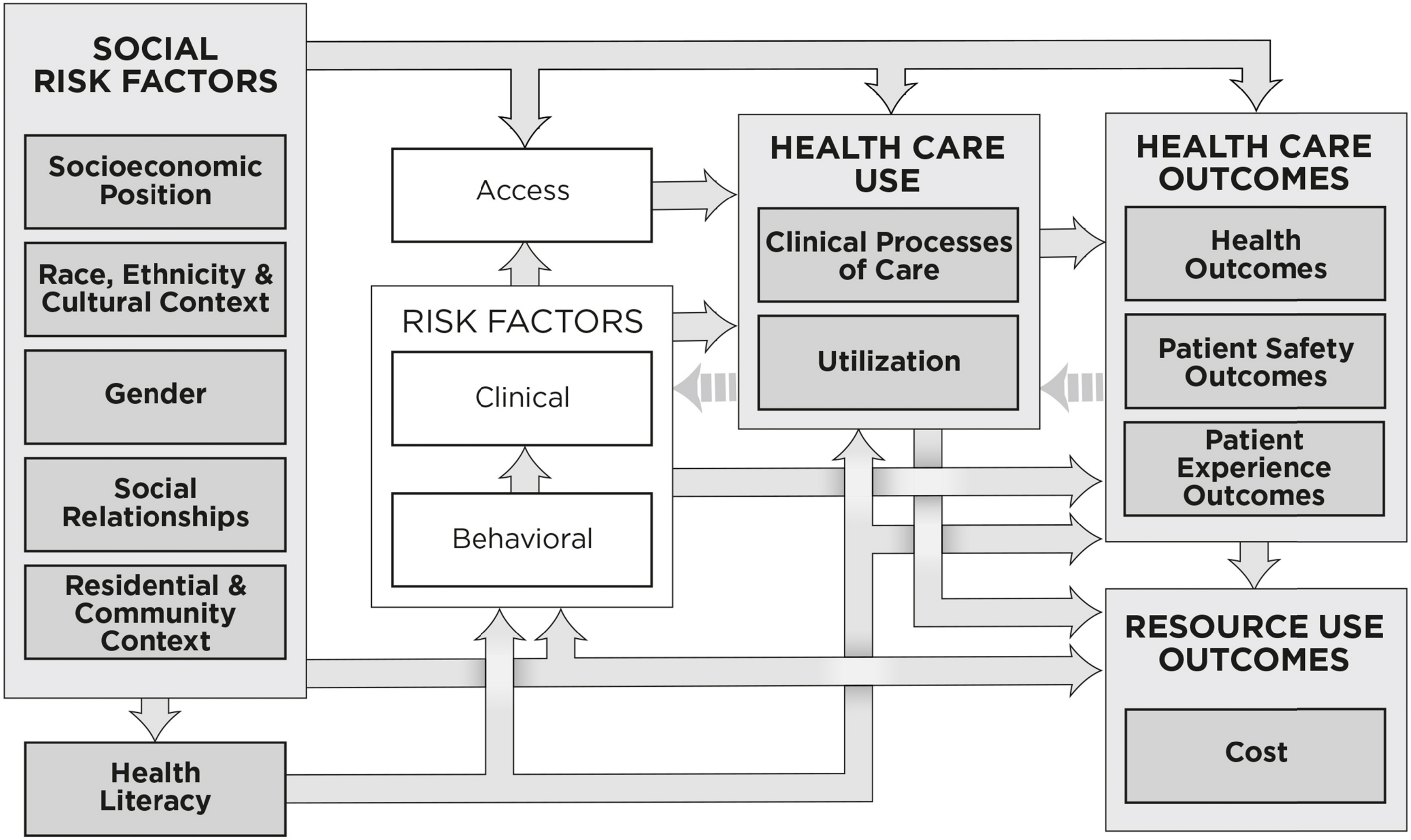

FIGURE S-1 Conceptual framework of social risk factors for health care use, outcomes, and cost.
NOTE: This conceptual framework illustrates primary hypothesized conceptual relationships.

TABLE S-1 Health Care Use and Outcome Domains and Example Medicare Quality Measures

Health Care Use or Outcome Domain	Example Medicare Quality Measures
Health Care Use	
Clinical Processes of Care	• HbA1c testing for beneficiaries with diabetes • Influenza and pneumonia vaccination • Primary percutaneous coronary intervention received within 90 minutes of hospital arrival for patients with AMI • Blood cultures performed in the emergency department prior to initial antibiotic received in hospital for patients with pneumonia • Anemia management for kidney disease patients
Utilization	• Hospital admissions for COPD exacerbations • Heart failure admissions • 30-day readmissions after hospital discharge for AMI, heart failure, pneumonia, COPD, or total hip arthroplasty/total knee arthroplasty
Outcomes	
Resource Use (Costs)	• Medicare spending per beneficiary
Health (Clinical Care)	• Diabetes composite quality indicator (controlled diabetes, short- and long-term diabetes complications, lower-extremity amputation for diabetes) • 30-day mortality after hospital discharge for AMI, heart failure, or pneumonia
Patient Safety	• AHRQ Patient Safety Indicator composite (pressure ulcer, iatrogenic pneumothorax, central venous catheter-related bloodstream infections, postoperative hip fracture, perioperative pulmonary embolism or deep vein thrombosis, postoperative sepsis, postoperative wound dehiscence, accidental puncture or laceration) • Central line-acquired bloodstream infection • Catheter-acquired urinary tract infection • Surgical site infection • Incidence of major falls for post-acute care patients
Patient Experience	• Communication with nurses • Communication with doctors • Getting timely appointments, care, and information • Getting information from Part D drug plan • Helpful, courteous, and respectful office staff • Responsiveness of hospital staff • Care coordination • Pain management • Communication about medications • Cleanliness and quietness • Overall rating of hospital • Rating of Medicare Advantage health plan

NOTE: AHRQ = Agency for Healthcare Research and Quality; AMI = acute myocardial infarction; COPD = chronic obstructive pulmonary disease.

Socioeconomic Position

Socioeconomic position (SEP) is an indicator of an individual's absolute and relative position in a socially stratified society. SEP captures a combination of access to material and social resources as well as relative status, meaning prestige- or rank-related characteristics, and is commonly measured through indicators such as income and wealth (with wealth being of special relevance in older individuals), education, and occupation (including occupational history and employment status). To that end, the committee employs the term *socioeconomic position*, rather than the more commonly used phrase *socioeconomic status*, because *socioeconomic status* blurs distinctions between two different aspects of socioeconomic position (actual resources and status) and privileges status over actual resources (Adler et al., 1994; Krieger et al., 1997; Lynch and Kaplan, 2000). SEP over one's lifetime is a powerful predictor of many health-related processes and outcomes and is often related to outcomes in a dose–response manner. In the medical field, insurance status is also used as a proxy for SEP—for example, dual Medicare–Medicaid eligibility among the Medicare population is often used as a proxy for low income. However, insurance status is generally a very imperfect proxy, because (1) it does not capture the continuum of SEP, (2) it may capture dimensions of health status unmeasured by other data sources, and (3) because it represents insurance status itself, which is distinct from SEP. The committee made the following findings:

- The committee identified literature indicating that income may influence health care utilization, clinical processes of care, costs, health outcomes, and patient experience.
- The committee identified literature indicating that when measured by a proxy of insurance status, income may influence health care utilization, clinical processes of care, and patient experience.
- The committee identified literature indicating that education may influence health care utilization, health outcomes, and patient experience.
- The committee identified literature indicating that occupation may influence health care utilization, health outcomes, and patient experience.
- The committee identified no literature indicating that socioeconomic position may influence patient safety outcomes.

Race, Ethnicity, and Cultural Context

Race and ethnicity are another key social factor. Race and ethnicity are dimensions of a society's stratification system by which resources, risks, and rewards are distributed. As such, racial and ethnic categories capture a range of dimensions relevant to health, especially those related to social disadvantage (IOM, 2014a; Williams, 1997). These dimensions include access to key social institutions and rewards; behavioral norms and other sociocultural factors; inequality and injustice in the distribution of power, status, and material resources; and psychosocial exposures such as discrimination (Williams, 1997). It is well established that race and ethnic background is often predictive of health care and health outcomes even after accounting for such traditional measures of SEP as income and education (Krieger, 2000; LaVeist, 2005; Williams, 1999; Williams et al., 2010).

A number of factors likely contribute to this "independent" effect of race and ethnicity including

1. lack of comparability of a given SEP measure across race/ethnic groups (e.g., income returns to education are well known to vary by race, and income is differentially correlated with wealth by race);
2. importance of other exposures such as neighborhood environments that are pattered differently by race even among individuals of apparently similar SEP;
3. the importance of race or ethnic specific factors such as discrimination and immigration related factors, including time living in the United States and language proficiency; and
4. measurement error in SEP.

Although race and ethnicity reflect many different social circumstances, there can also be important heterogeneity in health within race and ethnic groups, driven for example by SEP heterogeneity or heterogeneity in English language proficiency, country of origin, time in the United States, or other cultural dimensions. The committee made the following findings:

- The committee identified literature indicating that race and ethnicity may influence health care utilization, clinical processes of care, costs, health outcomes, patient safety, and patient experience.
- The committee identified literature indicating that language may influence health care utilization, clinical processes of care, health outcomes, and patient experience.
- The committee identified literature indicating that nativity may influence clinical processes of care and patient experience.

Gender

Gender is known to be related to many health and health care–related outcomes. The committee used the term *gender* broadly to capture the social dimensions of gender and distinguish these from biological effects of sex. Gender is known to affect a number of health outcomes as well as interactions with the health care system, health care–related processes, and outcomes of health care. Gender or sexual minorities, including individuals who identify as lesbian, gay, bisexual, transgender, intersex, queer, and questioning, may also experience differences in health and health care. These disparities may be related to exposure to stigma, discrimination, and violence on the basis of their non-normative identity; barriers to accessing health care, including fear of discrimination from providers; and unhealthy behaviors, especially increased rates of smoking, alcohol use, and substance (IOM, 2011). The committee made the following finding:

- The committee identified literature indicating that gender may influence clinical processes of care and patient experience.

Social Relationships

Social relationships are another important social risk factor. It is well established that many dimensions of social relationships including access to social networks that can provide access to resources (including material and instrumental support) as well as the emotional support available through social relationships can be important to health (Berkman and Glass, 2000; Cohen, 2004; Eng et al., 2002; House et al., 1988). Likewise, social isolation and loneliness have been shown to have important consequences for health (Berkman and Glass, 2000; Brummett et al., 2001; Cohen, 2004; Eng et al., 2002; House et al., 1988; Wilson et al., 2007). Social relationships may be of special importance to health care access, process and outcomes among older individuals (Cornwell and Waite, 2009; Hawton et al., 2011; Seeman et al., 2001; Tomaka et al., 2006) and persons with ADL and IADL limitations (AARP Public Policy Institute, 2010). Social relationships are most frequently assessed in the health care and health services research literature with three constructs: marital status, living alone, and social support. The committee made the following findings:

- The committee identified literature indicating that marital status may influence health care utilization, clinical processes of care, costs, health outcomes, and patient experience.
- The committee identified literature indicating that social support may influence heath care utilization, clinical processes of care, health outcomes, and patient experience.
- The committee identified literature indicating that living alone may influence health care utilization, clinical processes of care, and health outcomes.
- The committee identified no literature indicating that social relationships may influence patient safety.

Residential and Community Context

The committee uses the term community context to refer to a set of broadly defined characteristics of residential environments that could be important to health and the health care process and its outcomes. Dimensions include the physical environments (e.g., housing, walkability, transportation options, and proximity to services) as well as the social environment (e.g., safety and violence, social disorder, presence of social organizations, and social cohesion) (Diez Roux, 2001; Diez Roux and Mair, 2010). Community context also references the policies, infrastructural resources and opportunity structures that influence individuals' everyday lives. The SEP or racial and ethnic composition of an area is sometimes used as a proxy for some of these attributes, although it is an imperfect proxy and can also capture unmeasured or imperfectly measured individual-level SEP. Community context may also have special relevance for older persons owing to decreases in mobility with age and for persons with mobility disabilities (Yen et al., 2009). The committee made the following findings:

- The committee identified literature indicating that community composition may influence health care utilization, clinical processes of care, health outcomes, and patient safety.
- The committee identified literature indicating that community context may influence health care utilization, health outcomes, and patient experience.
- The committee identified literature indicating that urbanization may influence health care utilization, clinical processes of care, costs, and patient experience.

Health Literacy

Health literacy is the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions (NASEM, 2015). Although an individual risk factor and not a social factor, the committee includes health literacy in the framework, because it is specifically mentioned in the IMPACT Act, and is thus of interest to Congress, is affected by social risk factors, and because the literature supports a role for health literacy in health care outcomes and quality measures. The committee also included the related concept of numeracy, the ability to understand information presented in mathematical terms and to use mathematical knowledge and skills in a variety of applications across different settings (IOM, 2014b). The committee made the following finding:

- The committee identified literature indicating that health literacy may influence health care utilization, clinical processes of care, cost, and patient experience.

CONCLUDING REMARKS

What is clear at this point is that health literacy and social risk factors (SEP; race, ethnicity, and cultural context; gender; social relationships; and residential and community context) have been shown to influence health care use, costs, and health care outcomes in Medicare beneficiaries. However, some specific factors were found not to influence one or more outcomes. The committee has not yet evaluated the literature for the purpose of identifying the factors that could be incorporated into measures used in Medicare payment programs; that is the focus of the third report from the committee.

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Introduction

Recent health care payment reforms aim to improve the alignment of Medicare payment strategies with goals to improve the quality of care provided, patient experiences with health care, and health outcomes, while also controlling costs. These efforts move Medicare away from the volume-based payment of traditional fee-for-service models and toward value-based purchasing, in which cost control is an explicit goal in addition to clinical and quality goals (Rosenthal, 2008). Specific payment strategies include pay-for-performance and other quality incentive programs that tie financial rewards and sanctions to the quality and efficiency of care provided, and risk-based alternative payment models (APMs) such as bundled (episode-based) payments and accountable care organizations (ACOs) in which health care providers are held accountable for both the quality and cost of the care they deliver (Burwell, 2015; Rosenthal, 2008). In this report, these types of strategies, including both incentive programs and APMs, will be referred to broadly as “value-based payment” (VBP). The Patient Protection and Affordable Care Act of 2010 (ACA) prompted widespread adoption of value-based payment at the federal level by directing the Centers for Medicare & Medicaid Services (CMS) to implement payment reforms in the Medicare program and by establishing a number of tools CMS can use to achieve VBP goals.

OVERVIEW OF THE MEDICARE PROGRAM

Medicare is the government’s health care program for individuals age 65 and older, those with permanent kidney failure (end-stage renal disease [ESRD]), and some individuals with long-term disability (Medicare.gov, n.d.-a). Medicare beneficiaries must be U.S. citizens or permanent legal residents. Medicare consists of four programs:

- Part A, the hospital insurance program that pays fee-for-service for inpatient hospital care, skilled nursing facility care, hospice care, and home health care;
- Part B, the medical insurance program that pays fee-for-service for outpatient care (physician services), home health care, durable medical equipment, and some preventive services;
- Part C, or Medicare Advantage (MA), are insurance programs run by Medicare-certified private companies that cover all the benefits and services covered under

Part A and Part B, often include Part D pharmaceutical drug coverage, and may also cover additional benefits and services at extra cost; and

- Part D, the pharmaceutical drug reimbursement program that is also run by Medicare-approved private companies and for which Medicare pays approximately 75 percent of the cost (CMS, 2015h; MedPAC, 2014).

Persons under age 65 years receiving Social Security disability insurance benefits[1] or who have permanent kidney failure (ESRD) and qualify for Social Security benefits also qualify for Medicare. Those with amyotrophic lateral sclerosis (ALS; Lou Gehrig's disease) qualify for Medicare immediately upon receiving Social Security disability insurance and persons with ESRD receive Medicare benefits on the fourth month of dialysis treatment or the month the patient enters a qualifying hospital for a kidney transplant. All others receive coverage after a 24-month waiting period.

As with private health insurance, Medicare premiums and care are not free (Medicare.gov, n.d.-c). However, Medicare Part A is premium-free for Medicare beneficiaries 65 years of age or older who qualify for Social Security (requiring 40 quarters of work in which a threshold amount of Social Security taxes were paid).[2] Part A premiums for those 65 years or older who do not meet the Social Security eligibility cost up to $407 per month in 2015. Monthly Medicare Part B premiums generally cost $104.90 (in 2015) but higher-income individuals pay more, up to $335.70 in 2015. Help with the cost of Medicare premiums is available to low-income beneficiaries meeting specific eligibility requirements through Medicaid. These beneficiaries are frequently referred to as "dual-eligibles." Persons who chose to enroll in MA (Medicare Part C) plans pay the Part B premium and any additional premium costs imposed by the plan provider. Medicare Part D premium costs vary based on level of coverage and the specific provider chosen by the beneficiary.

As with private insurance, Medicare Parts A and B include deductibles and coinsurance, and Part D also includes an out-of-pocket threshold ($4,700). Many Medicare beneficiaries have some sort of supplemental coverage for cost-sharing expenses under Medicare. Some enrollees in Parts A and B purchase what is known as Medicare Supplement Insurance (Medigap) policy, sold by private companies. In 2010, 14 percent of Medicare beneficiaries had no supplemental coverage (Cubanski et al., 2015).

Medicare is financed through beneficiary premiums, federal general revenue, and payroll taxes (Medicare.gov, n.d.-b). In 2014, Medicare benefit payments totaled $597 billion, among which 45 percent was for Part A benefits, 44 percent was for Part B benefits, and 11 percent was for Part D benefits (CBO, 2015).

In 2012, the program covered more than 50.9 million Americans among whom 42.2 million were 65 years of age or older and 8.6 million were disabled and under 65 years of age (CMS, 2013). The health status of Medicare beneficiaries, even within those who began Medicare coverage on the basis of age, varies widely. Medicare coverage is the same for all Medicare beneficiaries, regardless of the basis for original enrollment. That is, a 40-year-old beneficiary enrolled due to ESRD provisions or on the basis of Social Security Disability determination and who requires hospitalization for any Medicare-covered condition receives the

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[1] Persons under age 65 years receiving certain Railroad Retirement Board disability benefits also may qualify.

[2] Government employees who did not pay into Social Security but paid Medicare payroll taxes and those who receive railroad retirement benefits also qualify for premium-free Part A at age 65 years.

same coverage at the same costs as an 85-year-old beneficiary who enrolled on the basis of age 20 years prior.

CURRENT STATUS OF VALUE-BASED PAYMENT IN MEDICARE

The ACA and subsequent legislation, including the Improving Medicare Post-Acute Care Transformation Act of 2014 (IMPACT Act) and the Medicare Access and CHIP Reauthorization Act of 2015 require CMS to implement VBP programs for Medicare inpatient hospital care, ambulatory care, health plans, and post-acute care. Currently, there are eight VBP programs in Medicare, with two post-acute care programs in proposal or planning.[3] These programs are summarized below and in Table 1-1. Appendix A contains more detailed descriptions of the programs.

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[3] This report does not discuss innovation models conducted under the CMS Innovation Center and other demonstration programs, such as the Maryland all-payer model, the Nursing Home Value-Based Purchasing Demonstration, and the Bundled Payments for Care Improvement (BPCI) Initiative.

TABLE 1-1 Summary of Medicare Value-Based Payment Programs[a]

Program	Incentive Design, Including Maximum Adjustment	Measures	Risk-Adjustment Included	Comments
Hospital Readmission Reduction Program[b]	–1% 2013 –2% 2014 –3% 2015	Excess readmissions for AMI, HF, PN, COPD, total hip or knee arthroplasty	Demographic characteristics, clinical comorbidities, patient frailty	In FY 2016, an estimated 78% of hospitals will be penalized, and 1.2% of hospitals will be penalized the maximum rate of 3%.[c] The average hospital penalty among penalized hospitals is estimated to be –0.63%, totaling approximately $428 million.[d]
Hospital-Acquired Condition (HAC) Payment Reduction[e]	Top 25% worst performing hospitals receive a reduction of 1% of all discharge payments	AHRQ Patient Safety Indicator 90 CDC NHSN infection measures[f]	Age, sex, comorbidities, complications[g]	In FY 2015, more than 700 hospitals received payment reductions under the HAC reduction program.

