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REPORT

Mapping Gender Differences in Cardiovascular Disease and Diabetes Care

A Pilot Assessment of LDL Cholesterol Testing Rates in a California Health Plan

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Sponsored by the Barbra Streisand Women's Heart Center at Cedars Sinai Heart Institute

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Preface

Despite improvements over recent decades in care for cardiovascular disease (CVD) and diabetes, which is a major CVD risk factor, evidence suggests that the care women receive—and their health outcomes—continue to lag behind those of men, even for routine care, such as monitoring and control of cholesterol. Awareness of and action to address gender gaps in women's CVD care are limited, in part, because quality of care is not routinely measured and reported by gender.

This pilot project, "Mapping Gender Disparities in Cardiovascular Care in California," describes and maps gender differences in CVD and diabetes care using data from a large health plan. Our study aims to identify gender gaps in care in California and, where they are found, to increase awareness of potential gender disparities and begin to inform approaches to address gaps in care. In this report, we focus on gender differences in one key aspect of routine CVD care and related prevention among patients with diabetes: low-density lipoprotein (LDL) cholesterol screening. We use conventional statistical approaches to compare quality of care among men and women and spatial mapping to demonstrate the pattern of gender gaps across the state.

A key component of the project is to explore how mapping can be used to assess gender disparities in care and to make this information actionable by identifying targets for intervention. By mapping the gaps in LDL screening by gender, the study takes an initial step toward making gender disparities in routine care both visible and actionable in order to motivate systematic efforts to improve women's quality of care.

The results from this study are intended to provide the basis for further work to learn and document what it will take to rapidly spread mapping approaches that prove to be helpful in understanding and addressing disparities in health and health care, particularly with regard to improving women's health outcomes.

The findings from this research will be of interest to decisionmakers in health plans, health care delivery systems, employers and other payers, policymakers, researchers, consumer groups, and, most importantly, women and men, including but not limited to patients with CVD or diabetes.

This work was sponsored by the Barbra Streisand Women's Heart Center in the Cedars-Sinai Heart Institute. The research was conducted in RAND Health, a division of the RAND Corporation. A profile of RAND Health, abstracts of its publications, and ordering information can be found at www.rand.org/health.

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Why Examine Gender Differences in Routine Care for Cardiovascular Disease and Diabetes?

Cardiovascular disease (CVD) and diabetes contribute significantly to the burden of disease among U.S. women and men. CVD includes both heart disease and other vascular diseases, such as those involving blockages of blood vessels outside the heart. CVD is the leading cause of death for women, as well as for men. When heart disease and stroke are counted separately, heart disease remains the leading cause of death among women, cancer is second, and stroke is third (Centers for Disease Control and Prevention, 2010). More than one in three adult women has some form of CVD (American Heart Association and American Stroke Association, 2013), and, despite typically having later onset of CVD, women spend more years living with CVD than do men (American Heart Association Statistics Committee and Stroke Statistics, 2012). Since 1984, more U.S. women than men have died of CVD (American Heart Association and American Stroke Association, 2013); 26 percent of women over age 45 die within a year of having a recognized heart attack, compared with 19 percent of men (American Heart Association Statistics Committee and Stroke Statistics, 2012). Diabetes is a major cardiovascular risk factor, and it increases risk of CVD more so in women than in men (Roche and Wang, 2013). Thus, high-quality routine care for both CVD and diabetes is at least as relevant to women's health and survival as it is to men's.

Improvements in women's CVD treatment could help to improve women's health outcomes, but a better understanding is needed of how CVD affects women and how CVD care for women could be improved. Although the American Heart Association's "Go Red for Women" campaign (Go Red for Women, 2013) and efforts by Sister-to-Sister and WomenHeart have done much to raise awareness among both women and their clinicians about CVD, there is still too little attention devoted to preventing heart disease in women and improving the quality and outcomes of their care (Henry J. Kaiser Family Foundation, 2013). Despite improvements over recent decades in care for CVD and diabetes, which is a major CVD risk factor, evidence suggests that the care women receive—and their health outcomes—continue to lag behind those of men, even for routine care such as monitoring and control of cholesterol (Veterans Health Administration, 2012; Bird et al., 2007; Chou et al., 2007a; Chou et al., 2007b; Chou et al., 2007c).

Awareness of and action to address deficiencies in the quality of women's CVD care are limited, in part, because quality of care is not routinely measured and reported by gender. Conventional methods of measuring quality of care focus on average "quality performance scores" across the overall population that a plan serves in different markets or regions; separate assessments and reporting by gender or local area are rare. Without routine tracking and reporting of quality of care by gender, the care received by women is generally assumed to be equal to that received by men. As a result, the quality gap in CVD and diabetes care remains largely invisible to individual women, providers, payers and policymakers, even among those seeking to improve women's health and health care. In cases where gender gaps in care have been monitored and targeted, such as in recent initiatives by the Veterans Health Administration,

marked reductions in gender disparities in CVD and other types of care have been achieved, though some gaps persist (Veterans Health Administration, 2012).