Hospital Value-Based Purchasing[h]	Only hospital program to offer sanctions and rewards; it is a zero-sum program; 1% in 2013, increasing 0.25% each year until 2%	Clinical process measures (i.e., measures related to getting appropriate treatments in a timely manner) Patient experience (taken from the Hospital Consumer Assessment of Healthcare Providers and Suppliers Survey) Clinical outcomes (30-day mortality for AMI, HF, and PN, as well as certain patient safety measures from AHRQ PSI 90 Composite and CDC NHSN CLABSI) Efficiency (Medicare spending per beneficiary [MSPB])	Clinical and efficiency measures: demographics and comorbidities Patient experience: education, self-rated health, response percentile, primary language other than English, age, service line (maternity/surgical/medical), interactions (surgical line * age, maternity line * age)[i] MSPB: price-standardized	For FY 2015, 74% of hospitals had payment adjustments (bonuses or penalties) of less than 0.5%; only 8 percent of hospitals received bonuses of 0.5% or greater, and 18 percent of hospitals received penalties of 0.5% or greater.[j]
Medicare Shared Savings Program[k]		ACO expenditures above/below benchmarks	Demographics; case-mix; disease severity	For performance year 2014, 92 MSSP ACOs held spending to $806 million below their benchmarks, resulting in $341 million in payments to the ACOs and a net savings of $465 for the Medicare Trust Funds. No ACOs owed losses.[l]

Physician Value-Based Modifier[m]	Budget neutral; rewards and penalties Category 1 (have met minimum reporting requirements): Value modifier calculated using CMS quality tiering methodology (or, in 2015, groups could choose a neutral modifier) Category 2 (have not met minimum reporting requirements): fixed negative adjustment of –1% in 2015 and –2% in 2016	Quality: composite score covering six domains (effective clinical care; person and caregiver-centered experience and outcomes; community/population health; patient safety; communication and care coordination; and efficiency and cost reduction)[n] Cost: composite score covering two domains (per capita costs for all attributed beneficiaries and per capita costs for beneficiaries with specific conditions)	Quality measures: age, sex Patient experience: age, education, general health status, mental health status, Medicaid status, low-income subsidy, Asian language survey (Cantonese/Korean/Mandarin/Vietnamese), survey mode (proxy helped or answered)[o] Cost measures: age, sex, original reason for Medicare entitlement, disability status, Medicaid enrollment, clinical comorbidities	In 2015, 691 groups fell into Category 1 and 319 were designated to Category 2. Of Category 1 groups, 127 groups elected to have their Value Modifier calculated using quality tiering. Among these, 14 groups received upward adjustments for performance, 81 received no adjustments, 11 received negative adjustments, and 21 received no adjustment due to insufficient data to determine quality and cost performance. A total of $11.4 million was distributed from groups receiving negative adjustments to those receiving positive adjustments.[p] This program expires in 2018 and will be replaced in 2019 by the Merit-based Incentive Payment System.[q]

End-Stage Renal Disease Quality Incentive Program[r]	–2%	Quality: clinical measures (anemia management, dialysis adequacy, iron management, bone mineral metabolism, vascular access, patient satisfaction) and reporting measures	Adults patients: Age, dialysis onset, body surface, body mass, comorbidities Pediatric patients: age, dialysis method Patient experience: survey mode; overall health; overall mental health; heart disease; deaf or serious difficulty hearing; blind or serious difficulty seeing; difficulty concentrating, remembering, or making decisions; difficulty dressing or bathing; age; sex; education; speaks language other than English at home; did someone help the patient complete the survey; total years on dialysis[s] Also adjusted for volume, geographic factors, wage index[t]	69.1% of facilities were expected to have no payment reduction in 2012. 16.6% of facilities were expected to receive a 0.5% reduction, 6.0% a 1.0% reduction, 7.7% a 1.5% reduction, and 0.6% a 2.0% reduction.[u]

Medicare Advantage (MA) (Part C)[v]	Bonus payments or rebates are a fixed percentage (50, 65, or 70% based on Star Quality rating)	Star Quality ratings	Quality measures: CMS–HCC model, which includes age, sex, clinical comorbidities, Medicaid status, disabled status, and working aged status Patient experience: age, education, general health status, mental health status, survey mode (proxy helped or answered), Medicaid status, low-income subsidy, and Chinese language survey[w]	
Medicare Part D[x]	Bonus payments or rebates for MA Part D plans 20% of the costs that are higher than expected	Star Quality Ratings (for MA Part D plans, Part D Star Rating contributes to overall plan rating)[y]	Age, education, general health status, mental health status, survey mode (proxy helped or answered), Medicaid status, low-income subsidy, and Chinese language survey[z]	Nearly 75% of plans pay a portion of their profits to Medicare each year under risk corridors; between 2010 and 2012, total annual payments ranged between $900 million and $1 billion
Skilled Nursing Facility Value-Based Purchasing[aa]	–2% if facilities do not report quality data on three domains Incentive program begins in 2019	For 2018, quality domains include skin integrity and changes in skin integrity; incidence of major falls; functional status, cognitive function, and changes in function or cognitive function. CMS proposed the NQF-endorsed, 30-day all-cause readmission measures for the incentive program		

Home Health Value-based Purchasing[bb]	Incremental increase in maximum penalties or rewards of 5% in 2018, 6% in 2020, 8% in 2021	Proposed measures to cover clinical processes, clinical outcomes, patient safety, patient and caregiver experience, population/community health, efficiency, and cost reduction		

NOTE: ACO = accountable care organization; AHRQ = Agency for Healthcare Research and Quality; AMI = acute myocardial infarction; CDC = Centers for Disease Control and Prevention; CMS = Centers for Medicare & Medicaid Services; CLABSI = Central-Line Associated Bloodstream Infection; COPD = chronic obstructive pulmonary disease; FY = fiscal year; HCC = hierarchical condition categories; HF = heart failure; MSSP = Medicare Shared Savings Program; NHSN = National Healthcare Safety Network; NQF = National Quality Forum; PN = pneumonia; PSI = patient safety indicator.

SOURCES:

[a] The information in this table is derived from the material in Appendix A. The interested reader is referred there for more complete information.

[b] Unless indicated otherwise, the information in this row is from CMS, 2014d.

[c] Boccuti and Casillas, 2015.

[d] Boccuti and Casillas, 2015.

[e] CMS, 2014b.

[f] CMS, 2015e.

[g] HHS, 2014b.

[h] Unless indicated otherwise, the information in this row is from MLN, 2013.

[i] HCAHPS, 2013.

[j] GAO, 2015.

[k] Unless indicated otherwise, the information in this row is from CMS, 2014c.

[l] CMS, 2015i.

[m] Unless indicated otherwise, the information in this row is from CMS, n.d.-c.

[n] CMS, 2015b.

[o] CMS, 2015a.

[p] CMS, n.d.-a.

[q] CMS, 2015k.

[r] Unless indicated otherwise, information in this row is from CMS, 2015c.

[s] CMS, 2015f.

[t] MedPAC, 2015c.

[u] Mullin, 2012.

[v] Unless indicated otherwise, information in this row is from MedPAC, 2015b.

[w] CMS, 2015g.
[x] Unless indicated otherwise, information in this row is from MedPAC, 2014.
[y] Medicare.gov, n.d.-d.
[z] CMS, 2015g.
[aa] Unless indicated otherwise, information in this row is from CMS, 2015j.
[bb] Unless indicated otherwise, information in this row is from HHS, 2015.

Medicare Value-Based Payment Programs for Hospital Inpatient Care

Hospital Readmission Reductions Program

The Hospital Readmission Reductions Program (HRRP) requires CMS to reduce a share of the base operating payments to acute care hospitals paid under the Inpatient Prospective Payment System (IPPS) that have the highest readmission rates (CMS, 2014d). For fiscal year (FY) 2013 and FY 2014, CMS adopted measures to calculate excess readmissions for three conditions: acute myocardial infarction (AMI), heart failure, and pneumonia. In FY 2014, CMS refined the measure to account for planned readmissions, and in FY 2015, CMS expanded the program to include excess readmissions from two additional conditions: chronic obstructive pulmonary disease (COPD) and total hip arthroplasty or total knee arthroplasty. For FY 2013, the maximum reduction was 1 percent of a hospital's base operating payment; for FY 2014, the maximum reduction was 2 percent, and for FY 2015, the maximum reduction is 3 percent (CMS, 2014d).

Hospital-Acquired Condition Payment Reduction

The Hospital-Acquired Condition Payment Reduction program requires the Secretary of Health and Human Services to reduce payments to acute care hospitals paid under the IPPS based on their performance on select risk-adjusted hospital-acquired condition (HAC) quality measures beginning in FY 2015 (discharges beginning October 1, 2014) (CMS, 2015e). Performance measures include the Agency for Healthcare Research and Quality (AHRQ) Patient Safety Indicator (PSI) 90 and the Centers for Disease Control and Prevention (CDC) National Healthcare Safety Network (NHSN) infection measures. The top 25 percent worst performing hospitals receive a payment reduction of 1 percent for all discharges in those hospitals (CMS, 2014b).

Hospital Value-Based Purchasing

The Hospital Value-Based Purchasing program is a pay-for-performance program also for acute care hospitals paid under the IPPS and implemented by CMS beginning FY 2013 (MLN, 2013). In this program, hospitals are eligible for either incentive payments (rewards) or penalties for their performance; it is the only Medicare hospital incentive program that offers both rewards and sanctions. In FY 2013, performance measures included clinical process measures and patient experience measures. CMS added clinical outcome measures to the total performance measures in FY 2014. In FY 2015, CMS also added an efficiency measure, Medicare spending per beneficiary (MSPB). Clinical and efficiency measures are currently risk adjusted for patient demographics and comorbidities; MSPB is also price standardized (MLN, 2013).

Maximum rewards and penalties can equal up to a total of 1–2 percent of a hospital's base operating payment: 1 percent in FY 2013 and increasing in 0.25 percent increments annually to 2 percent in FY 2017 and future years (MLN, 2013). The program is a zero-sum program, so the total incentive payments must equal the total reduced payments (penalties).

Medicare Value-Based Payment Programs for Ambulatory Care

Medicare Shared Savings Program

The Medicare Shared Savings Program (MSSP) is a key payment and delivery system reform program of the ACA, implemented beginning in 2014 (CMS, 2015l). MSSP reforms payments to ACOs and aims to motivate delivery and organizational reforms that improve care coordination across providers, as well as the quality and efficiency of care (CMS, 2015l).

To calculate shared savings and losses, CMS first establishes a benchmark for each performance year based on 3 years of per-beneficiary costs for traditional, fee-for-service Medicare Part A and Part B for the beneficiaries enrolled in the ACO. The benchmark is also adjusted at the beginning of each agreement period for "beneficiary characteristics and such other factors as the Secretary [of Health and Human Services] determines appropriate" (CMS, 2014c; MLN, 2014). This risk adjustment is currently performed using the CMS–hierarchical condition categories (HCC) model originally developed for MA, and includes certain demographic characteristics, case-mix, and disease severity (CMS, 2014c, n.d.-d; MedPAC, 2015a). The benchmark reflects the expected per-beneficiary costs for the performance period.

At the end of each performance period, CMS compares MSSP ACOs' actual spending to the calculated benchmark. As of January 1, 2015, 404 ACOs covering 7.92 million Medicare beneficiaries in 49 states; Washington, DC; and Puerto Rico entered into a Shared Savings Program agreement with CMS (CMS, 2015d).

Physician Value-Based Modifier

The Physician Value-Based Modifier is a budget-neutral pay-for-performance program required by the ACA and established by CMS beginning in 2015. Under this program, physicians can receive incentive payments for high-quality, efficient care and penalties for poor performance (CMS, n.d.-c).

CMS divides eligible physicians into two categories based on whether they meet minimum reporting requirements using the Physician Quality Reporting System (Category 1) or not (Category 2). In general, physicians in Category 1 are subject to value modifier payment adjustments based on the quality and cost of the care they provided during the performance period, while those in Category 2 are subject to a value modifier payment set at a fixed downward adjustment (CMS, 2015b, n.d.-c). Quality measures are adjusted for patient demographics (age and sex), and cost measures are adjusted for patient demographics (e.g., age, sex, original reason for Medicare entitlement, disability status, Medicaid enrollment) and clinical comorbidities (CMS, n.d.-c). The program is budget neutral; total upward adjustments for Category 1 must equal total downward adjustments for Categories 1 and 2 combined (CMS, 2015b). In other words, funds from the worst performing physician groups are redistributed to the best performing groups.

End-Stage Renal Disease Quality Improvement Program

The End-Stage Renal Disease Quality Improvement Program is authorized under the Medicare Improvements for Patients and Providers Act (MIPPA), which requires CMS to reduce payments to outpatient dialysis facilities treating patients with ESRD based on quality of care (CMS, 2015c). Beginning in 2012, CMS reduced the bundled payment rate to ESRD facilities that perform poorly by up to 2 percent. CMS groups its quality measures into two groups: clinical measures, which reflect a facility's clinical performance, and reporting measures, which assess whether facilities have met reporting requirements (CMS, 2015c). CMS then calculates both an achievement score and an improvement score for each clinical measure (except the CDC NHSN Bloodstream Infection in Hemodialysis Outpatients measure, which is given only an achievement score) (CMS, 2014a). Facilities that meet a minimum total performance score will receive full payment, while those that fall under it may receive a reduction between 0.5 percent and 2.0 percent (CMS, 2014a, n.d.-b).

Medicare Value-Based Payment Programs for Health Plans[4]

Medicare Advantage/Part C

As described in the previous section, MA or Medicare Part C is the insurance program that covers the Part A and Part B benefits, typically offers Part D prescription drug coverage, and may offer additional benefits and services at additional cost (MedPAC, 2015b). Compared to traditional, fee-for-service Medicare (i.e., Part A and Part B), MA plans can limit providers, provide supplemental benefits (e.g., additional coverage or reduced cost sharing), and charge a premium for the supplemental benefits (MedPAC, 2015b). In 2015, roughly 30 percent of Medicare beneficiaries were enrolled in MA plans (MedPAC, 2015b). Medicare pays private insurance companies to run the insurance programs. In 2014, these payments totaled $159 billion. Plans with higher-quality ratings have bonus payments added to their benchmark through the Medicare Five-Star Rating System. Payments are also risk adjusted for patient characteristics (MedPAC, 2015b).

Medicare Part D

Medicare Part D is a reimbursement program for pharmaceutical drugs. In 2013, 35.7 million Americans were enrolled in Medicare Part D, and in FY 2014, expenditures totaled $73.3 billion (HHS, 2014a). Although CMS administers Part D, the individual plans are run by Medicare-approved private insurance plans that submit annual bids to CMS to cover expected benefit and administrative costs (MedPAC, 2015d). These plans are paid through several mechanisms. CMS pays plans direct subsidies, which take the form of a monthly prospective payment and cover approximately 75 percent of an enrollee's premium (MedPAC, 2015d). CMS then subtracts the cost of an enrollee's premium (calculated as the difference between a plan's bid for basic benefits and the national average bid) from the risk-adjusted payment to calculate the final direct subsidy payment. For low-income enrollees, Medicare pays plans an additional low-income subsidy to cover most of the cost sharing and premiums (i.e., costs above the direct subsidy otherwise paid for by the enrollee out of pocket) (MedPAC, 2015d). Medicare also pays

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[4] The committee included Medicare Part C and Part D, because the study sponsor, the Office of the Assistant Secretary for Planning and Evaluation of the Department of Health and Human Services, included them as relevant payment models in its presentation to the committee at the first meeting (Epstein, 2015), and thus the program is of interest to them. Additionally, the committee considers Part C and Part D to have important design features through which quality and cost performance affect payment and market share. As described in more detail below, Part C and Part D are both risk-sharing models of payment, which necessitates consideration of risk adjustment for the capitation amount or global spending target, and also include other value-based payment mechanisms, such as bonus payments (Part C) and risk corridors (Part D).

plans through two risk-sharing mechanisms: individual reinsurance and risk corridor adjustments.

Medicare Value-Based Payment Programs for Post-Acute Care

Skilled Nursing Facility Value-Based Purchasing

The IMPACT Act requires CMS to implement a quality-reporting program for Skilled Nursing Facilities (SNFs) and the Protecting Access to Medicare Act of 2014 authorizes an SNF incentive program (CMS, 2015j). Beginning 2018 and in accordance with the IMPACT Act, SNFs will be required to report quality data on three quality domains to CMS or face a payment reduction of 2 percent (CMS, 2015j).

Home Health Value-Based Purchasing

CMS proposed a Home Health Value-Based Purchasing model and included program details in the CY [calendar year] 2016 Home Health Prospective Payment Final Rule (HHS, 2015). Under this program, home health agencies would be subject to upward or downward payment adjustments based on quality measured over 5 performance years. Proposed maximum adjustments would increase incrementally from 5 percent in 2018 and 2019 to 6 percent in 2020 and 8 percent in 2021 and 2022 (HHS, 2015). In its proposal, CMS identified possible quality measures covering clinical processes, clinical outcomes, patient safety, patient and caregiver experience, population/community health, and efficiency and cost reduction for use in the program. Additionally, CMS sought public comment on constructing the initial set of quality measures for the program (HHS, 2015).

Future Directions for Medicare Value-Based Payment

Value-based payment is a key goal of the Department of Health and Human Services (HHS) and is likely to be taken up more widely in the future. In 2015, Secretary of HHS Sylvia Burwell announced three primary strategies by which HHS aims to achieve VBP goals (Burwell, 2015). These strategies build on the initiatives described throughout this section as well as a number of demonstration and pilot programs, and include using financial incentives, implementing delivery system and organizational reforms that promote better care coordination across providers and settings, and improving the information available to both providers and patients to help them make informed decisions (Burwell, 2015). Whether VBP and these strategies are successful at improving quality and patient experiences and reducing costs in the long run remains to be seen. However, based on early results, policy makers, health care researchers, advocates, and other stakeholders have begun to raise concerns about potential unintended consequences VBP may have on health disparities.

POTENTIAL UNINTENDED CONSEQUENCES OF VALUE-BASED PAYMENT ON VULNERABLE POPULATIONS AND HEALTH DISPARITIES

Impact of Value-Based Payment on Providers Serving Vulnerable Populations

A wide range of stakeholders representing government, academia, providers, advocates, and others have raised concerns that some of Medicare's VBP programs, especially the HRRP, may be disproportionately penalizing hospitals serving the most vulnerable patients. This concern is grounded in part in an understanding of health outcomes as emerging from the interaction between patients and the health care system rather than being properties of either in isolation. When outcomes depend on both provider and consumer, provider inputs may differ according to consumer needs, with implications for provider reimbursement. In other words, resources required to care for patients may differ depending on the patient's life circumstances, symptoms, needs, and abilities to interact with the health care system, and whether a health system's processes and programs support these patient differences (Batalden et al., 2015; Loeffler et al., 2013). Because providers serving vulnerable populations are likely to have fewer resources to begin with (e.g., lower operating margins, fewer board-certified physicians) and because more vulnerable and complex patients may require more resources to achieve certain health outcomes, providers serving these patients may be more likely to fare poorly on quality rankings and receive financial penalties and less likely to receive incentive payments (Chien et al., 2007; Joynt and Rosenthal, 2012; Ryan, 2013).

Several studies have shown that larger hospitals, teaching hospitals, and safety-net hospitals, which traditionally serve more disadvantaged patients, are more likely to rank poorly on quality measures and therefore are more likely to be penalized under Medicare VBP programs (Berenson and Shih, 2012; Gilman et al., 2014, 2015; Joynt and Jha, 2013; Rajaram et al., 2015). An analysis by the Medicare Payment Advisory Commission (MedPAC) found that not only were hospitals serving the most low-income patients more likely to be penalized under the HRRP, but also their average penalty was double that of those serving the fewest low-income patients (MedPAC, 2013). Studies have also shown that hospitals serving more racial and ethnic minorities and those in metropolitan areas may be more likely to be penalized under Medicare VBP reforms (Shih et al., 2015; Williams et al., 2014). Other studies have found that these types of hospitals would similarly rank poorly and be more likely to be penalized under potential expansions of Medicare VBP programs to include other conditions (Ly et al., 2010; Sjoding and Cooke, 2014). Likewise, earlier studies found that hospitals serving greater proportions of racial and ethnic minorities were more likely to have low quality rankings, less likely to be eligible for bonus payments, and more likely to be penalized (Karve et al., 2008; Mehta et al., 2008). An analysis of the impact of implementing pay for performance in primary care in Massachusetts found that primary care practices with more vulnerable populations would receive less per practice compared to practices with fewer vulnerable patients (Friedberg et al., 2010).