Our study aims to identify gender gaps in care in California and, where they are found, to increase awareness of potential gender disparities and begin to inform approaches to address gaps in care. In this study, we focus on adults who have been diagnosed with CVD and the much larger population of adults diagnosed with a major cardiovascular risk factor, namely diabetes. We use conventional statistical approaches to compare quality of care among men and women and spatial mapping to demonstrate the pattern of gender gaps across the state—focusing on a key measure of CVD and diabetes care for which frequent gender gaps have been observed: annual low-density lipoprotein (LDL) cholesterol testing for CVD and diabetes patients. There is broad agreement among clinicians that all patients with a diagnosis of ischemic heart disease or diabetes should receive annual screenings, for example, for high LDL cholesterol. By focusing on insured patients who already have a diagnosis, insurance, and access to care, we can move beyond the known gender differences in symptoms, presentation, and diagnosis, as well as those in insurance coverage and access to care.

We focus on LDL screening because screening is the first step in assessing quality of care. Testing of LDL levels is a necessary step to initiating or adjusting treatments, such as prescribing lipid-lowering drugs when LDL levels are high. Thus, lack of screening may point to other gaps in the quality of care, including intermediate outcomes, such as whether or not a patient's LDL cholesterol level is adequately controlled to reduce risks associated with CVD and diabetes. Indeed, research on disparities in care often finds that gaps in screening are associated with larger gaps in treatment and poorer intermediate outcomes (Fremont, Correa-de-Araujo, and Hayes, 2007).

Study Approach

This study is designed to assess gender differences in one key aspect of routine CVD care and related prevention among patients with diabetes: LDL screening. By mapping the gaps in LDL screening by gender using data from a major California health plan, the study takes an initial step toward making gender disparities in routine care both visible and actionable in order to motivate systematic efforts to improve women's quality of care. The plan includes patients with several major types of insurance, including commercial health maintenance organization (HMO),[1] commercial preferred provider organization (PPO),[2] Medicaid, and Medicare. Because the study includes a wide range of patients, the results will reflect gaps that may impact many Californians in managed care.

[1] HMO plans are not health insurance plans per se, but rather managed care networks that health insurers contract with to help coordinate high-quality care and control health care costs. Health insurance plan members with commercial HMO insurance typically obtain their insurance through their employer and are required to get all their care within a network of HMO providers, including a primary care physician who is responsible for managing and coordinating the patient's care. HMOs are currently more closely regulated and monitored than PPOs and tend to have more systems and incentives in place to ensure that quality guidelines, such as annual screenings, are followed.

[2] PPO plans also are a network of providers with which the insurer contracts to coordinate high-quality care and control costs. However, in contrast with HMOs, PPO members are generally not required to have a primary care physician (PCP) and can seek care from other providers without clearance by their PCP. Because of different incentives and regulations, systems to support coordination of care and monitor and improve performance on quality measures, such as LDL screening, have tended to be less well developed in PPO networks, though this may be changing in response to recent health reforms.

Our analyses examine two populations: (1) individuals who have ischemic vascular disease (IVD) or who have experienced a cardiovascular event (including acute myocardial infarction, percutaneous transluminal coronary angioplasty, or coronary artery bypass graft) (approximately 30,000 patients); and (2) individuals with a diagnosis of diabetes (approximately 155,000 patients). IVD involves narrowing of blood vessels that can deprive different parts of the body of nutrients and oxygen. Severe narrowing of the vessels, such as that due to atherosclerosis (i.e., plaque buildup of fats in the vessel wall), can cause insufficient blood supply (known as ischemia), which can damage the affected part of the body, including the heart and brain. Coronary artery disease is a kind of IVD affecting the heart and can cause such symptoms as angina or result in an acute myocardial infarction, or, in nonmedical terms, a heart attack. For quality measures, the broader category of IVD is increasingly used instead of CVD because atherosclerotic disease in vessels in one part of the body, such as peripheral vascular disease in the legs, is associated with vascular disease and risks to the heart vessels and those supplying the brain. In both IVD and CVD, treatment to lower LDL cholesterol is a key component of treatment.

To ensure that we have data on the full assessment period, we focus only on CVD and diabetic patients who were continuously enrolled in the insurance plan during the study period. These two populations shed light on key issues in cardiovascular care, including secondary prevention among those with CVD and prevention among those with an easily established and well-documented cardiovascular risk factor. Secondary prevention refers to efforts to improve outcomes and reduce the risk of additional cardiovascular events among those with CVD and the risk of initial CVD events, among those with diabetes.

We first examined the overall gender differences in LDL screening and then examined whether and how other factors are associated with quality of care for these measures and whether rates differ by gender. Next, we tested whether gender differences may be explained by other factors, such as age and insurance type. Finally, we mapped men's and women's quality of care by region, county, and zip code. Mapping differences by geographic level allowed us to identify disparities at the local level, as evidenced by differences between counties or individual zip code areas.

Key Findings

- **Men had higher rates of LDL screening than did women in both the CVD and diabetes populations.** Among adults with CVD, men were more likely than women to receive LDL screening, with 78 percent of men and 73 percent of women receiving the indicated screening. The difference is statistically significant. Although the gender gap of about 5 percentage points in rates of LDL testing points may not appear large, it translates into a relatively large number of women not tested among the 30,000 CVD patients in this one plan who might have been tested if they had been men. For the 155,000 patients with diabetes, the average gender difference in screening was smaller, with 76 percent of the men and 74 percent of the women screened. This difference is also statistically significant.