Studies have also looked at the neighborhoods in which providers are located. Blustein and colleagues (2010) found that neighborhood resources (poverty, unemployment, health care provider shortages, and low educational achievement) were associated with hospital performance on health care process measures proposed for Medicare's Hospital Value-Based Purchasing Program. Specifically, hospitals located in areas with fewer college graduates in the workforce or higher levels of chronic poverty, and those located in counties that were partly or entirely designated health professional shortage areas had significantly worse performance scores for

AMI and HF. Chien and colleagues (2012) found that in the Integrated Healthcare Association's pay for performance program provider organizations located in neighborhoods with higher socioeconomic status (SES) were more likely to have above average performance rankings.

Impact of Value-Based Payment on Health Disparities

That providers serving vulnerable populations may be disproportionately penalized under Medicare's VBP programs has raised concerns that these programs have the potential to increase health disparities (Casalino et al., 2007; Friedberg et al., 2010; Ryan, 2013). If providers serving vulnerable populations are likely to have fewer resources to begin with and providers serving these patients may be more likely to receive financial penalties and less likely to receive incentive payments, as is suggested above, value-based purchasing programs may be taking resources from the organizations who need it most (Chien et al., 2007; Ryan, 2013). In so doing, value-based purchasing would widen the resource gap between providers serving vulnerable populations and those serving patients who are better off (Chien et al., 2007). Moreover, because more vulnerable patients may need more resources to achieve certain health outcomes, widening the resource gap may also lead to widening health disparities (Bhalla and Kalkut, 2010; Ryan, 2013). Two studies of the Medicare Premier Hospital Quality Incentive Demonstration found no evidence that pay-for- performance widened racial disparities in performance (clinical processes or outcomes) (Epstein et al., 2014), nor did incentives widen disparities between hospitals serving more poor patients compared to those serving fewer poor patients (Jha et al., 2010). However, because hospital participation in the demonstration program was voluntary, effects may not be generalizable.

Improving Value-Based Payment to Address Unintended Consequences

While the impact of value-based purchasing strategies on providers serving vulnerable populations and on health disparities continues to be monitored both under Medicare and more widely, and because more VBP programs are being implemented and existing programs are expanding, some methods have been proposed to improve these payment programs to address the potential unintended consequences on vulnerable populations and disparities. Chief among methods proposed to improve VBP to address these unintended consequences is accounting for differences in patient characteristics when measuring quality and calculating payments, sometimes referred to as *risk adjustment* or *payment adjustment*. Most emerging VBP strategies recognize that differences in patient characteristics may impact health care outcomes and costs independently of variations in the provision of care, and that these must be accounted for when measuring quality and calculating payments (Rosenthal, 2008). Currently, and as detailed in the Medicare payment program descriptions earlier in the chapter in Table 1-1 and in Appendix A, patient characteristics included in these adjustments typically include only certain demographic and clinical characteristics (e.g., age, sex, and clinical comorbidities). If patient characteristics beyond demographic and clinical information contribute to differences in underlying risk that cause differences in health care outcomes and costs, certain policy makers, researchers, health care providers, and other stakeholders have proposed that these other characteristics should also be accounted for when measuring quality and calculating payments (Boozary et al., 2015; Feemster and Au, 2014; Fiscella et al., 2014; Girotti et al., 2014a; Jha and Zaslavsky, 2014; Joynt and Jha, 2013; Lipstein and Dunagan, 2014). Specific characteristics proposed for inclusion when calculating payments include SES and other social determinants of health (e.g., race or ethnicity, health literacy, and English language proficiency).

Accounting for Social Risk Factors in Value-Based Payment

The primary method proposed to account for social risk factors in value-based payment has been to include them in risk adjustment of performance measures used as the basis for payment. To that end, it is important to separate two different methods—risk adjustment and payment adjustment. Risk adjustment primarily aims to improve measurement accuracy, such as for the purposes of quality assessment and public reporting, but becomes a method of payment adjustment when measures that are risk adjusted are used as the basis for payment. In other words, risk adjustment can include social factors for the purposes of measurement accuracy without affecting payment. Similarly, payment adjustment can be done by basing payment on measures that are risk adjusted or through other methods, such as directly funding programs to improve the quality of care for disadvantaged patients (Berenson and Shih, 2012). However, because recent discussions about including SES and other social determinants of health in risk adjustment occurs in the latter context of value-based purchasing, these two issues have been conflated, proposed adjustments have implications for health equity and fairness of provider reimbursement, and the proposal has controversial.

Critics of including social factors in risk adjustment argue that what may appear as differences by social groups may be genuinely attributed to quality differences and not the social factors themselves. In this case adjusting for the social factor would obscure genuine disparities and make it more difficult to hold those providing lower-quality care accountable (Jha and Zaslavsky, 2014; Kertesz, 2014; Krumholz and Bernheim, 2014; O'Kane, 2015). They further argue that so doing implicitly accepts a lower standard for vulnerable patients (Bernheim, 2014; Jha and Zaslavsky, 2014). This would not only enable lower quality care for disadvantaged persons, but would also reduce incentives for improvement (Bernheim, 2014; Kertesz, 2014). Additionally, critics note that social factors account for very little variance in performance measurement, so including social factors in risk adjustment models would not substantially change quality rankings (Bernheim, 2014; Krumholz and Bernheim, 2014). Finally, they suggest that other ways of accounting for social factors such as directly funding programs for vulnerable patients, providing incentives based on improvement and not achievement, adjusting payment rather than performance measurement, and phasing in penalties to disadvantaged providers more slowly may be more appropriate (Bernheim, 2014).

Proponents argue that certain social factors lie outside the control of providers and thus hospitals should not be accountable for them (Jha and Zaslavsky, 2014; Joynt and Jha, 2013; Pollack, 2013; Renacci, 2014). In this way of thinking, social factors are confounders masking true performance, and adjusting for them provides more accurate measurement (Fiscella et al., 2014; Jha and Zaslavsky, 2014). If this is the case, risk adjusting for social factors would ensure that hospitals are being fairly assessed and that providers caring for more disadvantaged patients are not punished precisely for caring for these patients (Girotti et al., 2014b). Indeed, if serving disadvantage patients results in disproportionate penalties, this may disincentivize providers from caring for them (Joynt and Jha, 2013). Others also raise concerns that because disproportionate penalties will further reduce the already limited resources of providers serving greater shares of disadvantaged patients with even fewer financial resources, quality in these providers will likely worsen (Grealy, 2014; Ryan, 2013), and the organizations could potentially fail, leaving fewer providers to care for disadvantaged patients (Lipstein and Dunagan, 2014). In both cases, this would widen disparities.

Operating under the assumption that social factors do impact health care quality and efficiency outcomes independently of variations in the provision of health care, a small number of analyses have included SES and other social determinants of health in risk adjustment of provider performance profiles to estimate the effect of including social factors in measuring quality, but findings have been mixed. Three studies found that including these social determinants had no impact on risk adjustment models, and thus hospital rankings (Blum et al., 2014; Eapen et al., 2015; Keyhani et al., 2014). One study found that including social determinants had little impact on most providers' quality scores, but a substantial impact on a few (Zaslavsky and Epstein, 2005). Five studies found that including SESand other social determinants substantially altered provider quality rankings (Fiscella and Franks, 1999, 2001; Franks and Fiscella, 2002; Maney et al., 2007; Nagasako et al., 2014). One study found that including patient characteristics in adjusting payments rather than quality measures would reduce payment disparities (Damberg et al., 2015). Similarly, several studies have found that inclusion of SES in predictive models improves the models' predictive ability (Amarasingham et al., 2010; Fleming et al., 2014; Han et al., 2012; Kansagara et al., 2011).

Previous Recommendations for Accounting for Social Risk Factors in Medicare Payment Programs

In light of this debate, two expert panels have previously examined whether to include social risk factors in risk adjustment for Medicare payment models and offered recommendations. In its June 2013 *Report to the Congress*, MedPAC recommended that CMS use two methods of adjustment, one for public reporting (i.e., quality measurement) and another for financial incentives. Readmissions rates for public reporting would remain unadjusted for socioeconomic disparities so as not to mask potential disparities in quality of care. However, when calculating penalties, hospitals would be compared not to all other hospitals as is currently done, but to hospitals with a similar patient mix (MedPAC, 2013). Their methodology would not only reduce the number of penalties to hospitals serving the most poor, but also the size of the penalty.

The National Quality Forum (NQF) is a nonprofit, membership-based organization that endorses standards for performance measurement. In 2013, NQF convened an expert panel, including representatives of health care providers, advocacy groups, government, industry, and academia to make recommendations about including SES and other social factors in risk adjustment for performance measures. In 2014, the panel released a technical report reversing NQF's previous position to exclude "sociodemographic factors"[5] in risk adjustment of performance measures used in "accountability applications" (i.e., as a basis of payment or public reporting). The panel recommended that sociodemographic factors should be included in risk adjustment if there is a conceptual relationship between a given factor and specific quality metrics as well as empirical evidence of that association (NQF, 2014). It also mentioned that the performance metric should specify risk adjustment methods to include the factor (NQF, 2014). Congress has also taken up the issue. Two bills proposed that CMS risk adjust readmissions

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[5] Socioeconomic factors are defined as "a variety of socioeconomic (e.g., income, education, occupation) and demographic factors (e.g., race, ethnicity, primary language)" (NQF, 2014).

measures used in the HRRP for patient SES and other related measures.[6,7] Additionally, while authorizing the establishment of several VBP programs in Medicare, the IMPACT Act also required the Secretary of HHS submit a report to Congress by October 2016 that assesses the impact of SES on quality and resource use in Medicare using measures such as poverty and rurality from existing Medicare data. The IMPACT Act also required a report to Congress by October 2019 on the impact of SES on quality and resource use in Medicare using measures (e.g., education and health literacy) from other data sources. It also required qualitative analysis of potential SES data sources and secretarial recommendations on obtaining access to necessary data on SES and accounting for SES in determining payment adjustments (Epstein, 2015).

STATEMENT OF TASK

As input to the analyses to be included in the 2016 and 2019 reports to Congress, HHS, acting through the Office of the Assistant Secretary for Planning and Evaluation, asked the Institute of Medicine (IOM) to convene an ad hoc committee to provide a definition of SES for the purposes of application to Medicare quality measurement and payment programs; to identify the social factors that have been shown to impact health outcomes of Medicare beneficiaries; and to specify criteria that could be used in determining which social factors should be accounted for in Medicare quality measurement and payment programs. Furthermore, the committee will identify methods that could be used in the application of these social factors to quality measurement and/or payment methodologies. Finally, the committee will recommend existing or new sources of data and/or strategies for data collection. The committee's work will be conducted in phases and produce five brief reports. Details of the statement of task and the sequence of reports can be found in Box 1-1. In this first report, the committee will focus on the definition of SES and other social factors relevant to the health outcomes of Medicare beneficiaries. Reports will be released every 3 months, addressing each item in the statement of task in turn. It is important to note that the committee has been tasked with providing recommendations only in the fourth report.

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[6] Establishing Beneficiary Equity in the Hospital Readmission Program Act. H.R. 4188. 113th Congress (2014).
[7] Hospital Readmissions Program Accuracy and Accountability Act of 2014. S. 2501. 113th Congress (2014).

BOX 1-1
Statement of Task

An ad hoc committee will provide a definition of socioeconomic status (SES) for the purposes of application to Medicare quality measurement and payment programs; to identify the social factors that have been shown to impact health outcomes of Medicare beneficiaries; and to specify criteria that could be used in determining which social factors should be accounted for in Medicare quality measurement and payment programs. Further, the committee will identify methods that could be used in the application of these social factors to quality measurement and/or payment methodologies. Finally, the committee will recommend existing or new sources of data and/or strategies for data collection. The committee's work will be conducted in phases and produce five brief reports, which build upon the IOM's previous studies relevant to this study.

The first report will:

- Define socioeconomic status for the purpose of application to quality, resource use, or other measures used for Medicare payment programs.
- Identify SES factors and other social factors (such as race, health literacy, limited English proficiency) that have been shown to impact health outcomes of Medicare beneficiaries.

The second report will:

- Identify best practices of high-performing hospitals, health plans, and other providers that serve disproportionately higher shares of socioeconomically disadvantaged populations and compare those best practices to practices of low-performing providers serving similar patient populations.

The third report will:

- Specify criteria (along with their strengths and weaknesses) that could potentially be used to determine whether an SES factor or other social factor should be accounted for in Medicare quality, resource use, or other measures used in Medicare payment programs.
- Identify SES factors or other social factors that could be incorporated into quality, resource use, or other measures used in Medicare payment programs.
- Identify methods that could be used in the application of SES factors and other social factors to quality, resource use, or other measures used in Medicare payment programs.

The fourth report will:

- For each of the SES factors or other social factors described above, recommend existing or new sources of data on these factors and/or strategies for data collection, while also identifying challenges to obtaining appropriate data and strategies for overcoming these challenges.

In the fifth report:

- The committee will synthesize and interpret the 4 brief reports issued as described above into one report that will include comprehensive project findings, conclusion, and recommendations based on the 4 previous reports.

Interpreting the Statement of Task

The statement of task for this report includes several key words that drove the committee's work. The statement of task refers to identifying "SES factors" that "have been shown" to "impact" "health outcomes" of "Medicare beneficiaries." This project is intended to provide very practical and targeted input to HHS and Congress as they consider whether to adjust Medicare payment programs for social risk factors. This project builds on decades of research assessing the social determinants of health; it does not reinvent or redefine that field of scholarship. The committee is narrowly focused on how social risk factors affect health care use and outcomes of a specific group of people—Medicare beneficiaries—in response to encounters with the health care system, not how social factors affect health status generally.

As will be defined in Chapter 2, the committee identified five social risk factors that are conceptually likely to be of importance to health outcomes of Medicare beneficiaries: socioeconomic position; race, ethnicity, and cultural context; gender; social relationships; and residential and community context. Although an independent risk factor and not a social factor, the committee included health literacy as another important factor, because it is specifically mentioned in the IMPACT Act and thus is of interest to Congress, and because it is affected by social factors. Additionally, although the statement of task specifies only examining the impact of these social risk factors on "health outcomes," it also specifies that the social risk factors should be targeted "for the purpose of application to quality, resource use, or other measures used for Medicare payment programs." Thus, given the importance that Medicare VBP programs has placed on this broader set of measures and given that Medicare applies these measures when calculating payments, the committee interpreted "health outcomes" as encompassing measures of health care use, health care outcomes, and resource use. Hence, the committee included two domains of health care use measures (health care utilization and clinical processes of care) and one measure of resource use (costs) in the literature search. In addition to health (clinical care) outcomes, the committee also included related outcomes of patient experience and patient safety.

Figure 1-1 illustrates the committee's conceptual framework. The framework illustrates the primary hypothesized relationships by which social risk factors may directly or indirectly affect health care use, health care outcomes, and resource use outcomes among Medicare beneficiaries. In the figure, dotted arrows represent feedback mechanisms and bold lettering highlights social risk factors plus health literacy and the domains included in the expanded definition of "health outcomes" that are at issue in this report. The framework is not intended to illustrate the entire universe of potential causes and risks.

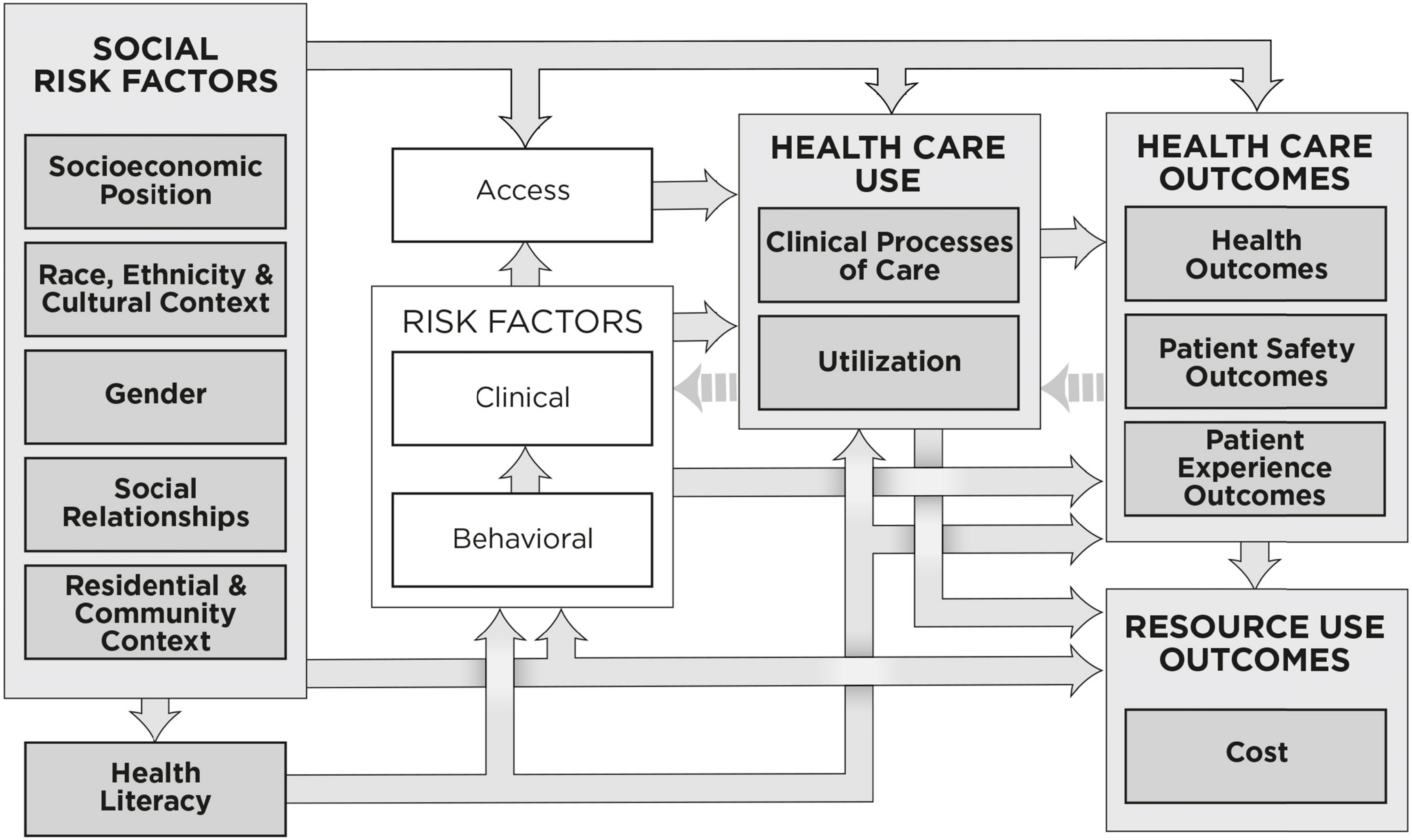

FIGURE 1-1 Conceptual framework of social risk factors for health care use, outcomes, and cost.
NOTE: This conceptual framework illustrates primary hypothesized conceptual relationships.

The conceptual framework applies to all Medicare beneficiaries, including disabled beneficiaries and beneficiaries with ESRD, because although the committee acknowledges that the Medicare population is heterogeneous (even among beneficiaries age 65 and older), the committee expects the effect of social risk factors to be similar for all Medicare subpopulations (beneficiaries with disabilities, those with ESRD, and older adults). Any variation in the effect of social risk factors among disabled Medicare beneficiaries under age 65, Medicare beneficiaries age 65 and older, and beneficiaries with ESRD is considered to fall within a continuous spectrum of effects. The committee will revisit this assumption in subsequent reports. It is important to note that disabled Medicare beneficiaries are systematically different from persons with disabilities more generally, because in order to be eligible for federal disability benefits, a person must be unable to work, have a low income, and meet certain medical criteria (SSA, n.d.). As such, they are by definition a more socially vulnerable group for which social risk factors may be particularly salient, similar to older adults. Finally, Medicare coverage and the quality measures used to asses health care and health outcomes do not differ for Medicare beneficiaries by origin of entitlement (i.e., whether an individual qualified because of disability, age, or ESRD), except for certain measures of ESRD care and outcomes, and thus the health outcomes in the framework are also equally applicable.