- **Gender gaps varied by age.** Gender gaps were considerably larger for younger adults than for middle and older age groups. Across genders, CVD patients in the youngest age group (21 to 44) had considerably lower rates of LDL testing (average of 65 percent) relative to middle and older age groups, which averaged 83 and 71 percent, respectively. However, the disadvantage was larger for younger women (15 percentage points lower for women compared with 10 for men). Among diabetes patients, there was little gender difference among those ages 45 to 64. But among those ages 21 to 44, there was a gap of 7 percentage points in rates of testing in men and women (68 percent of men compared with 61 percent of women).

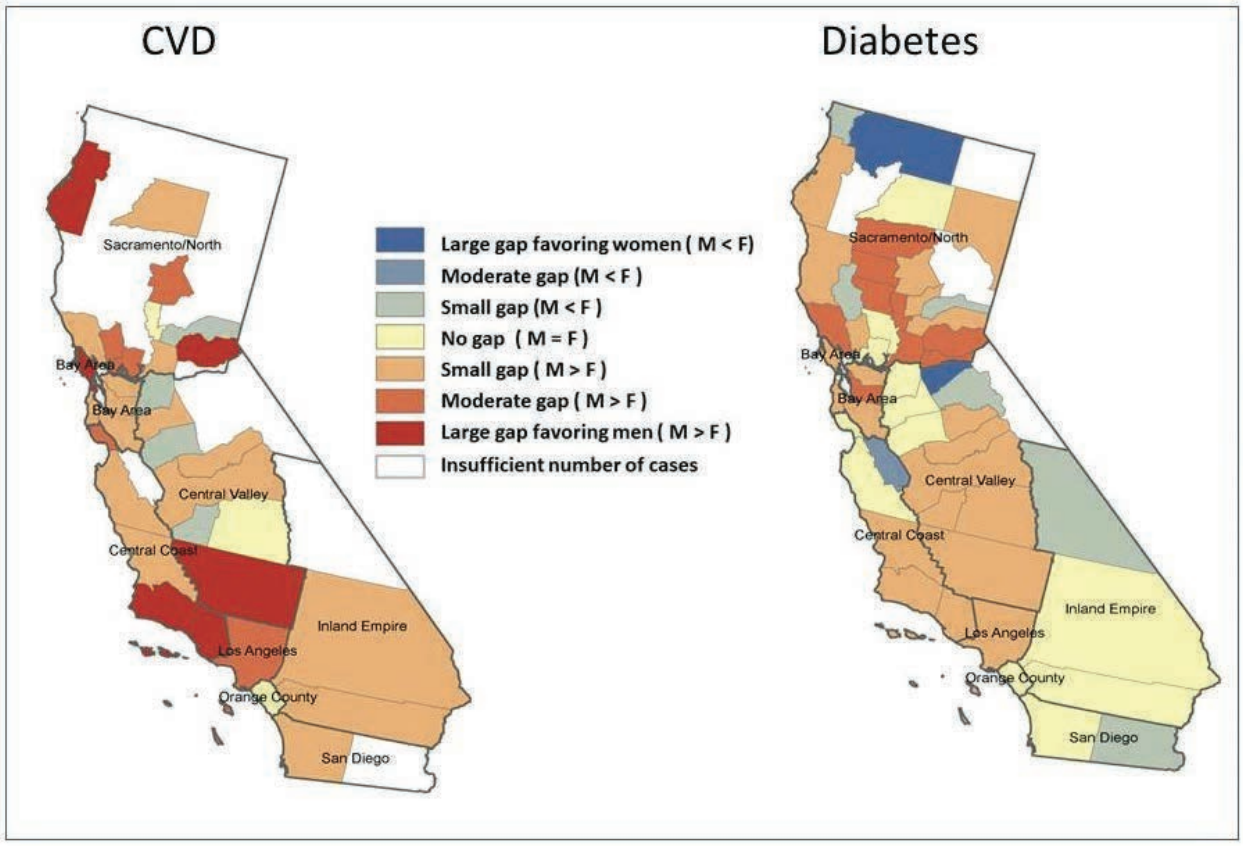
- **Gender gaps differ by insurance type.** The size and pattern of gender gaps varied depending on the type of insurance. For example, on average, we found no significant gender gaps in LDL testing for patients with either CVD or diabetes among those with commercial HMO insurance. However, gender gaps were present for commercial PPO populations. The gender differences among adults in commercial PPO plans remained even after taking into account other factors, such as age, region, and area income. Overall, rates of LDL testing were higher among those with commercial HMO insurance than those with commercial PPO insurance.

- **Gender gaps occurred across regions, counties, and zip codes.** Though average gender gaps were generally small when examined at regional levels, larger and more prevalent gaps were observed as the view shifted to smaller county and zip code levels, respectively. For example, three of eight Integrated Healthcare Association (IHA) regions (38 percent) showed moderate (5 to less than 10 percentage points) gender gaps for LDL screening rates among CVD patients, and all such gaps favored men. None of the regions showed large (10 or more percentage points) gender gaps. Similarly, 35 percent of counties in California had moderate or large gaps favoring men among CVD patients. In contrast, none had large gaps favoring women, and only 12 percent had moderate gaps favoring women. Because of the smaller sample of CVD patients, there were insufficient numbers of cases for us to estimate gender gaps within most zip codes. Among patients with diabetes, no region had moderate or large gender gaps. However, 17 percent of counties had moderate gender gaps among diabetics favoring men. In contrast, 4 percent of counties had large gaps favoring women, and 2 percent had moderate gaps favoring women. More locally, 33 percent of the 725 zip codes with a sufficient number of cases to examine had moderate to large gaps favoring men among diabetics. Only 18 percent of the zip codes had larger or moderate gaps favoring women.