Current Medicare quality measures fall within each of the domains embraced by the committee in the expanded definition of "health outcomes"—health care use, health care outcomes, and resource use outcomes. The committee expects that quality measures will change over time, but developed a framework that will remain stable regardless of the specific measures used to assess the theoretical constructs. Thus, it is important to note that what Medicare currently considers a quality "outcome" may not necessarily align with the committee's definition of a health care outcome. For example, Medicare and health care quality experts frequently consider readmissions to be an outcome of care. However, in the committee's conceptual framework, readmissions are more theoretically consonant as a measure of utilization that is given a quality interpretation. Table 1-2 contains examples of Medicare quality measures currently in use in each of the health care use and outcome domains.

TABLE 1-2 Health Care Use and Outcome Domains and Example Medicare Quality Measures

Health Care Use or Outcome Domain	Example Medicare Quality Measures
Health Care Use	
Clinical Processes of Care	• HbA1c testing for beneficiaries with diabetes • Influenza and pneumonia vaccination • Primary percutaneous coronary intervention received within 90 minutes of hospital arrival for patients with AMI • Blood cultures performed in the emergency department prior to initial antibiotic received in hospital for patients with pneumonia • Anemia management for kidney disease patients
Utilization	• Hospital admissions for COPD exacerbations • Heart failure admissions • 30-day readmissions after hospital discharge for AMI, heart failure, pneumonia, COPD, or total hip arthroplasty/total knee arthroplasty
Outcomes	
Resource Use (costs)	• Medicare spending per beneficiary
Health (Clinical Care)	• Diabetes composite quality indicator (controlled diabetes, short- and long-term diabetes complications, lower-extremity amputation for diabetes) • 30-day mortality after hospital discharge for AMI, heart failure, or pneumonia
Patient Safety	• AHRQ Patient Safety Indicator composite (pressure ulcer, iatrogenic pneumothorax, central venous catheter-related bloodstream infections, postoperative hip fracture, perioperative pulmonary embolism or deep vein thrombosis, postoperative sepsis, postoperative wound dehiscence, accidental puncture or laceration) • Central line-acquired bloodstream infection • Catheter-acquired urinary tract infection • Surgical site infection • Incidence of major falls for post-acute care patients
Patient Experience	• Communication with nurses • Communication with doctors • Getting timely appointments, care, and information • Getting information from Part D drug plan • Helpful, courteous, and respectful office staff • Responsiveness of hospital staff • Care coordination • Pain management • Communication about medications • Cleanliness and quietness • Overall rating of hospital • Overall rating of Medicare Advantage health plan

NOTE: AHRQ = Agency for Healthcare Research and Quality; AMI = acute myocardial infarction; COPD = chronic obstructive pulmonary disease.

COMMITTEE PROCESS AND OVERVIEW OF THIS REPORT

The committee comprises expertise in health disparities, social determinants of health, risk adjustment, Medicare programs, health care quality, clinical medicine, and health services research. Appendix B contains biographical sketches for the committee members. The committee will meet five times over 12 months and issue five brief, consensus reports. The committee met in open, public session at its first meeting to discuss the charge to the committee with the leadership of the Office of the Assistant Secretary for Planning and Evaluation. In the next (and final) chapter of this report, the committee presents the results of a literature search to identify those social risk factors that have been shown to influence health care use, costs, and health care outcomes.

The literature search was conducted by a professional librarian available to committees of the IOM. The committee limited its search to studies on patients in the United States, and to review articles published in the past 20 years and original research published in the past 10 years. The searches included both searches targeting publications relating to Medicare beneficiaries, disabled populations, and patients with ESRD and broader searches not specifically targeting these populations. The literature search focused on social risk factors identified by the committee (as described in Chapter 2) and on health care use and outcomes such as those used in Medicare VBP programs. The relevant literature retrieved is described generally without an assessment of the quality of each individual study and with no attempt at data integration, such as in a meta-analysis. However, research that did not control for covariates and evidence pertaining to pediatric populations were not included. Because the committee expects social risk factors to affect subpopulations similarly, where variations in effect fall within a continuous range of effects, in describing the evidence, the committee did not systematically distinguish between the adult subpopulations to which articles refer. The identification and description of the literature should not be mistaken for a systematic review that uses a formal system for weighing and describing evidence, such as those used in clinical or public health guideline development.

The committee's interpretation of the task for report one was to define SES for the purposes of application to Medicare payment programs and to identify whether there exists literature showing an influence of one or more social risk factors on one or more measures of relevant health care use or outcomes. In its findings, the committee uses the term "influence" to describe an association between a social risk factor and a health care use or outcome measure without implying a causal association. Future work of the committee will address the question of whether a specific social factor could be incorporated into Medicare payment programs, the methods to do so, and data needs to accomplish the task.

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2

Social Risk Factors

CONCEPTUAL FRAMEWORK

As noted in Chapter 1, the committee developed a conceptual framework to guide its approach to the inclusion of social risk factors in Medicare payment programs. The committee agreed to employ the phrase *social risk factors* to broadly characterize a set of constructs that capture the key ways in which social processes and social relationships could influence key health-related outcomes in Medicare beneficiaries. The conceptual model is broadly grounded in many models articulating the social determinants of health, but it is also tailored and made specific to the health-related processes and outcomes that are of interest in understanding and evaluating the performance of the health care system among Medicare beneficiaries.

The five domains of social risk factors are

1. Socioeconomic position (SEP);
2. Race, ethnicity, and cultural context;
3. Gender;
4. Social relationships; and
5. Residential and community context.

The five social risk factors may influence health care and health through a number of potential pathways. These include (1) direct effects of social risk factors on behavioral and clinical disease risk factors (as well as on the prevalence and development of disease), (2) direct effects of social risk factors on access to care and on the process of care, and (3) direct effects of social risk factors on the quality of health care received and on the outcomes of this care. These social risk factors may also directly affect satisfaction with care and adverse health care effects, as well as the cost of care if, for example, additional effort on the part of the health care system is required to achieve a given outcome.

The five social risk factors may also influence health literacy, the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions (NASEM, 2015). Health literacy in turn has an important impact on the patients' interaction with the health care system and may affect access to care and the process of care, which in turn has consequences for quality of care, outcomes of care, satisfaction and patient safety, and cost. Health literacy may also directly affect quality of care, outcomes of care, adverse effects, satisfaction, and cost.

It is important to note that social risk factors may affect the outcomes of interest through many interrelated pathways, some of which may be *indirect* or mediated through clinical or behavioral risk factors, disease prevalence, and behaviors or mediated through access to care and the process of care (e.g., the types of facilities and providers where patients are seen and the processes followed in the health care system). In addition, social risk factors may affect the outcomes of care through *direct* pathways by influencing the outcomes of the care received independently of effects on clinical or behavioral risk factors, access to care, or the process of care (e.g., the effectiveness of a blood pressure control using a certain drug may be modified by the persons social context even if the treatment is high quality and appropriate). Feedback loops may also be present.

DEFINITIONS AND LITERATURE SEARCH

In this section, the committee defines each of these five social risk factor domains, as well as health literacy, and summarizes the results of the literature search linking effects of each domain on health care outcomes and quality measures. Within each factor, results of review articles are discussed first, followed by results from individual studies. Individual studies are organized by outcome domain (e.g., health care use), subdomain (e.g., clinical processes of care), and measure (e.g., receipt of recommended care).

Socioeconomic Position

Socioeconomic position (SEP) is an indicator of an individual's absolute and relative position in a society's stratification system. SEP captures a combination of access to material and social resources as well as relative status, meaning prestige- or rank-related characteristics (Krieger et al., 1997). To that end, the committee employs the term *socioeconomic position*, rather than the more commonly used phrase *socioeconomic status*, because *socioeconomic status* blurs distinctions between the two different aspects of SEP (actual resources and status), and privileges status over the material and social resources (Krieger et al., 1997; Lynch and Kaplan, 2000).

SEP is commonly measured through indicators such as income and wealth (with wealth being of special relevance for older individuals and disabled persons out of the paid workforce), education, and occupation (including occupational history and employment status) (Braveman et al., 2005; Krieger et al., 1997; Lynch and Kaplan, 2000). SEP over the life course is a powerful predictor of many health-related processes and outcomes and is often related to outcomes in a dose–response manner (Adler et al., 1994; Krieger et al., 1997; Lynch and Kaplan, 2000). In the medical field, insurance status (whether an individual has insurance and insurance type) is also used as a proxy for SEP—for example, dual Medicare–Medicaid eligibility among the Medicare population is often used as a proxy for low income. However, insurance status is generally a very imperfect proxy, because it does not capture the continuum of SEP, may capture dimensions of health status unmeasured by other data sources, and because it represents insurance status itself, which is distinct from SEP.

Several review articles examined the influence of SEP on health care use and health care outcomes, but each found only a small number of studies. Two reviews examined the effect of

SEP on readmissions, one of which found no association between education and readmissions after acute myocardial infarction (AMI) and insufficient but suggestive evidence that income negatively affects readmissions (Damiani et al., 2015). By contrast, the other study found substantial inconsistencies about which patient characteristics, including indicators of SEP and other measures, were predictive of readmissions for heart failure and no patterns emerged (Ross et al., 2008). Three articles examined the effect of SEP on outcomes after surgery. A review of socioeconomic factors and kidney transplant outcomes reported that higher educational attainment, higher income, and being employed are associated with better outcomes after kidney transplantation (Hod and Goldfarb-Rumyantzev, 2014). A review of patient characteristics and outcome after hip replacement surgery (Young et al., 1998) reported that education and employment were likely to influence outcomes, although the review was limited by few studies with inconsistent findings. A review examining patient factors and outcomes after orthopedic surgery involving implantable devices found only one study examining SEP and outcomes, and this study found that only individual income was associated with better outcomes (Waheeb et al., 2015).

Income

Individual income is strongly associated with morbidity and mortality (Ecob and Smith, 1999). Moreover, this relationship is graded such that increases in income are associated with increases in health status even above a threshold of material deprivation (Adler et al., 1994). Income can affect health outcomes directly as a means of purchasing health care and indirectly as a means of acquiring health promoting resources, such as better education, housing, and nutrition (Adler and Newman, 2002). Relative income may also affect health through psychosocial mechanisms (Marmot and Wilkinson, 2001). Wealth can affect health in similar ways, although it is less frequently studied (Braveman et al., 2005). Wealth can also provide economic resources during periods of low income, and as such may be more relevant for older adults and persons with disabilities who are out of the paid labor force (Braveman et al., 2005). A number of articles examined the independent effect of individual-level income (typically measured by annual household income) on health care use, health care outcomes, and costs. Most studies examined utilization and clinical processes of care.

In terms of utilization, studies examined the influence of income on readmissions and hospitalizations. With regard to readmissions, one study found a significant income gradient in which lower income was associated with increased readmissions (Philbin et al., 2001), while others reported that low income was not significantly associated with readmission within 30 days (Maniar et al., 2014; Moore et al., 2013), 60 days (Arbaje et al., 2008), or 1 year (Bernheim et al., 2007). With regard to other types of hospitalizations, one study found that lower income was associated with significantly greater preventable hospitalizations for ambulatory care–sensitive conditions (Blustein et al., 1998), one study found that low income was significantly associated with chronic obstructive pulmonary disease (COPD) exacerbations requiring hospitalization or an emergency department (ED) visit (Eisner et al., 2011), and one study examining hospital admissions (including readmissions) found no association with income (Sattler et al., 2015). In terms of clinical processes of care, one study found that patients with the highest incomes had significantly higher overall quality scores, and when examined by type of care, wealthier patients had significantly higher scores for preventive care and screenings compared to those with the lowest income (Asch et al., 2006). Another study found that low-income patients were significantly less likely to get recommended rheumatoid arthritis therapy (Yazdany et al., 2014).

One study examining medication adherence found that low income was associated with poorer adherence related to cost (Billimek and August, 2014).

Fewer articles examined health care outcomes, including health outcomes and patient experiences. No studies examining the effect of income on inpatient safety were identified. In terms of health outcomes, one study reported a significant income gradient where functional health outcomes increased with higher income (Bierman et al., 2001), one study found that low income was not associated with 1-year mortality after AMI (Bernheim et al., 2007) and another study found no significant differences in health outcomes after lower-limb revascularization by income (Durham et al., 2010). In terms of patient experience, one study found that excellent ratings of care were significantly lower among colorectal cancer patients, but not among lung cancer patients, and also reported no differences in experiences of interpersonal care by income (Ayanian et al., 2010). Another study found that income was not significantly associated with perceived care coordination or patient satisfaction among breast cancer patients (Hawley et al., 2010). Two studies found that low income was associated with significantly higher costs from lower-limb revascularization (Durham et al., 2010) and from cardiovascular disease (Shaw et al, 2008).

Insurance

Although numerous studies have examined the impact of insurance coverage on health outcomes (e.g., IOM, 2009), this literature search restricted studies to those examining insurance as a proxy for income. As with income and education, most articles on insurance as a proxy for income assessed health care utilization, of which most also focused on hospital readmissions. Three articles found that patients on Medicaid (as a proxy for low income) had significantly higher odds of readmissions (Aujesky et al., 2009; Jiang et al., 2003; Oronce et al., 2015), while one found that among low-income elderly adults (those with incomes under 200 percent of the federal poverty level), not having Medicaid coverage was significantly associated with increased early readmissions (Iloabuchi et al., 2014). One study found that Medicare beneficiaries in need of food assistance with managed care were more likely to be readmitted compared to those without managed care, but that there was no association among Part D coverage, Medicare–Medicaid dual eligibility status, and other subsidies and readmissions (Sattler et al., 2015).

One study reported a significant interaction between Medicaid coverage and comorbidities, such that Medicaid recipients with a low level of comorbidities had increased risk of 1-year readmissions compared to non-Medicaid recipients with a low level of comorbidities (Foraker et al., 2011). One study reported no significant differences in time to readmission or death by insurance status among patients with left ventricular assist devices (Smith et al., 2014), and one study reported no association between Medicaid coverage or uninsured status and 30-day readmissions for community-acquired pneumonia (Jasti et al., 2008). One article looked at treatment differences and found that Medicaid patients with myocardial infarction were significantly less likely to receive revascularizations regardless of the availability of the service in their neighborhood, but if available, revascularization rates were slightly higher among Medicaid patients (Fang and Alderman, 2003).

Several articles looked at other utilization measures, and one that found that Medicaid patients had significantly longer lengths of stay for incident heart failure compared to non-Medicaid patients (Foraker et al., 2014). One found no association between public insurance (excluding Medicare) and avoidable hospitalizations among patients with lupus (Ward, 2008), and one that found that among Medicare beneficiaries, Medicare–Medicaid dual eligible beneficiaries were less likely to have a follow-up visit and more likely to have either an ED visit or a readmission after hospital discharge compared to those without Medicaid coverage (DeLia et al., 2014). One study reported no association between Medicaid or other state insurance coverage and perceptions of care coordination or patient satisfaction among breast cancer patients (Hawley et al., 2010). The committee made the following findings:

- The committee identified literature indicating that income may influence health care utilization, clinical processes of care, costs, health outcomes, and patient experience.
- The committee identified literature indicating that when measured by a proxy of insurance status, income may influence health care utilization, clinical processes of care, and patient experience.

Education

Education is important for health, because it shapes future economic resources, including income and occupation (Adler and Newman, 2002; IOM, 2014a). Education level has been shown to have a strong relationship with health behaviors, health status, morbidity, and mortality—in particular, life expectancy (IOM, 2014a). Literature on the independent effects of education on health care utilization, health care outcomes, and costs typically measures education using categories of educational attainment (e.g., years of schooling or credentials achieved). As with the literature on income, most of the literature on education and health care focuses on utilization outcomes.

Several studies examined the influence of education on readmissions, among which two found that low education was associated with increased readmissions (Arbaje et al., 2008; Jasti et al., 2008), one found that higher education was associated with decreased readmissions (Maniar et al., 2014), and three found that low education was not associated with readmissions (Bernheim et al., 2007; Iloabuchi et al., 2014; Sattler et al., 2015). One study found that education was not significantly associated with preventable hospitalizations for ambulatory care–sensitive conditions (Blustein et al., 1998) and one found that low education was associated with significantly increased COPD exacerbations requiring hospitalization or an ED visit (Eisner et al., 2011). With regard to health outcomes, one study found that high education was associated with better glycemic control among diabetes patients (Maney et al., 2007) and one found a strong, consistent, and significant gradient where functional health outcomes improved with increasing educational attainment (Bierman et al., 2001). Finally, several articles examined patient experience, among which one found no difference in the likelihood of excellent ratings of care or in experiences with interpersonal care by education among lung and colorectal cancer patients (Ayanian et al., 2010), one reported that low education was significantly associated with better experiences reported through Consumer Assessment of Healthcare Providers and Systems (CAHPS) (O'Malley et al., 2005), and one found a significant inverse gradient between education and ratings of care coordination among breast cancer patients (Hawley et al., 2010). The committee made the following finding:

- The committee identified literature indicating that education may influence health care utilization, health outcomes, and patient experience.

Occupation

Occupation covers both employment status (i.e., whether or not and to what degree an individual participates in the paid labor force) as well as the type of occupation among the employed (Adler and Newman, 2002). Occupation can affect health by exposing workers to hazardous health exposures as well as through psychosocial risks related to job strain, lack of control, and increased stress (Kasl and Jones, 2000; Theorell, 2000). Among Medicare beneficiaries, relatively fewer of whom remain in the work force, employment status may be more salient than occupational type. While a large literature has demonstrated the negative health effects of unemployment, job insecurity, and flexible employment on unhealthy behaviors, morbidity (including physical and mental health), and mortality (IOM, 2014a), fewer studies were identified that examined the influence of employment on health care utilization and outcomes. One article found that unemployment significantly increased odds of 30-day readmissions among patients hospitalized with community-acquired pneumonia (Jasti et al., 2008). One article reported that being retired was significantly associated with variations in glycemic control among diabetes patients across medical centers, but it did not specify the direction of the association (Maney et al., 2007). One article found that unemployment was associated with lower orthopedic outpatient satisfaction, but this association was no longer significant after adjustment (Abtahi et al., 2015). The committee made the following finding:

- The committee identified literature indicating that occupation may influence health care utilization, health outcomes, and patient experience.

Other Measures of SEP

Given the challenge of measuring income, a small number of studies examined access to economic resources through other types of measures. For example, two studies examined the effect of food sufficiency as a proxy. One found that being worried about food sufficiency was significantly associated in variations in glycemic control among diabetes patients across medical centers, but it did not specify the direction of the association (Maney et al., 2007), while the other reported that food insecurity was not associated with hospital admissions among Medicare beneficiaries in need of food assistance (Sattler et al., 2015). A third study examined the effect of self-reported financial burden among cancer patients and found that it was associated with some but not other measures of patient experience (Chino et al., 2014). Similarly, one study reported that individuals who reported financial barriers to medication were more likely to report poorer self-rated health and have higher hazard for readmissions at 1-year follow-up after AMI (Rahimi et al., 2007).

The committee made the following finding:

- The committee identified no literature indicating that socioeconomic position may influence patient safety outcomes.

Race, Ethnicity, and Community Context

Race and ethnicity are another key social factor. Race and ethnicity are dimensions of a society's stratification system by which resources, risks, and rewards are distributed. As such, racial/ethnic categories capture a range of dimensions relevant to health, especially those related to social disadvantage (IOM, 2014a; Williams, 1997). These dimensions include access to key social institutions and rewards; behavioral norms and other sociocultural factors; inequality and injustice in the distribution of power, status, and material resources; and psychosocial exposures like discrimination (Williams, 1997). In the health care setting, salient psychosocial mechanisms may include both provider discrimination and trust or mistrust between patients and providers (IOM, 2003). It is well established that race and ethnic background is often predictive of health care and health outcomes even after accounting for traditional measures of SEP like income and education (Krieger, 2000; LaVeist, 2005; Williams, 1999; Williams et al., 2010).

A number of factors likely contribute to this "independent" effect of race/ethnicity, including the following:

1. Lack of comparability of a given SEP measure across race/ethnic groups (e.g., income returns to education are well known to vary by race, and income is differentially correlated with wealth by race);
2. Importance of other exposures such as neighborhood environments that are patterned differently by race even among individuals of apparently similar SEP;
3. The importance of race- or ethnic-specific factors such as discrimination and immigration-related factors, including time living in the United States and language proficiency; and
4. Measurement error in SEP.

Although race and ethnicity reflect many different social circumstances, there can also be important heterogeneity in health within race and ethnic groups, driven for example by SEP heterogeneity or heterogeneity in English language proficiency, country of origin, time in the United States, or other cultural dimensions.

Race and Ethnicity

Race and ethnicity are typically identified through self-reported categories. Although race and ethnicity are conceptually distinct and federal standards recommend using separate items for collecting the two (whitehouse.gov, 1995), investigators use different classifications for both collecting and analyzing race and ethnicity. In health services research, Hispanic ethnicity is frequently combined with racial categories, such that the most frequently used "racial" categories are non-Hispanic white, non-Hispanic black, Hispanic, and Asian. This scheme conceals tremendous heterogeneity across Asian groups from different countries, as well as heterogeneity within the Hispanic group with regard to country of origin and racial classifications from other countries that represent different sociopolitical constructs. Given these measurement issues, it can be challenging to compare studies on race and ethnicity. Nevertheless, vast literature shows substantial racial and ethnic health disparities and health care disparities (Escarce and Goodell, 2007; IOM, 2003). Several review articles examined race and ethnicity effects on health care use and health care outcomes. One overarching review of racial and ethnic disparities in access to and quality of health care found that black and Hispanics are much less likely to have had an ambulatory care visit within the year and less likely to receive certain preventive services (e.g., flu shots among the elderly). Of three review articles examining effects of race and ethnicity on readmissions, one reported that non-whites had higher readmission rates for both pneumonia and heart failure (Calvillo-King et al., 2013), one reported that studies suggest race/ethnicity is positively related to readmission in the short term (30 days and 90 days) and suggestive but inconclusive for the longer term (6 months and 1 year) (Damiani et al., 2015), and one found substantial inconsistencies (Ross et al., 2008).

With respect to health care outcomes, three reviews examined surgical outcomes. One found that blacks are more likely to have poor surgical outcomes and Hispanics have comparable or better mortality outcomes compared to whites but inconsistent evidence on other outcomes (Haider et al., 2013). The study also reported comparable or better outcomes among Asians compared with whites, but noted that potential disparities within the heterogeneous Asian population remained unexplored. One review found that black women were more likely to die or suffer an adverse cardiac event after undergoing a percutaneous coronary intervention (Kamble and Boyd, 2008), and found only one study assessing race and postsurgical outcomes, which found no association between race and patient-reported outcomes after orthopedic surgery involving implantable devices (Waheeb et al., 2015).

Two reviews found that blacks were more likely to experience complications (Haider et al., 2013; Kamble and Boyd, 2008). One review examining patient experience outcomes found that the magnitude of racial/ethnic disparities in pain management was small, despite also finding problematic classification and lack of definition of racial and ethnic groups (Ezenwa et al., 2006).

A relatively substantial literature examined effects of race and ethnicity on health care use, health care outcomes, and costs. Much of the literature focuses on health care utilization and processes of care. In terms of utilization, many studies focused on readmissions. Five studies found that race was not associated with readmissions—two for all causes (Iloabuchi et al., 2014; Moore et al., 2013), one for pneumonia (Jasti et al., 2008), one for heart failure (Vaccarino et al., 2002), and one for orthopedic surgery (Hunter et al., 2015). Eleven studies found a significant association between black race and readmissions, among which 10 found that blacks had higher risk of readmission (Aujesky et al., 2009; Girotti et al., 2014; Joynt et al., 2011; Kim et al., 2010; Kroch et al., 2015; McHugh et al., 2010; Oronce et al., 2015; Silber et al., 2015; Tsai et al., 2014; Vivo et al., 2014), while one found that blacks had lower risk of readmission (Spertus et al., 2009). Three studies found that Hispanics had higher risk of readmission compared to whites (Rodriguez et al., 2011; Stahler et al., 2009; Vivo et al., 2014), while one did not (Oronce et al., 2015). One study reported mixed results and interactions between payer and black race or Hispanic ethnicity: Hispanic Medicare patients had significantly higher 30-day readmissions and Hispanics of all payers had significantly higher 180-day readmissions compared to whites. Black Medicare patients had significantly higher 180-day readmissions compared to whites (Jiang et al., 2005). One study reported that Asians did not have significantly different odds of readmission compared to whites (Oronce et al., 2015). One study found that there were no significant differences in readmissions among whites compared to non-whites (Kennedy et al., 2007), while another study found that non-white race was slightly significantly protective against readmissions (Singh et al., 2014). In terms of other utilization outcomes, one study found that blacks had significantly increased all-cause hospitalization over 2.5 year follow up of heart failure patients (Mentz et al., 2013).

A number of studies also examined differences in clinical process of care by race and ethnicity. Among articles investigating receipt of recommended preventive care, one study found no significant differences in the likelihood of having a prostate-specific antigen (PSA) screening in the past year between blacks and whites (Thomas et al., 2010). Three studies found that blacks were less likely to get recommended preventive care (Schneider et al., 2002; Trivedi et al., 2005, 2006), among which one found that racial disparities had decreased over time (Trivedi et al., 2005). One study found a significant interaction between race/ethnicity and comorbidity among Medicare beneficiaries, where lower rates of flu and pneumonia immunization among racial/ethnic minorities decreases relative to white beneficiaries as the burden of comorbidity increases (Orr et al., 2013) One study of socially-assigned race (Macintosh et al., 2013) reported mixed results. Contrasted with self-identified race/ethnicity, socially-assigned race/ethnicity describes the racial/ethnic categories others ascribe to a person through social interactions (Macintosh et al., 2013). The authors found that whites socially-assigned as whites and minorities socially-assigned as whites had significantly higher odds of having flu and pneumonia vaccinations, compared to minorities socially-assigned as minorities, no differences in cancer screening by socially-assigned race. Whites socially-assigned as whites were significantly less likely to receive cancer screenings compared with minorities socially-assigned as minorities (Macintosh et al., 2013). Two studies found that blacks had significantly higher odds of receiving recommended ambulatory care (Asch et al., 2006; Thorpe et al., 2013), among which one also reported that Hispanics also received more recommended care (Asch et al., 2006).

Among articles about clinical processes in the inpatient setting, one article reported that non-white stroke patients had significantly higher rates of inappropriate surgery (carotid endarterectomy) and significantly lower rates of appropriate surgery compared to whites (Halm et al., 2009). Another study found that blacks were significantly less likely to receive laparoscopy for appendicitis compared to whites (Lee et al., 2011a). Three studies found that blacks were significantly less likely to receive invasive cardiac procedures compared to whites (Fang and Alderman, 2003; Popescu et al., 2007; Shen et al., 2007). With regard to differences among Hispanics, one article reported that Hispanics were significantly more likely to receive laparoscopy for appendicitis compared to whites (Lee et al., 2011a), while three found that Hispanics were less likely to undergo invasive cardiac procedures (Fang and Alderman, 2003; Parikh et al., 2009; Shen et al., 2007). One article reported that whites received more recombinant tissue plasminogen activator therapy after stroke compared to blacks and Hispanics, and Asians under age 65 but not age 65 and older (Nasr et al., 2013). One study found no association between race and recommended AMI treatment (Shah et al., 2007), and another found no association between race and colorectal cancer treatment (Zullig et al., 2013). One study of clinical processes in the nursing home setting reported that having a higher proportion of black nursing home residents was protective against restraint use and receipt of antipsychotic medications, although this effect was attenuated for nursing home facilities in counties with a high proportion of black residents (Miller et al., 2006).

Most of the literature on race and ethnicity and health care outcomes examined differences in mortality, while several other studies also looked at functional outcomes and ambulatory care outcomes. As with other areas, much of the literature investigated mortality differences in blacks compared to whites. Several articles found no significant differences between blacks and whites in in-hospital mortality (Khambatta et al., 2013; Silber et al., 2015), 30-day mortality (Silber et al., 2015; Stamou et al., 2012), 1-year mortality (Stamou et al., 2012), and in time from surgery for colorectal cancer to death (Zullig et al., 2013). One article found no association between black race and 2-year mortality after AMI (Spertus et al., 2009) and another found no differences between blacks and whites in 2.5-year follow up after ischemic heart disease treatment (Cromwell et al., 2005), while one found that blacks had significantly increased mortality over 2.5-year follow up of heart failure patients (Mentz et al., 2013). Several studies reported significantly higher odds of in-hospital mortality (Nietert et al., 2005), 30-day mortality (Halm et al., 2009), 6-month mortality (Vaccarino et al., 2002), and 1-year mortality

(Popescu et al., 2007), while others found that blacks had significantly lower odds of in-hospital mortality (LaPar et al., 2011; Shen et al., 2007), 30-day mortality (Barnato et al., 2005; Popescu et al., 2007; Vivo et al., 2014), and 1-year mortality (Barnato et al., 2005; Popescu et al., 2007; Vivo et al., 2014). One article found that white patients but not black patients had significantly lower odds of death at teaching hospitals compared to non-teaching hospitals, suggesting a benefit accrued by whites but not blacks (Silber et al., 2009).

In terms of differences in mortality among Hispanics, several articles found no significant association between Hispanic ethnicity and in-hospital mortality (LaPar et al., 2011; Shen et al., 2007), 30-day mortality (Stamou et al., 2012; Vivo et al., 2014), or 1-year mortality (Parikh et al., 2009; Stamou et al., 2012; Vivo et al., 2014), while two articles found that Hispanics had significantly higher odds of mortality in hospital (Nasr et al., 2013) and at 30 days (Halm et al., 2009). One article found significantly higher rates of 2.5-year mortality among Hispanic patients undergoing medical management for ischemic heart disease compared to whites, but there were no differences by race for patients who underwent revascularization (Cromwell et al., 2005). Three articles reported no association between Asians and mortality in hospital (LaPar et al., 2011; Nasr et al., 2013) or at 30 days or 1 year (Vivo et al., 2014). One article found significantly higher rates of 2.5-year mortality among Asian patients undergoing medical management for ischemic heart disease compared to whites, but no differences by race for patients who underwent revascularization (Cromwell et al., 2005).

A small number of articles examined mortality differences among whites compared to non-whites. Of these, one article reported significantly higher risk of both in-hospital and 30-day mortality among non-whites compared to whites (Rangrass et al., 2014), while another found that non-whites had significantly lower rates of in-hospital death (Zacharia et al., 2010). One article reported no association between whites and non-whites and in-hospital, 30-day, 1-year, or 3-year mortality after AMI among Medicare beneficiaries 65 years or older (Shah et al., 2007), and another reported no significant difference between whites and non-whites in in-hospital mortality (Kennedy et al., 2007).

Studies examining racial and ethnic differences in functional outcomes examined differences after acute care or surgery and among the elderly. In terms of post-acute outcomes, one study reported that blacks, Hispanics, and other non-whites had significantly worse functional outcomes after stroke (Ottenbacher et al., 2008), but another study found no significant differences in functional status at discharge between black and whites after a moderate or severe stroke (Putman et al., 2010). One study reported that non-whites, especially blacks, had worse functional outcomes after primary total joint arthroplasty (hip and knee) (Lavernia et al., 2011). One article reported that after acute illness hospitalization, there were no differences in activities of daily living (ADLs) improvement by discharge and by 90 days between blacks and whites, but blacks were significantly less likely to improve instrumental activities of daily living (IADLs) functioning by discharge and 90 days compared to white patients (Sands et al., 2005).

In terms of functional outcomes among the elderly, one study of home health care patients age 65 and older reported mixed findings, where whites experienced significantly better outcomes compared to patients of other races, and this effect was especially pronounced compared to black patients (Brega et al., 2005). Another study of older Medicare managed care beneficiaries reported that blacks, American Indians/Alaskan Natives, and multiracial individuals had significantly greater ADL impairment compared to whites (Ng et al., 2014). Whites were also significantly more likely to experience positive change in ADLs than African Americans;

differences between whites and Hispanics on change in functional outcomes were not significant. Another study reported no differences in functional decline between blacks and whites among community-dwelling adults age 70 and older, except among those age 80 and older, among whom blacks had significantly lower risk of ADL decline (Moody-Ayers et al., 2005).

With respect to ambulatory care outcomes, two studies found that blacks had worse control of cardiovascular disease risk factors (Rooks et al., 2008; Wendel et al., 2006). Of these, one also found interactions by income, such that there were no differences in hypertension among those with low income, but blacks with higher income had greater odds of hypertension, while the reverse was true for left ventricular hypertrophy (Rooks et al., 2008). The other study examined both cardiovascular disease and type 2 diabetes risk factors and found that both Hispanics and blacks had significantly lower daily insulin doses but no differences in lipid or blood control (Wendel et al., 2006).

Several studies examined the relationship between race and patient experience using CAHPS data. In terms of inpatient care, one study reported that black and Asian lung and colorectal cancer patients and Hispanic colorectal cancer (but not lung cancer) patients were significantly less likely to report excellent care compared to white patients (Ayanian et al., 2010). One study reported that Hispanics and Asians consistently reported less positive ratings compared to non-Hispanic whites, and blacks and American Indians had some more positive and some more negative ratings compared to non-Hispanic whites, but after adjusting for hospital differences, Hispanics and blacks reported significantly more positive ratings than whites and Asians consistently reported less positive ratings (Goldstein et al., 2010). American Indian ratings were not substantially different compared to whites. Consistent with this study, another study found that blacks and Hispanics reported more positive overall experiences in U.S. Department of Veterans Affairs (VA) hospitals (Hausmann et al., 2014). One study found that only non-Hispanic black race was predictive of overall nurse, physician, and hospital ratings (O'Malley et al., 2005). Hispanic, Asian, and Native American race/ethnicity was not predictive of provider ratings. In terms of ambulatory care, one study reported that blacks and Hispanics reported more positive patient experiences at VA facilities compared to whites (Hausmann et al., 2013), and another found that patients reporting discrimination on the basis of race or ethnicity reported significantly poorer experiences of care (Weech-Maldonado et al., 2012). One study found that black, Hispanic, and Asian/Pacific Islander Medicare beneficiaries reported significantly poorer experiences with Part D prescription drug plans (Haviland et al., 2012). While some of these differences in patient experiences may be genuine, some evidence also suggests that differences in experience may be artefactual and due to differences in scale use by race (Elliott et al., 2009; Mayer et al., In press; Weech-Maldonado et al., 2008; Weinick et al., 2011).

A small number of articles examined patient safety outcomes. Compared to whites, blacks were found to have significantly higher rates of complications after general surgery (Silber et al., 2009, 2015) and prostate cancer surgery (Jayadevappa et al., 2011), but significantly decreased rates of complications after lung cancer resections (LaPar et al., 2011). One study reported no significant differences between blacks and whites in complications after percutaneous coronary intervention (Khambatta et al., 2013), and another reported no significant differences in complications from appendicitis treatment across white, black, Hispanic, or Asian patients (Lee et al., 2011b).

Several articles examined effects of race and ethnicity on costs. In terms of inpatient hospital costs, two studies found that blacks had higher total charges compared to whites

(Jayadevappa et al., 2011; Shen et al., 2007), whereas one study found that blacks had low costs (Dowell et al., 2004). One study found that Hispanics had higher costs to whites (Shen et al., 2007), but two found that Hispanics had significantly lower costs compared to whites (Dowell et al., 2004; Jayadevappa et al., 2011). One study reported that Native Americans incurred the highest costs of all racial groups (Dowell et al., 2004). One study examining renal dialysis costs found that black patients had significantly higher costs compared to non-black patients (Roach et al., 2010). The committee made the following finding:

- The committee identified literature indicating that race and ethnicity may influence health care utilization, clinical processes of care, costs, health outcomes, patient safety, and patient experience.

Language

Language typically represents language barriers, such as speaking a primary language other than English, having limited English proficiency (LEP), and otherwise needing interpreter services. Language barriers have been shown to be associated with poorer health care access; poorer health status; poorer quality care, including less recommended care (e.g., preventive services) and more adverse health effects (e.g., drug complications); and higher rates of diagnostic testing (Flores, 2005). One review found that use of professional interpreters improved clinical care, especially processes of care, among patients with a language barrier compared to patients with language-concordant care (Karliner et al., 2007). Another review similarly found that professional interpreter services are associated with increased office visits and prescriptions being written and refilled, while patients with no interpreter or an ad hoc interpreter have more tests resulting in more test costs and a higher risk of hospitalization (Flores, 2005). This review also found that interpreter services improve care processes, although whether interpreter use is associated with increased duration of visits remains unclear (Flores, 2005).

Individual studies echo review findings of generally worse outcomes for patients with language barriers. One study reported that deaf American Sign Language (ASL) users concordant providers (i.e., providers who sign) were more likely to receive an influenza vaccination but not a colon or cholesterol screening compared to deaf ASL users reporting discordant providers (McKee et al., 2011). Regarding health outcomes, one study found that among patients on warfarin, LEP was associated with less time in therapeutic range, but had no differences in risk of spending time in danger range. There was also a significant interaction with use of a communication surrogate, such that both LEP and non-LEP patients who used a surrogate spent less time in therapeutic range and more time in danger range (Rodriguez et al., 2013). A study of Latino diabetes patients found that LEP Latinos with language-discordant physicians had greater odds of poor glycemic control compared to Latino English speakers, but there were no differences between LEP Latinos with language-concordant physicians and Latino English speakers (Fernandez et al., 2011). Another study found that having English as the primary language spoken was associated with significantly lower risk of in-hospital, 30-day, 90-day, and 1-year mortality among critically ill patients (Mendu et al., 2013).

Several studies examined language and patient experiences of care. Among studies examining Spanish language, one study found that Spanish language was associated with significantly lower CAHPS ratings of nurses, doctors, and hospitals (O’Malley et al., 2005) one found that English-speaking Hispanics reported greater satisfaction with provider communication compared to Spanish-speaking Hispanics (Villani and Mortensen, 2014), and one reported no significant differences in provider ratings by Spanish language (Ayanian et al., 2010). Among studies examining experiences of Asian-language-speaking patients, one study found that there were significantly fewer excellent and excellent or very good ratings of providers among Chinese-speaking lung and colorectal patients compared to whites (Ayanian et al., 2010), and another reported that among LEP Asian Americans (Chinese and Vietnamese immigrants) there were no differences in provider communication or overall satisfaction with care between patients who used an interpreter compared to those who had language-concordant care (Green et al., 2005). However, significantly more patients who used interpreters reported having questions about their care and questions about their mental health that they wanted to ask but did not. Two studies examined patient experience among Asian language-speaking patients. One found that Chinese-speaking lung and colorectal cancer patients reported significantly fewer excellent and excellent or very good ratings of providers compared to whites (Ayanian et al., 2010), and one found that among limited English proficient Chinese and Vietnamese immigrants, there were no differences regarding provider communication and overall satisfaction between patients who used an interpreter compared to those who had language concordant care, but significantly more patients who used interpreters reported having questions about their care and questions about their mental health that they wanted to ask but did not (Green et al., 2005). In terms of utilization, one study found that patients needing interpreter services had significantly higher risk of at least one ED visit and of at least one hospitalization during the 12-month study period compared to patients not needing interpreter services (Njeru et al., 2015) and a study of Russian immigrants found that language difficulty was not significantly associated with health care use compared to non-immigrants (Aroian and Vander Wal, 2007). The committee made the following finding:

- The committee identified literature indicating that language may influence health care utilization, clinical processes of care, health outcomes, and patient experience.

Nativity

Nativity covers country of origin, immigration status (including refugee and documentation status), duration in the United States, as well as acculturation, or the extent to which an individual adheres to the social norms, values, and practices of his own ethnic group or home country or to those of the United States (IOM, 2014a). Nativity may affect health status through access to health care, language barriers (as described in the previous section), and deleterious health exposures such as communicable diseases from an individual's country of origin (IOM, 2014a). The relationship between immigration and health is complex, in particular due to the heterogeneity across immigrant communities, but studies have shown that country of origin and immigration status are associated with health behaviors, morbidity, and mortality (Abraido-Lanza et al., 1999; IOM, 2014a; Singh and Hiatt, 2006). One review of immigrants and health care found that most studies of immigrants and quality of health examined predominantly self-reported outcomes, in particular related to patient experience (Derose et al., 2009). In terms of health care outcomes, the review found that foreign-born Americans generally report poorer experiences with health care, including poorer satisfaction, although experiences may differ by immigrant subgroup. The review also found that immigrant adults had substantially lower overall health care costs.