- **Gender gaps favored women in some areas, but they more often favored men**. At the county level, gender gaps tended to favor men, as reflected in Figure S.1. However, we found numerous local areas in which the pattern was reversed, though the gaps favoring women tended to be smaller and less prevalent. For example, among CVD patients, there were gaps favoring men in 79 percent of counties. In 35 percent of counties, those gaps were moderate or large. But there were no moderate or large gaps favoring women at the county level, although in 12 percent of the counties there were small gaps favoring women. Among patients with diabetes, there were moderate gaps favoring men in 17 percent of counties and small gaps favoring men in another 40 percent of counties. In contrast, there were large gaps favoring women in 4 percent of counties, moderate gaps in 2 percent, and small gaps favoring women in another 12 percent of counties. At the zip code level, disparities were

more prevalent and more large disparities were observed, and the disparities continued to favor men more often than women. For example, in 14 percent of zip codes there was a large gap favoring men, and in 7 percent there was a large gap favoring women.

Figure S.1. Gender Gaps in LDL Testing by California County



NOTE: In mapping the data, we show the gender differences only in areas for which there are at least 30 men and 30 women in the eligible population (i.e., health plan members with CVD or diabetes, respectively). We consider gender differences in LDL testing rates of 10 or more percentage points as a large gap, 5 to less than 10 percentage points a moderate gap, 1 to less than 5 percentage points as a small gap, and less than 1 percentage point as no gap.

- **Maps shed light on the patterns of gender disparities across the state.** As illustrated by Figure S.1, maps provide additional information on the distribution of gender disparities in care across the state. The figure shows gender gaps in LDL testing by county. The size of the gender gap differs for counties across the state. Some gaps are larger or smaller than others, while some favor men and others favor women. For example, the map on the right for diabetic care shows several counties in the Northern part of the state with moderate gender gaps (i.e., men's LDL testing rate was 5 to less than 10 percentage points higher than the rate for women), indicated by the dark orange shading. In contrast, in the Southern portion of the state, there are several areas with no apparent gender gaps, indicated by the light yellow shading. There is also a county in the North with large gender gaps favoring women (women's LDL testing rate was 10 or more percentage points higher than the rate for men) shaded with dark blue. Variation in gender differences in care across the state suggests that lessons could be learned both from areas with the highest quality of care and from areas with the fewest gender disparities. One issue is whether disparities are more prevalent when

overall quality of care on LDL screening is high or when it is low.

Maps also provide additional insight into the differences in gaps for patients with CVD compared to those with diabetes. For example, maps allow us to focus on the areas of interest to specific stakeholders or the care of residents of a particular area. The geographic comparisons can themselves motivate efforts to improve care and reduce disparities. For example, mapping quality of care at specific geographic levels can be useful for considering the health care resources available and the neighborhood context when tackling differences, as well as public health and health care planning opportunities (Brownlee and Hurley, 2013; Lurie and Fremont, 2009; Williams et al., 2011). Thus, maps may prove to be essential in mobilizing local and regional stakeholders to tackle disparities efficiently and meaningfully.

- **Gender gaps in care appear to be actionable.** Adults with commercial HMO insurance received higher quality of care based on LDL screening for those with CVD and for those with diabetes, and the gender differences in care were smaller than among adults with commercial PPO insurance. Moreover the absence of gender differences among those with HMO insurance after adjustment for age, region, and area income suggests that gender gaps in care are actionable. The greater oversight and use of quality improvement efforts in HMOs are likely responsible for both the higher quality of care overall and the smaller gender differences compared with PPOs.

Next Steps

- **Gender-stratified reporting of quality of care is needed.** Without data, gender gaps in quality of care are invisible and intractable. Thus, gender-stratified reporting is essential if health plans, health care organizations, and policymakers are to ensure that overall improvements in care narrow rather than increase gender gaps. Moreover, women need to know where there are gaps in care in order to seek higher quality of care and to attain better outcomes. Similarly, providers need to know of gaps, particularly if they are serving women from areas with notable gender gaps.

- **Mapping of quality of care and disparities in care can improve understanding of data**. Quality maps are easy to read and readily understandable by diverse audiences, including women patients and their providers, as well as decisionmakers and other stakeholders. Maps also provide additional insight into variation in overall quality and in disparities in care beyond what is observed in conventional statistical models. Such comparative data are particularly relevant to those accountable for each region, county, and neighborhood and can be scaled to other geographic levels of interest.

- **Mapping of quality of care can make gaps actionable**. Gender gaps in quality vary by region and county in California. The patterns suggest the need to act locally to improve quality of care for women and for patients overall.

- **Geographic variation in quality of care and disparities suggest the need to map care in other California health plans.** Additional insights and opportunities for improving women's cardiovascular care are possible by examining and mapping quality of care across health plans, in order to see whether and how quality varies within and across geographic areas.

Analyses of gender gaps within individual health plans can provide additional plan-specific insights. Moreover, analyses of pooled data from multiple health plans are needed to assess gender disparities in care for CVD and diabetes for managed care patients and determine whether the size and patterns of disparities differ across plans.

Health plans can use the kind of analysis and mapping presented in this report to assess gender differences in quality of care and to motivate improvements in quality of care and in related treatment and outcome measures. Moreover, attention to the gaps in quality of care can inform a broader discussion of the prevalence and burden of CVD in women and the need for improvements in prevention and diagnosis, as well as treatment. By assessing and mapping gender differences in CVD care, this study aims to make disparities in care more visible and actionable than has been previously possible.

While mapping has been used to assess variations in health conditions and medical procedures (Goodman et al., 2010; Goodney et al., 2010), it has been far less commonly applied to assessing disparities in common ambulatory quality measures. To our knowledge, mapping has not been used to assess gender gaps in care. However, this approach can stimulate demand for gender-stratified reporting of quality of care and, in turn, for higher quality of cardiovascular care for women who experience lower quality of care and gender gaps. Understanding the patterns of gender disparities in quality of care and sharing this information with women, their clinicians, other stakeholders, and policymakers can facilitate and accelerate improvement in women's quality of care and outcomes for CVD.

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We also greatly appreciate the willingness of the health plan to share its data for this pilot study. We appreciate its continued efforts to identify and more effectively target gaps in care for the diverse populations it serves. The plan's collaboration on exploratory projects such as this this not only informs its own quality improvement efforts, but also has the potential to help improve care and reduce gaps in care by advancing knowledge and practices throughout California and the rest of the country.

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Abbreviations

ACA	Affordable Care Act
ASCVD	atherosclerotic cardiovascular disease
CVD	cardiovascular disease
HEDIS	Healthcare Effectiveness Data and Information Set
HMO	health maintenance organization
IHA	Integrated Healthcare Association
IVD	ischemic vascular disease
LDL	low-density lipoprotein
NCQA	National Committee for Quality Assurance
PCP	primary care physician
PPO	preferred provider organization

I. Introduction

Gender Differences in CVD and Diabetes

Cardiovascular disease (CVD) and diabetes contribute significantly to the burden of disease among women. More than one in three adult women has some form of CVD (American Heart Association and American Stroke Association, 2013), which includes both heart disease and other vascular diseases. In fact, women spend more years living with CVD than do men, and 26 percent of women over age 45 die within a year of having a recognized heart attack, compared with 19 percent of men (American Heart Association Statistics Committee and Stroke Statistics, 2012). Women also account for 60 percent of the deaths from strokes in the United States. Diabetes is a major cardiovascular risk factor, and it increases risk of CVD more so in women than in men (Roche and Wang, 2013). Thus, high-quality routine care for both CVD and diabetes is at least as relevant to women's health and survival as it is to men's.

It is also the case that CVD is different for women than for men. For example, while the majority of men who suffer heart attacks experience a major coronary artery blockage, at least half of heart attacks in women are likely to be caused by coronary microvascular disease, which involves narrowing or damage to smaller arteries in the heart (Bairey Merz et al., 2006). Because the most common diagnostic tests focus on identifying major coronary artery blockages, these tests are not as accurate for many women, making the diagnosis of CVD more challenging for women (Bairey Merz et al., 2006). Consequently, women often go undiagnosed or untreated for CVD. Both providers and patients may underestimate women's risk. In addition, the optimal treatment for microvascular disease remains unclear; until microvascular disease and other gender differences in CVD are better understood, secondary prevention aimed at screening for and treatment of CVD risk factors may be even more important for women than for men.

The study described here is designed to assess gender differences in one key aspect of routine CVD care and related prevention among patients with diabetes: low-density lipoprotein (LDL) cholesterol screening. By mapping the gaps in LDL screening by gender using data from a major California health plan, the study takes an initial step toward making gender disparities in routine care both visible and actionable in order to motivate systematic efforts to improve women's quality of care.

Gender Gaps in LDL Screening and Control

There is strong consensus that monitoring and controlling LDL cholesterol levels is a crucial component of high-quality care for women and men who have been diagnosed with CVD or diabetes (National Quality Forum, 2002; National Quality Forum, 2010; Stone et al., 2013). Hence, measures of whether LDL is tested at least annually and whether LDL is kept at a healthy level among CVD and diabetic patients have become standard measures of quality for health plans and delivery systems. National studies conducted in 2000 of enrollees in managed care plans and Medicare beneficiaries showed fairly consistent gender gaps, typically favoring men, though sometimes favoring women. These studies found that gender differences in rates of LDL testing were typically small (1 to less than 5 percentage points) or moderate in size (5 to less than

10 percentage points). However, large gaps (10 or more percentage points) were observed for gender differences in achieving control of high LDL cholesterol among both CVD and diabetes patients (Bird et al., 2007). These findings suggest that plans are more effective at screening than at achieving the desired intermediate outcomes (such as achieving control over high LDL) in women as compared with men (Bird et al., 2007; Chou et al., 2007a; Chou et al., 2007b; Chou et al., 2007c; Veterans Health Administration, 2012). Such disparities occur even when there is clinical agreement on the utility and cost-effectiveness of treatment. Moreover, poorer routine care for women with CVD and diabetes occurs despite women's higher utilization of health care services compared with men.