A small number of studies examined effects of nativity and health care utilization and outcomes. In terms of utilization, one study of Latino adults found that foreign-born citizens, foreign-born permanent residents, and undocumented Latinos were significantly less likely to receive preventive care compared to U.S.-born Latinos (Rodriguez et al., 2009), and one found that nativity was not associated with lung or colorectal cancer treatment after adjusting for language (Nielsen et al., 2010). One study reported that Russian immigrants had significantly higher health service use compared to non-immigrants (Aroian and Vander Wal, 2007). Regarding health care outcomes, one small study of Mexican and Mexican American adults with type 2 diabetes reported intermediate health outcomes, finding that acculturation was not significantly related to glycemic control (Ross et al., 2011). Several articles examined nativity and patient experience. One study found that non-immigrants reported a significantly greater number of problems with providers than Russian immigrants (Aroian and Vander Wal, 2007). Another study found that, after adjusting for language, being foreign born increased odds of reporting poorer interactions with physicians in some areas but not others (Dallo et al., 2008). For example, all foreign-born individuals had greater odds of reporting that their physician did not involve them in their care as much as they would have liked, but there were no significant differences in other areas of patient–physician interaction (e.g., physician not listening or understanding, distrust in physician, patient treated with respect, patient had unanswered questions).

By contrast, Nielsen et al. (2010) found that foreign-born patients were less likely than U.S.-born patients to report excellent quality of care, but after adjustment for language, the effect attenuated for the overall foreign-born sample and for Hispanic foreign-born patients and was no longer significant. However, this was not true of Asians, who still had significantly lower odds of reporting excellent care. Finally, one article reported that foreign-born citizens, foreign-born permanent residents, and undocumented Latinos were more likely to report that they received no health care information from doctors compared to U.S.-born patients (Rodriguez et al., 2009). Foreign-born citizens and permanent residents but not undocumented Latinos were also less likely to report receiving care in their language of preference, and undocumented Latinos were less likely to report excellent or good quality care. The committee made the following finding:

- The committee identified literature indicating that nativity may influence clinical processes of care and patient experience.

Gender

Gender is associated with many health and health care–related outcomes (IOM, 2014a). The committee used the term *gender* broadly to capture the social dimensions of gender and distinguish these from biological effects of sex. Gender is known to affect a number of health outcomes as well as interactions with the health care system, health care–related processes, and outcomes of health care.

Parsing the effects of gender from sex is challenging because investigators frequently do not specify which construct they are measuring, they use the terms interchangeably (often erroneously referring to sex differences as gender differences), and because gender differences and sex-linked biology may interact to produce health outcomes (Krieger, 2003). A small number of articles examined effects of gender on patient experience. Gender may affect patient experience because men and women presenting the same symptoms may behave differently and because providers may act differently toward men and women (Elliott et al., 2012). Several studies reported that, compared to men, women reported significantly worse experiences of care—in the inpatient setting (Elliott et al., 2012), at VA hospitals (Hausmann et al., 2014), and for COPD (Martinez et al., 2012). Among these, one study also found a significant interaction with age, where women age 18 to 24 report significantly better experiences of inpatient care than men, but women age 85 and older report significantly worse experiences than men (Elliott et al., 2012). One study found that men gave significantly more positive ratings of nurses and hospitals compared to women, but there were no significant differences in physician ratings by gender (O'Malley et al., 2005). One study reported no significant differences between men and women in reported pain or in the satisfaction with pain management and response to pain among ED staff (Patel et al., 2014).

Gender or sexual minorities may also experience differences in health and health care. Gender and sexual minorities include individuals who identify as lesbian, gay, bisexual, transgender, intersex, queer, and questioning. Health disparities among gender and sexual minorities may be related to exposure to stigma, discrimination, and violence on the basis of their non-normative identity; barriers to accessing health care, including fear of discrimination from providers; and unhealthy behaviors, especially increased rates of smoking, alcohol use, and substances (IOM, 2011). Conducting research on gender and sexual minority populations can be challenging with respect to defining sexual orientation and gender nonconformity operationally, collecting sensitive information, and due to the relatively small size of these populations (IOM, 2011). Despite these challenges, some evidence suggests that lesbians and bisexual women may be less likely to receive preventive services (e.g., breast cancer screenings and Pap tests) compared to heterosexual women (Buchmueller and Carpenter, 2010; IOM, 2011). The committee made the following finding:

- The committee identified literature indicating that gender may influence clinical processes of care and patient experience.

Social Relationships

Social relationships are another important social risk factor. It is well established that many dimensions of social relationships, including access to social networks that can provide access to resources (including material and instrumental support), as well as the emotional support available through social relationships, can be important to health, health care use, and outcomes of care (Berkman and Glass, 2000; Cohen, 2004; Eng et al., 2002; House et al., 1988a). Social isolation and loneliness have been shown to have important consequences for health (Berkman and Glass, 2000; Brummett et al., 2001; Cohen, 2004; Eng et al., 2002; House et al., 1988a; Wilson et al., 2007). Social relationships may be of special importance to health care access, processes, and outcomes among older individuals (Cornwell and Waite, 2009; Hawton et al., 2011; Seeman et al., 2001; Tomaka et al., 2006) and persons with ADL and IADL limitations (AARP Public Policy Institute, 2010). Social relationships are most frequently assessed in the health care and health services research literature with three constructs: marital status, living alone, and social support.

Marital Status

Marriage is a foundational structural element of social relationships that can convey substantial health benefits among the elderly. For example, marriage has been shown to be protective against injury (e.g., osteoporotic fractures, which mostly occur in the elderly) (Brennan et al., 2009) and mortality (Manzoli et al., 2007). Given demographic shifts in household composition and marriage in the past several decades, indicators assessing marital status not only include dichotomous measures of whether someone is married or not, but sometimes also include other measures of partnership (e.g., partnered or lacks a partner), as well as individuals who are single, widowed, or divorced. Several review articles each assessing a small number of articles found that being married is associated with better health care outcomes, including better outcomes after hip replacement surgery (Young et al., 1998), and lower rates of readmissions (Calvillo-King et al., 2013). Similarly, being unmarried, widowed, or otherwise lacking a partner is associated with worse outcomes, such as graft loss after heart transplantation (Coglianese et al., 2015) and increased risk of readmissions (Damiani et al., 2015). One review found that marriage was also associated with better medication adherence (Wu et al., 2008). Looking at individual studies, the effect of marital status on health care use and health care outcomes is somewhat more mixed.

Regarding utilization, several studies found an association between marital status and readmissions (Arbaje et al., 2008; Garrison et al., 2013; Howie-Esquivel and Spicer, 2012; Hu et al., 2014; Moore et al., 2013), while others did not (Iwashyna and Christakis, 2003; Jasti et al., 2008; Metersky et al., 2012; Watkins et al., 2013). Two studies found that marital status was significantly associated with hospital length of stay (Iwashyna and Christakis, 2003; Metersky et al., 2012). In terms of health outcomes, one study found that marital status was associated with both in-hospital and 90-day mortality among pneumonia patients, while another found that it was not associated with in-hospital mortality among heart failure patients (Watkins et al., 2013). Another study (Maney et al., 2007) found that marital status was significantly associated with the variance in glycemic control among diabetes patients, but it was not specifically associated with high or low control. One study found that there were significantly fewer excellent ratings of care among unmarried lung and colon cancer patients (Ayanian et al., 2010). The committee made the following finding:

- The committee identified literature indicating that marital status may influence health care utilization, clinical processes of care, costs, health outcomes, and patient experience.

Living Alone

Living alone is a structural element of social relationships and an indicator of social isolation or loneliness in health care and health services research. Living alone can be a dichotomous measure (living alone or not) or cover more finely graded household composition (e.g., living alone, living with one other, living with two others, and so on). Literature examining the influence of living alone on health care outcomes is sparse. Two reviews examining the relationship between living alone and health outcomes found just one article each. In a review of psychological variables that may affect recovery after surgery, Mavros and colleagues (2011) found one study that showed no association between loneliness and wound healing. In a review of literature on medication adherence among heart failure patients, Wu and colleagues (2008) identified just one meta-analysis, which found that living alone was positively associated with nonadherence. One slightly older review identified living alone as a risk factor for poor outcomes of elderly patients presenting to EDs (Aminzadeh and Dalziel, 2002).

A small number of individual studies examined the influence of living alone on health care use. In terms of utilization, two studies found that living alone significantly increased risk of readmissions (Hamner and Ellison, 2005; Iloabuchi et al., 2014). One study found that living alone was significantly associated with getting a flu shot but not getting a pneumonia vaccination among adults age 85 and older (Farmer et al., 2010). Another study found that living alone was not significantly associated with hospitalization, except among adults age 85 and older for whom living alone was protective against hospitalization (Ennis et al., 2014). The authors suggested that living alone among this older population may be a sign of healthy aging in place, rather than isolation. The committee made the following finding:

- The committee identified literature indicating that living alone may influence health care utilization, clinical processes of care, and health outcomes.

Social Support

Social support is a key function of social relationships and includes the provision of emotional and appraisal support through caring and concern, as well as more tangible instrumental and informational support such as the provision of material or other practical support (House et al., 1988b). Reviews examining the relationship between social support and health care outcomes mostly supports a positive effect of social support on health, finding that higher levels of social support are associated with better medication adherence (Dunbar et al., 2008; Wu et al., 2008), fewer readmissions (Calvillo-King et al., 2013; Dunbar et al., 2008; Luttik et al., 2005), better diabetes outcomes (Strom and Egede, 2012), and better outcomes after hip replacement surgery (Young et al., 1998). One review (Pelle et al., 2008) reported mixed evidence about the effect of social support on both inpatient and outpatient mortality among heart failure patients, while another (Mookadam and Arthur, 2004) reported a significant association between social support and both 6-month and 6-year mortality among patients after AMI. The reviews are limited by a small number of studies.

Individual articles looking at the influence of social support on other health care use and health care outcomes is mixed. With respect to health outcomes, Theiss and colleagues (2011) reported a significant association between social support and outcomes after joint operations. Platinga and colleagues (2010) reported no association between social support and mortality among chronic kidney disease patients. In terms of utilization, Platinga and colleagues (2010) found that more social support decreased likelihood of hospital admissions, while Perry and colleagues (2008) found no association between social support and health services use. Thomas and colleagues (2010) found that informational support in the form of a family member having cancer was associated with lower likelihood of having a PSA test, while other measures of informational and instrumental support were not significant. Regarding patient experiences, Platinga and colleagues (2010) found that higher levels of social support were associated with better quality of care ratings and increased likelihood that patients would recommend their dialysis center, and Rosland et al. (2011) found that patients who had a regular companion participate in primary care visits were more likely to have high satisfaction with their primary care provider. On the other hand, Perry and colleagues (2008) found that social support was not associated with satisfaction with care or the quality of provider communication among low-income individuals. One explanation for mixed findings is that because social support covers multiple, heterogeneous types of support, these different types of social support may have different effects on patient experiences, which may not be well captured using a global social support measure. To that end, Han and colleagues (2005) found that among breast cancer patients some types of social support but not others were associated with satisfaction with their physician and problems interacting with their medical team. The committee made the following findings:

- The committee identified literature indicating that social support may influence heath care utilization, clinical processes of care, health outcomes, and patient experience.
- The committee identified no literature indicating that social relationships may influence patient safety.

Residential and Community Context

The committee uses the term *community context* to refer to a set of broadly defined characteristics of residential environments that could be important to health and the health care process and its outcomes. Dimensions include the physical environments (e.g., housing, walkability, transportation options, and proximity to services) as well as the social environment (e.g., safety and violence, social disorder, presence of social organizations, and social cohesion) (Diez Roux, 2001; Diez Roux and Mair, 2010). Community context also references the policies, infrastructural resources, and opportunity structures that influence individuals' everyday lives. The SEP or racial and ethnic composition of an area is sometimes used as a proxy for some of these attributes, although it is an imperfect proxy and can also capture unmeasured or imperfectly measured individual-level SEP. Community context may also have special relevance for older persons due to decreases in mobility with age and for persons with mobility disabilities. One review found "limited evidence" that neighborhood environment is a primary influence on older adults health and functioning (Yen et al., 2009).

Community Socioeconomic Composition

A community's compositional characteristics may include dimensions of SEP (income, poverty, educational attainment, and employment), as well as the proportion of racial/ethnic minority residents, foreign-born residents, single parent households, or English language proficient residents. Studies may examine individual characteristics or composite indices covering multiple characteristics grouped into an overall measure, such as a deprivation index or segregation index. Community composition has been shown to affect health behaviors and other risk factors, morbidity, and mortality (Diez Roux and Mair, 2010; IOM, 2014a). As described above, community composition can be used to measure both group- and individual-level effects. Although measured in similar ways, the literature described below makes a conceptual distinction between studies that use community composition as a proxy for individual-level effects and those that use community composition as a genuine group-level exposure.

Community composition as a proxy for individual-level effects

Income Studies examined effects of neighborhood-level income, typically assessed using median household income of a patient's residence's zip code, as a proxy for individual income on utilization, health outcomes, patient safety, and costs. In terms of utilization, median household income has been associated with both treatment differences and readmissions. Regarding the former, one article found that high and middle income was significantly associated with higher use of laparoscopic appendectomy compared to low-income patients (Lee et al., 2011a), while another found that low-income elderly patients were less likely to get timely care for AMI (Agarwal et al., 2014). Four studies found that low income was associated with significantly increased odds of readmission (Jiang et al., 2005; Kim et al., 2010; Kroch et al., 2015; Oronce et al., 2015), while one found no association between household income and readmissions (Hunter et al., 2015). With respect to health outcomes, three articles found that median household income was inversely related to in-hospital mortality (Agarwal et al., 2014; Bennett et al., 2010; LaPar et al., 2011). Two studies examined patient safety outcomes, among which one found that income was not significantly associated with complications after lung cancer resections (LaPar et al., 2011), whereas the other found that higher incomes were protective against complications after elective ventral hernia repair (Novitsky and Orenstein, 2013). One article reported that the higher three income quartiles had significantly higher ST-segment elevation myocardial infarction (STEMI) costs compared to the lowest income quartile (Agarwal et al., 2014)

In addition to income, some studies use alternative measures of economic resources. For example, one study assessed area-level poverty relative to the federal poverty level and the type or rheumatoid arthritis therapy received, and found no significant differences (Yazdany et al., 2014). Another study found that the percent of residents receiving public assistance was significantly associated with receipt of certain preventive services (Zaslavsky and Epstein, 2005).

Education Few studies examined the influence of neighborhood educational attainment as a proxy for individual education on health care utilization and health care outcomes. One study found that areas with medium educational attainment (areas where 50 to 75 percent of households had individuals who achieved greater than a high school education) was significantly associated with a longer length of stay compared to areas with low levels of educational attainment (areas where less than 50 percent of households had an individual who achieved greater than a high school education) (Lee et al., 2011a). Interestingly, this study found no differences in length of stay among high education areas (more than 75 percent of households with someone who achieved greater than a high school education) compared to low education areas. One study reported no differences in the use of laparoscopic appendectomy among adults with appendicitis by education (Lee et al., 2011b).

Composite measures A small number of articles used neighborhood compositional measures as a proxy for individual SEP to examine health care utilization and health care outcomes. One study found that low neighborhood SEP was associated with significantly greater odds of operative death (Birkmeyer et al., 2008), and another found that below-average neighborhood SEP composition was associated with increased mortality 1-year after heart failure, but not with 30-day mortality (Rathore et al., 2006). Regarding utilization, one study found that lupus patients in the lowest SEP quartile had a higher risk of avoidable hospitalizations, but there were no differences in the higher three SEP quartiles (Ward, 2008). One article found that neighborhood SEP was associated with decreased likelihood of undergoing left ventricular systolic function assessment for heart failure, but not with prescription of angiotensin-converting-enzyme (ACE) inhibitors or 30-day readmissions (Rathore et al., 2006). Another article reported that neighborhood deprivation was significantly associated with medication non-adherence due to beliefs, but not with non-adherence due to costs among Mexican Americans with type 2 diabetes (Billimek and August, 2014).

Community composition as a measure of group-level effects

Income A number of studies examined the effects of area-level income, measured using median household income, and poverty, measured as relative to the federal poverty level, on health care utilization and health care outcomes. Of articles examining median household income and health care use, one study found that area-level income was not significantly associated with getting recommended rheumatoid arthritis therapy (Yazdany et al., 2014). Among studies examining readmissions outcomes, one found that income was not associated with readmissions (Hu et al., 2014), one found that medium but not high-median household income was associated with a lower hazard of readmission (Smith et al., 2014), and one reported a significant interaction between comorbidity and neighborhood income, such that patients with high comorbidity burden living in low-income areas had significantly higher rehospitalizations for all causes compared to those with a high comorbidity burden living in high-income areas (Foraker et al., 2011). This study reported similar effects for death and rehospitalization or death. In a separate study, these investigators also found a significant interaction between race and income, where blacks living in low-income neighborhoods had significantly higher 28-day and 1-year mortality compared to whites living in high-income neighborhoods (Foraker et al., 2013). On the other hand, Smith and colleagues (2014) found that income was not significantly associated with death over 6-year follow up.

Among studies that examined the effect of poverty on health care use and health care outcomes, one reported that poverty level was not significantly associated with mortality in hospital, or within 30 days, 90 days, or 1 year among patients receiving critical care (Villanueva and Aggarwal, 2013; Zager et al., 2011). A slightly greater number of studies examined health care utilization outcomes, among which one found that high poverty was associated with increased 30-day readmissions (Hu et al., 2014), while one found that poverty level was not significantly associated with either 30-day or 1-year readmission (Villanueva and Aggarwal, 2013). One study found that town-level poverty was predictive of AMI and heart failure hospitalizations (Harris et al., 2008). Of three studies examining clinical processes of care, one reported that higher poverty areas were associated with decreased odds of colon and rectal cancer treatments (Hines et al., 2014), and one found that poverty level was not significantly associated with receipt of recommended rheumatoid arthritis therapy (Yazdany et al., 2014). One study reported no association between county-level poverty and receipt of antipsychotic drugs among black or white nursing home residents, no association between poverty level and restraint use on black nursing home patients, and a small but significant protective effect of poverty on restraint use among white nursing home residents (Miller et al., 2006).

Two studies found that the proportion of households on public assistance was associated with decreased likelihood of getting recommended preventive care (Zaslavsky and Epstein, 2005; Zaslavsky et al., 2000).

Education Several articles examined the relationship between neighborhood education and health care use. Two articles found that neighborhood education was the strongest predictor of getting recommended preventive care (Zaslavsky and Epstein, 2005; Zaslavsky et al., 2000). Three articles examining readmissions reported inconsistent findings, with one finding that residing in a low education area was associated with significantly higher readmissions for AMI, heart failure, or pneumonia(Herrin et al., 2015), and one study reported increased likelihood of 30-day or 1-year readmission among patients living in an area with low educational attainment with comorbid mental health and substance use disorders who had been discharged from acute patient care (Stahler et al., 2009). One study reported no significant association between neighborhood education and 30-day all-cause readmissions (Hu et al., 2014). The latter article also found no association between neighborhood educational attainment and keeping a follow-up appointment after discharge (Stahler et al., 2009). One article found that educational attainment was not associated with hospitalization for heart failure or AMI (Harris et al., 2008).

Occupation Two articles examined area-level employment and health care utilization. One found that being in a retirement area significantly decreased risk of readmission (Herrin et al., 2015), and the other found that high unemployment was predictive of hospitalizations for AMI and heart failure (Harris et al., 2008).

Racial/ethnic composition Two articles examined neighborhood racial/ethnic composition and health care utilization. Zaslavsky and colleagues (2000) found that the proportion of black residents was negatively associated with getting recommended preventive care, while the proportion of Asian residents was positively associated, and the proportion of Hispanic residents was not significantly associated. Another study found that county-level racial composition may interact with nursing home facility-level racial composition on nursing home quality outcomes, blunting the protective effect of having a higher proportion of black residents on restraint use and receipt of antipsychotic drugs (Miller et al., 2006).

Composite measures A small number of articles examined composite measures of community composition and health care use and health care outcomes. Two studies found that area-level SEP was associated with increased readmissions from heart failure (Bikdeli et al., 2014) from all causes (Kind et al., 2014). One study found that lower area-level SEP was associated with poorer glycemic control even after controlling for individual SEP, but there was no association between area-level SEP and lipid control (Geraghty et al., 2010). One study reported a significant interaction between individual SEP and area-level SEP (Taylor et al., 2006). Specifically, the authors found that individuals with low SEP residing in high-SEP areas had shorter time to hospitalization, higher rates of hospitalization, and higher rates of uncontrolled blood pressure after accounting for other individual and neighborhood SEP factors, and compared to individuals of low SEP in low- or moderate SEP areas, and moderate- or high-SEP individuals from all-level SEP areas.