Focus of This Study

This study addresses the need for better understanding of gender differences in quality of care for CVD. Analyses of quality of care typically make direct comparisons across entire populations of patients (such as whether patients with diabetes who have commercial health maintenance organization [HMO] insurance experience higher quality of care in terms of LDL testing than those with commercial preferred provider organization [PPO] insurance). To our knowledge, with the exception of efforts by the Veterans Health Administration, which systematically assesses gender differences in care, overall quality scores are reported by health plans without stratifying by gender. Yet, stratified quality scores can unintentionally hide important and actionable disparities in the quality of care and may not even indicate where care is better or worse for a particular group, such as women. Moreover, statistical analyses typically *control for* differences in sociodemographic factors (such as gender, race/ethnicity, or socioeconomic measures) rather than measuring *whether there are* gender, racial/ethnic, or socioeconomic differences in care. Finally, studies examining gender differences typically seek to assess the average gender differences in quality of care. Unfortunately, evidence showing average gender differences has not been sufficient to motivate requirements for gender-stratified reporting or to engage most stakeholders in assessing and addressing gender differences in quality of routine CVD care locally or nationally.

Our study combines conventional statistical analysis with spatial mapping techniques in order to provide *actionable* information on gender differences in care at the local level, variations in differences across the state, and systematic patterns in care. Understanding gender differences at the local level, including variations in care, is important for developing effective quality improvement efforts targeted to address the needs of women receiving lower-quality care. Our study is designed to describe and map gender differences in CVD and diabetes care at the regional, county, and zip code levels using established quality performance scores derived from data from one California health plan. This information can be used, in turn, to determine how care differs and whether specific types of quality improvement efforts can be implemented or targeted in those areas where women are receiving lower quality of care.

In this study, we use mapping to provide a visual display of geographic variation in quality of care by gender. Mapping geographic variation in quality of care by gender is important to make gender disparities *actionable*:

- Mapping shows whether gender differences are uniform or vary by location.
- Mapping can reveal potential “hot spots” where care is exceedingly poor and where gender disparities are pervasive.
- Mapping makes quality-of-care data relevant and accessible to state and local decisionmakers and stakeholders by identifying the role of local factors and pointing to the need for locally tailored solutions.

Mapping gaps in the quality of care thus can serve as a catalyst to encourage improvements in care to eliminate disparities.

II. Methods

To compare quality of care for any two patient groups (e.g., patients receiving care in different health care systems, patients with different insurance types, or patients living in different geographic areas), we need to be able to precisely define both the groups and the type of care to be studied (e.g., a specific type of screening, treatment, or control over a specific biological risk factor, such as high LDL cholesterol) and then need to ensure that both groups being compared are composed of individuals who need that care.

In this section, we describe the methods used in this study. We begin with a brief discussion of the National Committee for Quality Assurance (NCQA) Healthcare Effectiveness Data and Information Set (HEDIS), which is the source of the quality-of-care measures used in this study. We then describe our dataset and the specific measures and variables used.

Quality of Care Measures

In this study, we use quality-of-care measures from the National Committee for Quality Assurance (NCQA) Healthcare Effectiveness Data and Information Set (HEDIS). The HEDIS quality measures are widely used by health plans to report and track quality of care. HEDIS quality measures are designed to address areas in which there is wide agreement that everyone who is eligible for a given measure should be receiving a certain type of care. For each measure, the percentage of patients who are eligible and have received the indicated care is reported. Standard criteria are applied so that individuals for whom a given test or treatment may not make clinical sense (e.g., because of another medical condition that they have) are excluded and do not affect calculated performance rate.

The HEDIS measures allow us to directly compare the quality of care that two populations or population subgroups received. Therefore, the HEDIS measures can be used to compare the care that women and men received and to examine whether and how gender differences in care vary by patient age and insurance type.

Quality measures shed light on gaps and variation in quality of care. The NCQA notes that over 90 percent of managed care plans use HEDIS measures to assess performance on important dimensions of care (National Committee for Quality Assurance, 2013). Health plans also use the data to determine where to focus their quality improvement efforts. Moreover, employers, consultants, and consumers use HEDIS data to help compare and select health plans. Thus, although reporting quality data to HEDIS is voluntary, plans are motivated to participate. However, to date, NCQA does not require gender-stratified reporting.

Most health plans examine and report HEDIS and other quality performance scores across populations and separately across business lines (e.g., insurance types, including Medicare HMO or PPO). Although most health plans have substantial analytic infrastructure, it is less common for plans to assess or stratify performance by gender or other patient sociodemographic factors. Instead, plans typically use the data to identify all patients who are not receiving high-quality

care and target them individually, which may include prompts to health care providers in the electronic medical record or reminder letters to patients to obtain indicated screenings, or through case management. The individual case-by-case approach can be inefficient and expensive, as it fails to take into account systematic variations in care that may reflect actionable contextual factors or differences in the lives of the patients. Moreover, the case-by-case approach fails to draw insights from areas in which quality is high and disparities in care are not occurring.

The case-by-case approach could be further enhanced by routinely assessing and tracking quality of care for major population groups. This study provides an example of such an analysis. When gaps in care are observed, the data can be analyzed to identify system- or community-level factors that might be used to more efficiently target efforts to improve care for the disadvantaged group as a whole. Without such targeting, quality improvement efforts, such as mail or telephone reminders reminding patients that they are due for a screening test, may unintentionally do more to improve care in the advantaged than in the disadvantaged groups and at times can even increase disparities.