Other compositional factors Two studies examined the effect of other compositional factors on health care use. One article found that the percent of residents never married, the number of Medicare beneficiaries per capita, the number of nursing home residents with pressure sores, and the number of nursing home residents with increased need for help were associated with increased readmissions for AMI, heart failure, and pneumonia, whereas the number of nursing home patients who were depressed or anxious was associated with decreased risk of readmission (Herrin et al., 2015). Another study found no association between the county-level nursing home occupancy rate and receipt of antipsychotic drugs among black and white nursing home patients. No significant association between the county-level nursing home occupancy rate and restraint use on black nursing home patients was found, but a small, significant protective effect on white nursing home residents was observed (Miller et al., 2006). The committee made the following finding:

- The committee identified literature indicating that neighborhood composition may influence health care utilization, clinical processes of care, health outcomes, and patient safety.

Contextual Community Effects

Contextual community effects include a variety of heterogeneous elements of a community's physical and social environments. Unlike compositional characteristics that aggregate individual-level characteristics, contextual characteristics cannot be disaggregated into individual-level characteristics, but are rather emergent properties of the place or the community itself. Evidence suggests that both physical and social environments may affect health behaviors (in particular, nutrition and physical activity), morbidity, and mortality (Diez Roux and Mair, 2010; IOM, 2002).

Built environment The built environment encompasses man-made aspects of the physical environment and may include transportation, walkability, sanitation, buildings and housing, and other elements of infrastructure and urban planning (IOM, 2002). Transportation and walkability may be especially relevant for the health outcomes of older adults and persons with mobility disabilities.

Housing Elements of housing include housing stability, homelessness, and quality and safety. Homelessness and housing instability are associated with poor health care access, increased physical and mental morbidity, and mortality (Fazel et al., 2008, 2014; Kushel et al., 2006). Poor housing can negatively affect health through exposure to environmental hazards such as lead or poor air quality, infectious disease, poor sanitation, and injury (IOM, 2002; Krieger and Higgins, 2002). Studies examining the association between housing status (namely, post-discharge residence—e.g., private residence, institutional residence such as skilled care or assisted living) found no association with readmissions in either the short term (30 days) or longer term (1 year) (Garrison et al., 2013; Jasti et al., 2008; Stahler et al., 2009).

Transportation Transportation can be a barrier to health care access and may include both availability of public transportation and travel distance; identified studies examining the influence of transport on health care utilization and health care outcomes focused on the latter. One study found no association between distance traveled and readmissions (Chou et al., 2014), while another reported that distance traveled relative to the patient mean distance was significantly associated with increased likelihood of 30-day readmission (Kroch et al., 2015). One article examined influence on patient experience and found that patients with a smaller travel distance were less satisfied with their care compared to patients living farther away (Abtahi et al., 2015).

Two articles examined influence of travel distance on mortality. One found that patients traveling further were significantly more likely to die in surgery (Chou et al., 2014). There was a significant interaction with disease severity such that travel distance had no effect on mortality among healthier patients, but high-severity patients traveling further had significantly higher rates of operative mortality compared to patients traveling less far. One article found no effect of travel distance measured by both point distance and driving distance and survival to discharge (Cudnik et al., 2010). However, the authors also reported that survival to discharge was higher in patients taken to a further, more specialized hospital, bypassing closer, but less specialized facilities, compared to those simply taken to the closest hospital (Cudnik et al., 2010).

Health care resources The availability of health care services is not evenly distributed in either number or quality. This uneven distribution has consequences for health care access and ultimately health status. Two studies examined the influence of area-level health care resources and health care use and outcomes. Herrin and colleagues (2015) found that a higher number of specialists per capita and the number of hospital beds per capita significantly increased risk of readmissions, while designation as a retirement area, the number of general practitioners per capita, and having more nursing homes per capita was associated with decreased risk of readmission. Nyweide and colleagues (2011) found that physician supply was not associated with Medicare beneficiaries' satisfaction with care.

Other elements of the built environment One study reported that, for patients diagnosed with comorbid mental health and substance use disorders discharged from acute inpatient care, living in an area with high levels of vacant housing and living relatively far from an Alcoholics Anonymous meeting location significantly decreased likelihood of keeping a 30-day follow-up appointment (Stahler et al., 2009). Another study reported that towns closer to a hospital had significantly higher hospitalization rates for heart failure (Harris et al., 2008).

Social environment While many elements of a social environment are compositional, or derived from the individuals who make up a social group, other elements such as economic inequality, urbanization, safety and violence, and social mobility are emergent properties of the groups as a whole (IOM, 2002).

Income inequality Income inequality, or the distribution of income across societies, has been shown to be associated with worse population health (e.g., Kawachi and Kennedy, 1999; Lynch and Kaplan, 2000; Subramanian and Kawachi, 2004; Wilkinson and Pickett, 2006). One study examined income inequality and found that it was associated with increased 30-day readmissions for AMI, heart failure, and pneumonia, even after adjustment of individual patient SEP (Lindenauer et al., 2013). The authors reported no association with 30-day mortality for any condition.

Neighborhood disadvantage One study reported that disadvantaged neighborhoods had both lower availability of and reduced use of revascularization services for AMI (Fang and Alderman, 2003). While the selected disadvantaged neighborhoods were more likely to have residents living under the poverty line, who were unemployed, had lower incomes, and less education compared to residents in other neighborhoods of the city under study, the authors did not assess "neighborhood disadvantage" using a specified measure.

Urbanization Urbanization describes where a place falls on the spectrum from urban to rural. Many studies categorize urbanization as dichotomous (i.e., urban or rural) or trichotomous (e.g., urban, suburban, or rural), while some use a more graded spectrum (e.g., percent urban). Rural areas present challenges related to health care access due to both the availability and distance to health care resources and may also increase risks from environmental hazards associated with rural industries, such as pesticides from farming (IOM, 2002). Individuals in urban areas may also experience negative environmental exposures such as air pollution and safety hazards of old buildings. Furthermore, urban areas may have concentrated areas of disadvantage that may expose residents to negative health effects of poverty and decay, as well as unique social, political, and economic contexts that converge with a city's physical attributes to shape health behaviors (e.g., physical activity and healthy eating) (IOM, 2002).

A review of the influence of social factors on readmission and mortality among pneumonia and heart failure patients found only a small number of studies that examine the effect of urban or rural residence (Calvillo-King et al., 2013). The review found that rural residence was associated with significantly fewer readmissions for heart failure, but not associated with readmission for pneumonia, and that urban residence was not significantly associated with increased mortality for either condition. Most studies of health care use and health care outcomes focused on utilization. One study found that rural residence was associated with decreased risk of readmission (Herrin et al., 2015), and another study found that urban residence was associated with increased risk of unscheduled readmission but not scheduled readmissions (Kim et al., 2010). Njeru and colleagues (2015) reported a significant interaction between rural residence and need for an interpreter, such that patients in need of interpreter services from rural areas had significantly increased risk of hospitalization. Ward (2008) reported no association between urban–rural status and avoidable hospitalization among lupus patients. In terms of treatment differences, one study reported that among colorectal cancer patients, rural residents were significantly less likely to receive chemotherapy and suburban patients were significantly less likely to receive radiotherapy (Hines et al., 2014). Another study found that percent urban was associated with receiving recommended childhood and adolescent immunizations, but no recommended care for adults (Zaslavsky et al., 2000). One study reported that urban residents reported significantly worse provider communication (Wallace et al., 2008). The committee made the following findings:

- The committee identified literature indicating that community context may influence health care utilization, health outcomes, and patient experience
- The committee identified literature indicating that urbanization may influence health care utilization, clinical processes of care, costs, and patient experience.

Health Literacy

Although an individual risk factor and not a social factor, the committee includes health literacy in the framework. It does so because it is specifically mentioned in the Improving Medicare Post-Acute Care Transformation Act of 2014, and is thus of interest to Congress. It does so also because it is affected by social risk factors, and the literature supports a role for health literacy in health care outcomes and quality measures. The committee also included numeracy as a related concept. Numeracy is the ability to understand information presented in mathematical terms, as health and medical information often is, and to use mathematical knowledge and skills in a variety of applications across different settings (IOM, 2014b). Adults with limited health literacy have lower levels of knowledge about health, poorer health status, and may receive fewer preventive services but have higher rates of ED use and hospitalizations, which may be associated with higher costs (IOM, 2004). Health literacy can be especially relevant for adults with certain disabilities, such as individuals who are deaf, hard of hearing, blind, or have low vision, who have communication barriers and for whom health care information is often not available in accessible formats (IOM, 2004).

Several review articles examined the association between health literacy and health care use and health care outcomes. A review of health literacy and ED outcomes found limited evidence, but the small number of studies identified suggest that inadequate health literacy may be associated with higher ED use and higher costs among Medicare beneficiaries age 65 and older (Herndon et al., 2011). A review of low health literacy and health outcomes found insufficient and inconsistent evidence on the effect of health literacy and numeracy on clinical processes of care (including immunizations, mammography screenings, medication adherence among patients with HIV), health outcomes (including medication adherence, asthma control, diabetes control and complications, and hypertension control), costs, and disparities (Berkman et al., 2011). Similarly, a review of health literacy and diabetes outcomes reported inconsistent and insufficient evidence on the effect of health literacy and numeracy on diabetes risk factors, diabetes complications, and patient experiences (Al Sayah et al., 2013).

Evidence from individual studies echoes the review findings. With respect to utilization, two studies found that higher health literacy was associated with lower utilization. One article found that patients with above basic health literacy had significantly lower risk and lower incidence of all-cause 30-day readmissions after AMI (Bailey et al., 2015). Another study reported a significant, graded, negative association, such that poorer health literacy was associated with significantly higher odds of COPD exacerbations requiring ED visits or hospitalizations (Omachi et al., 2013). Two articles examined effects of health literacy on patient experience. Aboumatar and colleagues (2013) found that among patients with hypertension, there were no differences between patients with high and low health literacy in patient ratings of care, including measures of trust, satisfaction, the likelihood of recommending their doctor, and reporting participatory decision making. Hawley and colleagues (2010) reported that breast cancer patients with moderate or low health literacy were significantly more likely to report poor satisfaction with their care coordination compared to patients with high health literacy. The committee made the following finding:

- The committee identified literature indicating that health literacy may influence health care utilization, clinical processes of care, cost, and patient experience.

CONCLUDING REMARKS

It is important to note that although often correlated (e.g., SEP is correlated with race/ethnicity and both race/ethnicity and income are correlated with community context) the different social risk factors also capture distinct dimensions that may need to be considered in understanding the social determinants of health care processes and outcomes in Medicare beneficiaries.

The conceptual framework implies that social risk factors may influence the health care process as well as the outcomes of care among Medicare beneficiaries in many interrelated ways. Thus, all other things being equal, the performance of a given health care system (in terms of quality, outcomes, and cost) can undoubtedly be affected by the social composition of the population it serves. At the same time, there are mechanisms through which the health care system can itself ameliorate the impact of social risk factors on quality, outcomes, and cost. As a simple example, through its action to control clinical risk factors the health care system can reduce the impact of social factors on health. As an example of more complex mechanisms, the health care system can partner with social services to improve health literacy or enhance the effectiveness of clinical interventions by, for example, ensuring local access to healthy foods. These strategies will of course require extra effort (and cost) on the part of the system, and there is still relatively limited evidence on the effectiveness of various strategies to achieve this goal.

What is clear at this point in time, however, is that health literacy and social risk factors (SEP; race, ethnicity, and cultural context; gender; social relationships; and residential and community context) have been shown to influence health care use, costs, and health care outcomes in Medicare beneficiaries. However, some specific factors were found not to influence one or more outcomes. The committee has not yet evaluated the literature for the purpose of identifying those factors that could be incorporated into measures used in Medicare payment programs; that is the focus of the third report from the committee.

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Appendix A

Overview of Medicare Value-Based Payment Programs

MEDICARE VALUE-BASED PAYMENT PROGRAMS FOR HOSPITAL INPATIENT CARE

Hospital Readmission Reductions Program (HRRP)

The Centers for Medicare & Medicaid Services (CMS) implemented the program beginning in fiscal year (FY) 2013 (October 1, 2012). To calculate the payment reduction, CMS first calculates a hospital's excess readmissions. The algorithm used to calculate excess readmissions captures an individual hospital's performance compared to that of hospitals nationally over a 3-year performance period. The excess readmission measure is then risk adjusted using a methodology endorsed by the National Quality Forum (NQF) to account for differences in patient characteristics; factors currently included in the adjustment include demographic characteristics, clinical comorbidities, and patient frailty (NQF, 2014). CMS then uses the adjusted excess readmissions measure to calculate the payment adjustment. According to a Kaiser Family Foundation analysis of CMS data, in FY 2016, based on performance for the period of June 2010 through July 2013, an estimated 78 percent of hospitals will be penalized under the HRRP, and 1.2 percent of hospitals will be penalized the maximum rate of 3 percent (Boccuti and Casillas, 2015). The average hospital penalty among penalized hospitals is estimated to be –0.63 percent, totaling approximately $428 million (Boccuti and Casillas, 2015).

Hospital-Acquired Condition (HAC) Payment Reduction

The Agency for Healthcare Research and Quality (AHRQ) Patient Safety Indicator (PSI) 90 Composite includes eight potentially preventable conditions:

1. pressure ulcer,
2. iatrogenic pneumothorax,
3. central venous catheter-related bloodstream infections,
4. postoperative hip fracture,
5. perioperative pulmonary embolism or deep vein thrombosis,
6. postoperative sepsis,
7. postoperative wound dehiscence, and

8. accidental puncture or laceration (CMS, 2015d).

The Centers for Disease Control and Prevention's (CDC's) National Healthcare Safety Network (NHSN) measures include Central-Line Associated Bloodstream Infection (CLABSI), Catheter-Associated Urinary Tract Infection (CAUTI), and Surgical Site Infection (SSI) measures (CMS, 2015d). The infection measures are currently risk adjusted for certain patient demographics (age and sex) and clinical factors (comorbidities and complications) (HHS, 2014). Measures are then grouped into two domains. Domain 1 covers the PSI 90 Composite and is weighted at 25 percent toward the total HAC score for FY 2016. Domain 2 covers the three CDC NHSN CLABSI, CAUTI, and SSI measures and is weighted at 75 percent toward the total HAC score. In other words, the hospitals receive 99 percent of what they otherwise would have been paid for all discharges (CMS, 2014a). In FY 2015, more than 700 hospitals received payment reductions under the HAC reduction program (CMS, 2014a).

Hospital Value-Based Purchasing

Clinical process measures include measures related to getting appropriate treatments in a timely manner (e.g., receiving angioplasty within 90 minutes of hospital arrival for acute myocardial infarction [AMI] patients). Patient experience measures are taken from the Hospital Consumer Assessment of Healthcare Providers and Suppliers (HCAHPS) survey and cover eight dimensions of care:

1. nurse communication,
2. physician communication,
3. cleanliness and quietness,
4. responsiveness,
5. pain management,
6. pharmacy communication,
7. discharge information, and
8. an overall rating, plus a consistency score (the median score across all dimensions).

Clinical outcomes include 30-day mortality for AMI, heart failure, and pneumonia, and certain patient safety measures—AHRQ PSI 90 composite and CDC NHSN CLABSI (MLN, 2013). For each domain of performance, CMS calculates both an achievement score (compared to a threshold of performance) and an improvement score (compared to a baseline benchmark for all other hospitals, not just other similar hospitals), and uses the better of the two scores when calculating the total performance score (CMS, 2012). The four domains are weighted for the total performance score as follows: 20 percent for clinical process, 30 percent for patient experience, 30 percent for clinical outcomes, and 20 percent for efficiency. CMS uses this performance score in a mathematical formula to calculate an incentive payment for each hospital (MLN, 2013).

According to a Government Accountability Office (GAO) analysis, for FY 2015, 74 percent of hospitals had payment adjustments (bonuses or penalties) of less than 0.5 percent; only 8 percent of hospitals received bonuses of 0.5 percent or greater, and 18 percent of hospitals received penalties of 0.5 percent or greater (GAO, 2015). GAO analysis also found that payment adjustments varied significantly by hospital characteristics, with safety-net hospitals receiving smaller bonuses and larger penalties compared to hospitals overall, while small urban hospitals received larger bonuses and smaller penalties compared to hospitals overall (GAO, 2015).

MEDICARE VALUE-BASED PAYMENT PROGRAMS FOR AMBULATORY CARE

Medicare Shared Savings Program (MSSP)

The MSSP has two tracks: a one-sided model and a two-sided model. In the one-sided model, health care organizations are eligible to share a portion of cost savings achieved only for the first year of the organization's agreement with Medicare. They are not accountable for losses during the performance period. Accountable care organizations (ACOs) that enter into a one-sided model must enter a two-sided agreement in subsequent agreements. In the two-sided model, health care organizations share a portion of both savings and losses achieved, and must remain in this model for subsequent agreements. ACOs that enter into a two-sided agreement are eligible for a higher sharing rate with a higher performance payment limit compared to those that enter into a one-sided agreement (CMS, n.d.-d). The benchmark is weighted toward the third year using the national growth rate such that benchmark year (BY) one is weighted at 10 percent, BY two is weighted at 30 percent, and BY three is weighted at 60 percent (CMS, 2014c).

To qualify for shared savings, organizations must meet a minimum savings threshold, the minimum savings rate (MSR). For organizations in both the one- and two-sided models, the MSR is calculated based on the percent below the benchmark adjusted for beneficiary characteristics and accounting for normal variation. For the two-sided model, the threshold above which organizations must share losses is determined using the minimum loss rate (MLR), which is calculated based on the percent above the benchmark adjusted for beneficiary characteristics and accounting for normal variation (CMS, 2014c). Among these, 99 percent (401 ACOs) entered into a one-sided agreement and 1 percent (3 ACOs) entered into a two-sided agreement. For performance year 2014, 92 MSSP ACOs held spending to $806 million below their benchmarks, resulting in $341 million in payments to the ACOs and a net savings of $465 for the Medicare Trust Funds (CMS, 2015e). No ACOs under the two-sided model owed losses (CMS, 2015e).

Physician Value-Based Modifier

Beginning in 2015, the value modifier was applied to physicians in groups of 100 or more eligible professionals (defined as physicians and select other practitioners and therapists) (CMS, n.d.-c). In 2016, it will be applied to physicians in groups of 10 or more eligible professionals, and beginning 2017, it will be applied to all physicians (CMS, n.d.-c). Although the precise value modifier calculation methodology will change slightly between 2015 and 2016, for physicians in category 1, quality is assessed using a composite score covering six domains (effective clinical care, person- and caregiver-centered experience and outcomes, community/population health, patient safety, communication and care coordination, and efficiency and cost reduction) and cost is assessed using a composite score covering two domains (per capita costs for all attributed beneficiaries and per capita costs for beneficiaries with specific conditions) (CMS, 2015b).

For 2015, category 1 physician groups could either receive a neutral value modifier (fixed at 0.0 percent; no adjustment) or elect to have their value modifier calculated using CMS's quality tiering methodology. Under quality tiering, physicians could receive an upward, neutral, or downward adjustment (CMS, n.d.-c). For 2016, all category 1 physicians have their value modifier calculated using quality tiering; groups with 10 to 99 eligible professionals can receive an upward or neutral (no) adjustment, and groups with 100 or more eligible professionals can receive an upward, neutral, or downward adjustment (CMS, 2015b). Physicians in category 2 will receive a value modifier set at a fixed negative adjustment (–1.0 percent for 2015 and –2.0 percent for 2016).

In 2015, 691 groups met the minimum Physician Quality Reporting System (PQRS) reporting requirements for category 1, and 319 failed to meet reporting requirements and were designated to category 2 (CMS, n.d.-a). Of category 1 groups, 127 groups elected to have their value modifier calculated using quality tiering. Among these, 14 groups received upward adjustments for performance, 81 received no adjustments, 11 received negative adjustments, and 21 received no adjustment owing to insufficient data to determine quality and cost performance. A total of $11.4 million was distributed from groups receiving negative adjustments to those receiving positive adjustments. The Physician Value-Based Payment Modifier Program is set to expire in 2018, but a new physician incentive program, the Merit-Based Incentive Payment System (MIPS) is set to begin in 2019 (CMS, 2015h).