Data and Measures

Data and population studied. In this study, we use California data from a large regional health insurer. Our analyses examine two populations: (1) individuals who have ischemic vascular disease (IVD) or who have experienced a cardiovascular event (including acute myocardial infarction, percutaneous transluminal coronary angioplasty, or coronary artery bypass graft) and (2) individuals with a diagnosis of diabetes. IVD involves narrowing of blood vessels that can deprive parts of the body of nutrients and oxygen. Severe narrowing, such as that due to atherosclerosis (i.e., plaque buildup of fats in the vessel wall), can cause insufficient blood supply and damage parts of the body, including the heart and brain. Such damage is referred to as ischemia. Coronary artery disease is a kind of IVD affecting the heart and can cause such symptoms as angina or result in an acute myocardial infarction (in nonmedical terms, a heart attack). For quality measures, the broader category of IVD is increasingly used instead of CVD because atherosclerotic disease in vessels in one part of the body, such as peripheral vascular disease in the legs, is associated with vascular disease and risks to the heart vessels and those supplying the brain. In both IVD and CVD, treatment to lower LDL cholesterol is a key component of treatment.

Focusing on these two populations allows us to include both those individuals who have been diagnosed with CVD and the much larger population of adults who have been diagnosed with a major cardiovascular risk factor—diabetes—and for whom there are well established screening and treatment guidelines.

For the analyses presented here, Population 1 includes over 30,000 patients who had IVD or a cardiovascular event during the period of study (2010–2011); Population 2 consists of more than 155,000 patients with diabetes. These two populations shed light on key issues in cardiovascular care: (1) secondary prevention to reduce the risk of subsequent CVD events

among those with CVD and (2) prevention among those with an easily established and well-documented cardiovascular risk factor.

To ensure that we have data on the full assessment period, we focus only on CVD and diabetic patients who were continuously enrolled in the insurance plan during the study period. Thus, we focus on insured patients with access to care and specific diagnoses. Because diabetes is far more prevalent than cardiovascular events, the measures for patients with diabetes have much larger sample size. Consequently, the confidence intervals around these results are narrower, and smaller differences can be statistically significant. The larger sample size also means that there are more zip codes with sufficient numbers of patients with diabetes, which allows us to map care for these patients in greater detail than for those with CVD.

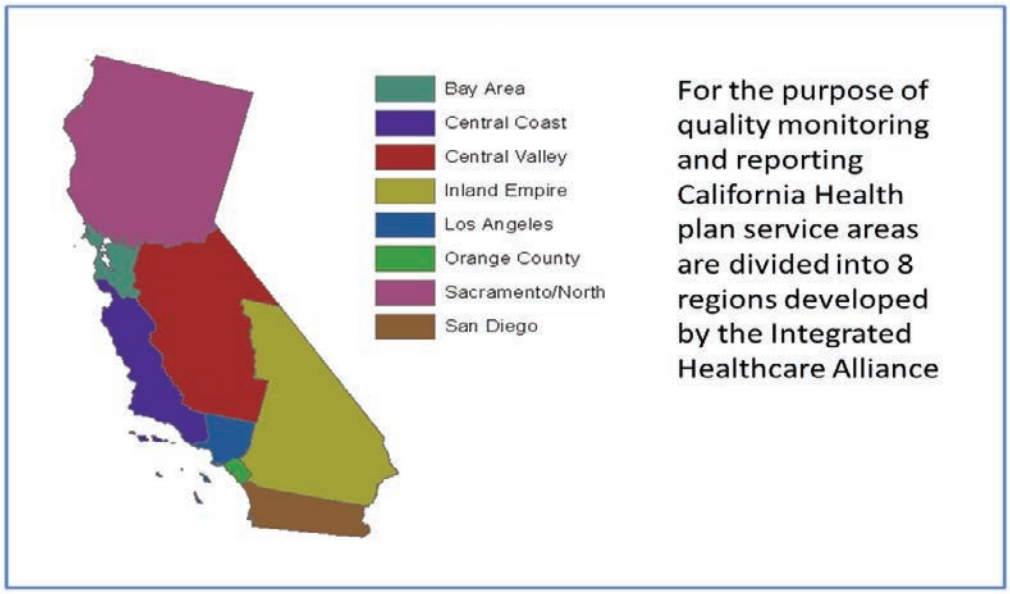
Measures. For both populations, we compare rates of annual LDL screening—i.e., monitoring patients' LDL level—among men and women. We focus on screening measures because screening is the first step in assessing quality of care. Although LDL screening at least once a year does not ensure that patients with high LDL levels will receive treatment to reduce those levels, the absence of testing means that the clinician does not know whether the patient needs additional care. Indeed, for reporting purposes, the NCQA and other quality accreditation organizations assume that if a CVD or diabetic patient does *not* have a documented screening test, the LDL is not appropriately controlled.

We do not examine rates of LDL control in the current study; because data on this measure were available only for a small sample of plan members, there were not enough members to allow us to map gender differences at the local or regional level. However, if the pattern observed in previous studies holds, we would expect that the extent of gender gaps found for screening would be matched by even larger disparities among control measures.

Other variables. We also examine quality of care in relation to several variables other than gender. First we consider age, to see whether overall quality or gender differences in care vary with age. Next we examine whether care varies by patient insurance type. The data include patients with Medicare, commercial HMO, commercial PPO, and Medicaid insurance. The largest groups are those with commercial HMO or commercial PPO insurance, so we compare care across those two insurance types. We compared quality of care at multiple geographic areas, including the eight geographic regions used in HEDIS reporting by the Integrated Healthcare Alliance (IHA;[3] see Figure 1), county, and zip code. For some multivariate models, we also take into account area income measures derived from Census data.