End-Stage Renal Disease Quality Incentive Program

To calculate facility performance, the Medicare Improvements for Patients and Providers Act (MIPPA) requires CMS to use quality measures assessing anemia management, dialysis adequacy, and other measures specified by the Secretary of the Department of Health and Human Services (HHS) regarding iron management, bone mineral metabolism, vascular access, and patient satisfaction (CMS, 2015c). Achievement scores are calculated based on where facilities rank in relative to other facilities during the performance period (between the 15th percentile threshold and 90th percentile benchmark) (CMS, 2015c). Improvement scores are calculated relative to the facility's prior performance and the benchmark (CMS, 2015c). Since 2014, payments for adult beneficiaries are adjusted for age, dialysis onset, body surface, body mass, and specific acute and chronic patient comorbidities; adjustments for pediatric patients are adjusted only for age and dialysis method (MedPAC, 2015c). Payments are also adjusted for facility-level factors, including low volume (between the minimum of 11 cases and 25 cases), rural location, and wage index (CMS, 2015c; HHS, 2014; MedPAC, 2015c). For reporting measures, facilities are given points based on whether they meet reporting requirements (CMS, 2015c). CMS calculates a total performance score on the basis of a facility's clinical measures and reporting measures (CMS, 2015c). Clinical measures are weighted more heavily than reporting measures, although CMS determines the precise weight annually. For 2016 and 2017, clinical measures are weighted at 75 percent and reporting measures at 25 percent, and that increases in 2018 to clinical measures at 90 percent and reporting measures at 10 percent (CMS, n.d.-b). CMS then assigns payment adjustments on the basis of a facility's score.

MEDICARE VALUE-BASED PAYMENT PROGRAMS FOR HEALTH PLANS

Medicare Advantage (MA)/Part C

To determine payments to county-level MA plans, plans first submit a bid to offer coverage, which reflects administrative costs and profit. CMS then compares the bid to a benchmark (calculated using statutory formulas, including county-level rates based on traditional Medicare rates, the national fee-for-service rate, and plan quality) to determine the basic payment amount for enrollees in each county. To do so, CMS first calculates a risk measures for each enrollee, using the CMS hierarchical condition category model, which includes demographics (age and sex), clinical comorbidities, Medicaid status, disabled status, and working aged status,[1] and then multiplies it for the base rate for enrollees. For MA plans whose bid is above the benchmark, enrollees pay a premium covering the difference. For plans whose bid is below the benchmark, the plans receive the standard bid and also a rebate that is a fixed percentage of the difference between the non-standardized bid and its case-mix adjusted benchmark (50, 65, or 70 percent depending on a plan's star rating). This rebate must be shared with enrollees as either additional benefits or lower premiums. Payments to regional plans are calculated similarly, but their benchmark accounts for county-level plans. Plans that offer Part D coverage offer a separate bid for Part D payment, which is calculated the same way as for plans that offer just Part D coverage (MedPAC, 2015b).

MA plans that achieve higher-quality ratings under Medicare's Five Star Ratings Program are eligible for quality bonus payments (CMS, 2015a). Plan quality is assessed on the basis of performance on preventive services; management of chronic conditions; beneficiary experience (e.g., satisfaction); beneficiary complaints, access, and performance problems; members choosing to leave the plan; and plan management of beneficiary appeals (Medicare.gov, n.d.-b). Since 2011, CMS required plans to achieve four stars or higher to be eligible for bonus payments, but they are eliminating the threshold beginning in 2016 (CMS, 2015f). In 2016, plans with higher ratings will receive a bonus equaling 5 percent of the county-level rate (CMS, 2015a).

Medicare Part D

CMS calculates this payment by adjusting each plan's bid (which is estimated based on the expected costs of a Medicare beneficiary of average health) with their enrollees' actual health status. For this risk adjustment, CMS uses the prescription drug hierarchical condition category (RxHCC) risk-adjustment model, which takes into account patient case-mix, demographics (age and sex), disability status, low-income status, and long-term institutionalized status (MedPAC, 2015d).

Through individual reinsurance, Medicare subsidizes 80 percent of drug spending above the out-of-pocket threshold (enrollee costs, including the deductible and cost sharing, also known as the catastrophic cap; $4,850 in 2016), while the plan pays 15 percent, and the enrollee pays 5 percent (Medicare.gov, n.d.-a; MedPAC, 2014). In 2013, Medicare expenditures for reinsurance totaled nearly $20 billion (MedPAC, 2015a). Risk corridor adjustments limit plans' potential losses or gains by financing costs that are higher than expected or recouping profits deemed excessive (MedPAC, 2015a). At the end of each benefit year, CMS compares a plan's actual costs to its bid. Up to 5 percent of the bid, plans can keep all profits and must pay all losses. Between 5 and 10 percent above or below the bid, Medicare shares half of savings and losses with the plan. For 10 percent or more above or below the bid, Medicare covers 80 percent of the

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[1] "Working aged" refers to individuals age 65 and older who qualify for Medicare benefits based on their age and who are also eligible for employer group health plan coverage through their current employment or their spouse's current employment. For the working aged, either Medicare or the employer health plan can serve as primary or secondary coverage, depending on the employer size and the beneficiary's preference (CMS, 2014b).

risk, while plans are at risk of 20 percent (MedPAC, 2014). Nearly 75 percent of plans pay a portion of their profits to Medicare each year under risk corridors; between 2010 and 2012, total annual payments ranged between $900 million and $1 billion (MedPAC, 2014).

MEDICARE VALUE-BASED PAYMENT PROGRAMS FOR POST-ACUTE CARE

Skilled Nursing Facility (SNF) Value-Based Purchasing

The quality domains include skin integrity and changes in skin integrity, incidence of major falls, and functional status, cognitive function, and changes in function and cognitive function. For FY 2018 forward, CMS proposed three measures, with one measure addressing each of the three domains. CMS will implement the SNF Value-Based Purchasing Program (the incentive program) beginning FY 2019. CMS proposed adopting the NQF-endorsed 30-day all-cause readmission measure as the performance measure on which FY 2019 incentive payments will be based, and CMS is soliciting comment on implementing the measure for SNF incentive payment application (CMS, 2015g).

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Appendix B

Committee Biosketches

Donald M. Steinwachs, Ph.D. (*Chair*), is a professor in the Department of Health Policy and Management at the Johns Hopkins Bloomberg School of Public Health. He is active in the Center for Health Services and Outcomes Research, previously named the Health Services Research and Development Center, where he served as director for many years. His research spans the design and application of health information systems for evaluation and management, development of classification systems and modeling tools, and research on the impact of organization, financing, and quality of care on outcomes for persons with chronic diseases. Dr. Steinwachs was a co-developer of the widely used ACG (Adjusted Clinical Groups) case-mix adjustment and co-developer of the Johns Hopkins HaH (Hospital at Home). He developed methods for measuring provider continuity, needs and unmet needs for care, and measures of the timeliness of care. He was president of the Association for Health Services Research (now AcademyHealth) and received the 2013 Distinguished Research Award from AcademyHealth. He currently serves on the National Research Advisory Council of the U.S. Department of Veterans Affairs. He served on numerous committees of the National Academies of Sciences, Engineering, and Medicine, including the Board on Health Care Services and the Institute of Medicine Committee on Understanding and Eliminating Racial and Ethnic Disparities in Health Care. He holds a Ph.D. from Johns Hopkins University and is an elected member of the National Academy of Medicine.

John Z. Ayanian, M.D., M.P.P., is director of the Institute for Healthcare Policy and Innovation, the Alice Hamilton Professor of Medicine at the School of Medicine, professor of health management and policy at the School of Public Health, and professor of public policy at the Ford School of Public Policy, all at the University of Michigan. He also serves as associate editor of the *New England Journal of Medicine*. Dr. Ayanian has focused his career on health policy and health services research related to access to care, quality of care, and health care disparities, and has served in key health policy advisory roles to state and federal government. Prior to joining the University of Michigan, Dr. Ayanian was a professor at the Harvard Medical School and at the Harvard School of Public Health, and a practicing primary care physician at Brigham and Women’s Hospital in Boston. At Harvard, Dr. Ayanian also directed the Health Disparities Research Program of Harvard Catalyst, Harvard’s Clinical and Translational Sciences Center; the Outcomes Research Program of the Dana-Farber/Harvard Cancer Center; and the Harvard Medical School Fellowship in General Medicine and Primary Care. In addition to his medical degree from Harvard Medical School, he holds an M.P.P. from Harvard's John F. Kennedy School of Government. He is an elected member of the National Academy of Medicine.

Charles Baumgart, M.D., is senior medical director at xG Health Solutions, an organization that was spun out of Geisinger Health System, designed to partner with health care organizations nationally to bring Geisinger population health management expertise to local health care improvement efforts. He has worked with numerous health care systems, both academic and community-based, as well as with managed care organizations. He has most recently been the xG Health clinical/physician lead for support of a New York Delivery System Reform Incentive Payment program site, the Suffolk County Care Collaborative (Stony Brook University Hospital). Before joining xG Health Solutions, Dr. Baumgart was the Geisinger Health Plan senior medical director for government programs. His responsibilities included the development of the clinical management program for a new Managed Medicaid program in northeast Pennsylvania, leveraging Geisinger's existing Advanced Medical Home model. In his role, he worked with all aspects of population and quality management, including support of medical home development, analytics, and provider pay-for-performance programs. Dr. Baumgart previously served as a senior medical director and then the vice president and chief medical officer for Presbyterian Health Plan in Albuquerque, New Mexico. Dr. Baumgart graduated with an M.D. from the University of Iowa. Dr. Baumgart is board certified in internal medicine and quality assurance and utilization review. He has participated in the advanced training program in health care delivery improvement with Intermountain Healthcare, is a certified managed care executive through America's Health Insurance Plans, and served as a senior examiner with the Malcolm Baldrige National Quality Award Program.

Melinda Buntin, Ph.D., is the chair of the Department of Health Policy at Vanderbilt University's School of Medicine. She previously served as deputy assistant director for health at the Congressional Budget Office (CBO), where she was responsible for managing and directing studies of health care and health care financing issues in the Health, Retirement, and Long-term Analysis Division. Prior to joining CBO, Dr. Buntin worked at the Office of the National Coordinator for Health Information Technology, where she established and directed the economic analysis, evaluation, and modeling group, while on leave from RAND Corporation. At RAND, Dr. Buntin served as deputy director of RAND Health's Economics, Financing, and Organization Program, director of Public Sector Initiatives for RAND Health, and co-director of the Bing Center for Health Economics. Her research at RAND focused on insurance benefit design, health insurance markets, provider payment, and the care use and needs of the elderly. She has a Ph.D. in health policy with a concentration in economics from Harvard University. Dr. Buntin is a member of the National Academies of Sciences, Engineering, and Medicine's Board on Health Care Services.

Ana V. Diez Roux, M.D., Ph.D., M.P.H., is Distinguished University Professor of Epidemiology and dean of the Drexel University Dornsife School of Public Health. Before joining Drexel University, she served on the faculties of Columbia University and the University of Michigan, where she was chair of the Department of Epidemiology and director of the Center for Social Epidemiology and Population Health at the University of Michigan School of Public Health. Dr. Diez Roux is internationally known for her research on the social determinants of population health and the study of how neighborhoods affect health. She has been a member of the MacArthur Network on Socioeconomic Factors and Health and was co-director of the Network on Inequality, Complexity and Health. Dr. Diez Roux received an M.D. from the University of Buenos Aires and a master's degree in public health and doctorate in health policy and management from the Johns Hopkins Bloomberg School of Public Health. She is an elected member of the National Academy of Medicine and has served on numerous committees of the National Research Council and Institute of Medicine, most recently on the Committee on Recommended Social and Behavioral Domains and Measures for Electronic Health Records.

Marc N. Elliott, Ph.D., is a senior principal researcher and holds the Distinguished Chair in Statistics at the RAND Corporation. His areas of interest include health disparities, Medicare, vulnerable populations, experiences with health care, profiling of health care institutions, survey sampling, experimental design, causal inference, and case-mix adjustment. He has developed Bayesian methods of estimating race/ethnicity and associated disparities using surname and address information. Dr. Elliott led an Office of Minority Health project, developing novel, cost-effective sampling and analytic methods to improve national health estimates for small racial/ethnic subgroups. Since 2006, he has led the Centers for Medicare & Medicaid Services Medicare CAHPS (Consumer Assessment of Health Providers and Systems) Analysis project. Since 1996, he has been RAND's lead statistician on the Agency for Healthcare Research and Quality (AHRQ) CAHPS I-III projects and currently co-leads the AHRQ CAHPS IV project. Dr. Elliott was recognized by Thomas Reuters as being one of the Top 1 percent of Cited Scientists 2002-2012. Dr. Elliott is a fellow of the American Statistical Association. He earned his Ph.D. in statistics from Rice University.

José J. Escarce, M.D., Ph.D., is a professor of medicine in the David Geffen School of Medicine at the University of California, Los Angeles (UCLA), and a professor of health policy and management in the UCLA Fielding School of Public Health. His research interests and expertise include health economics, managed care, physician behavior, racial/ethnic and socioeconomic disparities in health care, technological change in medicine, and access, costs, and quality of care. Dr. Escarce is currently working on projects that address sociodemographic barriers to access, vertical integration between acute and post-acute care, bundled payments, and the effects of financial and non-financial incentives on costs and quality in provider groups and health systems. He holds an M.D. from the University of Pennsylvania School of Medicine and a Ph.D. from the Wharton School. Dr. Escarce is an elected member of the National Academy of Medicine and was a member of the Institute of Medicine Committee on Understanding and Eliminating Racial and Ethnic Disparities in Health Care and of the Board on Population Health and Public Health Practice.

Robert Ferrer, M.D., M.P.H., is John M. Smith, Jr. Professor and vice chair for research in the Department of Family and Community Medicine at the University of Texas Health Science Center at San Antonio (UTHSCSA). Dr. Ferrer is a practicing family physician with research interests at the interface of primary care and public health, including primary care transformation and quality improvement, social determinants of health, and applications of complexity science to health and health care. Currently, he also serves as director of community engagement for UTHSCSA's Clinical Translational Science Award. Dr. Ferrer is active in community health initiatives, having served as chair of the leadership team for San Antonio's Communities Putting

Prevention to Work grant from the Centers for Disease Control and Prevention and is now vice-chair of the Bexar County Health Collaborative. He has also been a member of the Expert Panel for the Agency for Healthcare Research and Quality Innovations Exchange. Dr. Ferrer holds an M.D. from Hahnemann University School of Medicine and an M.P.H. from the University of Washington.

Darrell J. Gaskin, Ph.D., is associate professor and deputy director of the Johns Hopkins Center for Health Disparities Solutions. His research aims to improve access to care for poor, minority, and other vulnuerable populations and to eliminate racial/ethnic and socioeconomic disparities in health care. His current research explores the relationship between "place" and health care disparities and examines racial/ethnic and socioeconomic disparities in hospital care. He is vice chair of the Board of Directors of AcademyHealth and a member of the Center for Health Policy Development Board and the board of directors for the National Academy of State Health Policy. He has served as a member of the Congressional Black Caucus Commission on the Budget Deficit, Economic Crisis, and Wealth Creation and of the Board of Directors of the Maryland Health Insurance Plan, the state's high-risk pool, and was vice chair of the Board of Directors of the Maryland Health Benefits Exchange Commission. He has also served as a member of several Institute of Medicine committees, including the Committee on Valuing Community-Based, Non-Clinical Prevention Policies and Wellness Strategies and the Committee on the Future of Emergency Care in the United States Health System. He received an M.S. from the Massachusetts Institute of Technology and a Ph.D. from the Johns Hopkins Bloomberg School of Public Health.

Mark D. Hayward, Ph.D., is Centennial Commission Professor in the Liberal Arts and professor of sociology at the University of Texas at Austin. From 2005 to 2015, he was director of the university's Population Research Center. His primary research addresses how life course exposures and events influence the morbidity and mortality experiences of the adult population. Recent studies have clarified how early life conditions and especially educational experience influence socioeconomic, race, and gender disparities in adult morbidity and mortality; the demography of race/ethnic and gender disparities in healthy life expectancy; social inequality in the biomarkers of aging; and the health consequences of marriage, divorce, and widowhood. He recently served as the president of the Southern Demographic Association and chair of the Aging and Life Course section of the American Sociological Association. He has served on the boards of the Population Association of America and the Society of Biodemography and Social Biology, and he was a member and then chair of the Inter-University Consortium for Political and Social Research Council. Currently, he is a member of the National Advisory Committee for the Robert Wood Johnson Foundation's Health and Society Scholars Program. He served on the National Research Council (NRC) Committee on Population and the NRC Panel on New Directions in Social Demography, Social Epidemiology, and the Sociology of Aging. Dr. Hayward received his Ph.D. in sociology from Indiana University.

James S. Jackson, Ph.D., is the past director of the Institute for Social Research and the Daniel Katz Distinguished University Professor of Psychology at the University of Michigan. He has previously held positions as chair of the Social Psychology Training Program and director of the Research Center for Group Dynamics, the Program for Research on Black Americans, and the Center for Afroamerican and African Studies, all at the University of Michigan. His research focuses on issues of racial and ethnic influences on life course development, attitude change, reciprocity, social support, and coping and health among African Americans. His research efforts include carrying out a number of national and international surveys of black populations. Dr. Jackson is a fellow of the American Academy of Arts and Sciences and the American Academy of Political and Social Science, and was appointed to the National Science Board of the United States by President Obama in 2014. He has served on several committees of the National Academies of Sciences, Engineering, and Medicine, including currently on the Board on the Health of Select Populations of the Institute of Medicine, and on the Board on Behavioral, Cognitive, and Sensory Sciences, Standing Committee on Integrating New Behavioral Health Measures into the Substance Abuse and Mental Health Services Administration's Data Collection Programs (as chair), and Roundtable on the Application of Social and Behavioral Science Research of the Division of Behavioral and Social Sciences and Education. Dr. Jackson holds a Ph.D. in social psychology from Wayne State University and is an elected member of the National Academy of Medicine.

Daniel Polsky, Ph.D., is the executive director of the Leonard Davis Institute of Health Economics, Professor of Medicine in the Perelman School of Medicine, and the Robert D. Eilers Professor of Health Care Management in the Wharton School at the University of Pennsylvania. His research areas include access to health care, provider payment, disparities, and economic evaluation of medical and behavioral health interventions. He serves on the Congressional Budget Office's Panel of Health Advisers and the National Academies of Sciences, Engineering, and Medicine's Board on Population Health and Public Health Practice. He was the senior economist on health issues at the President's Council of Economic Advisers in 2007–2008. He received a Ph.D. in Economics from the University of Pennsylvania and a master of public policy from the University of Michigan.

Meredith Rosenthal, Ph.D., is professor of health economics and policy and the associate dean of diversity at the Harvard T.H. Chan School of Public Health. She is a member of the Massachusetts Public Health Council and an elected board chair of the Massachusetts Health Quality Partners. Dr. Rosenthal's research focuses primarily on policies that will help slow the growth in health care spending. These efforts include changes in payment incentives, benefit design, and the provision of information and behavioral "nudges" to both patients and providers. Her research has influenced the design of provider payment systems in both the public and private sectors. She has advised federal and state policy makers in health care payment policy and implementation, and has also testified in congressional hearings on pay-for-performance and in legislative hearings in California and Massachusetts concerning health care provider payment and benefit design policies. Dr. Rosenthal earned her Ph.D. in health policy (economics track) at Harvard. She is an elected member of the National Academy of Medicine.

Anthony Shih, M.D., M.P.H., is executive vice president of The New York Academy of Medicine (NYAM). Established in 1847, NYAM advances solutions that promote the health and well-being of people in cities worldwide. Dr. Shih's expertise is in health care policy, urban health, health system performance measurement, health care quality improvement, and health care philanthropy. Prior to joining NYAM, Dr. Shih served as The Commonwealth Fund's executive vice president for programs, overseeing all of the fund's program and research activities, which were focused on improving the U.S. health care system. Previously, Dr. Shih held several senior management roles, including chief quality officer and vice president of strategy at IPRO, a leading independent, not-for-profit health care quality improvement organization. At IPRO, he developed and managed large-scale quality assessment and improvement projects for Medicare and Medicaid populations, as well as led IPRO's Health Care Transparency Group. Earlier in his career, Dr. Shih was assistant medical director for a community-based mental health organization serving immigrant and refugee populations in Oakland, California. Board-certified in preventive medicine, Dr. Shih received his M.D. from the New York University School of Medicine and his M.P.H. from the Columbia University Mailman School of Public Health.