[3] IHA is a statewide multistakeholder leadership group that promotes quality improvement, accountability, and affordability of health care in California. It is a nonprofit association and is working to actively convene all health care parties for cross-sector collaboration on health care topics. IHA administers regional and statewide programs and serves as an incubator for pilot programs and projects.

Figure 1. California Regions



We begin by comparing overall gender differences in LDL screening among the CVD and diabetes populations. We then examine whether and how other factors are associated with quality of care for LDL screening and whether these differ by gender. HEDIS measures are designed to include only individuals who should receive the care being considered. Hence, the convention for quality reporting of these measures is to report and assess them without making statistical adjustments for such factors as age and insurance type. We follow this convention in the primary statistical analyses of overall gender differences, as well as in mapping of gender differences at the regional, county, and zip code levels.

We conducted selected analyses in which we adjusted statistically for such factors as age and insurance type. This approach, called multivariate regression, can assess statistically whether observed differences in care are attributable to other measured factors. We used multivariate regression to assess whether gender differences in quality of care persist after taking into account patient age, insurance type, geographic region, and area income.

We also conducted some secondary analyses to assess whether the same basic relationships hold within specific groups. Because having commercial HMO insurance was associated with higher rates of LDL testing, we did separate multivariate analyses for those patients with commercial HMO insurance and for those with commercial PPO insurance. For all analyses, we considered P values < 0.05 to be statistically significant.

Finally, we map the gender disparities to display the geographic variation in quality of care. Locations are defined by patients' residential zip code. In mapping the data, we show the gender differences only in areas for which there are at least 30 men and 30 women in the eligible population (i.e., health plan members with CVD or diabetes, respectively). This approach, based on NCQA HEDIS guidelines, helps to minimize variation associated with having too few cases

of either gender and also helps to protect privacy of individual patients. As a result of this restriction on the data, more areas are shown without data (as indicated by white areas on the maps) as we move from regions to counties and from counties to zip code.

III. Findings

We begin by comparing overall gender differences in LDL screening among the CVD and diabetes populations. We then examine whether and how other factors are associated with quality of care for LDL screening and whether these differ by gender. Next, we test for independent effects of gender on quality of care when various other factors are taken into account. Finally, we map the gender disparities to display the geographic variation in quality of care.

Overall Patterns in LDL Screening

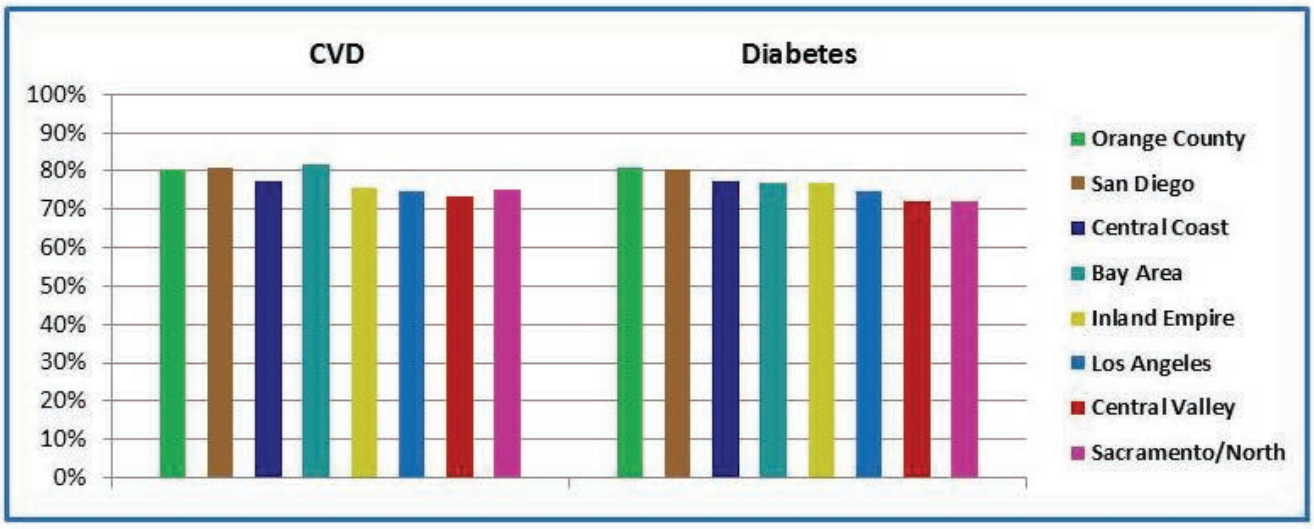
Men had higher rates of LDL screening than did women in both the CVD and diabetes populations. Among adults with CVD, men were more likely than women to receive LDL screening, with 78 percent of men and 73 percent of women receiving the indicated screening. The difference is statistically significant. Although the gender gap of about 5 percentage points in rates of LDL testing points may not appear large, it translates into a relatively large number of women not tested among the 30,000 CVD patients in this one plan who might have been tested if they had been men. For the 155,000 patients with diabetes, the average gender difference in screening was smaller, with 76 percent of the men and 74 percent of the women screened. This difference is also statistically significant.

LDL screening rates were higher for individuals in commercial HMOs than for those in commercial PPOs in both the CVD and diabetes populations. Among patients with CVD, 81 percent of commercial HMO patients received screening, while commercial PPO patients fared significantly worse, with 75 percent receiving screening. The pattern was similar among patients with diabetes. Whereas 80 percent of commercial HMO patients received LDL screening, only 75 percent of PPO patients did.

Quality of care also varied significantly by age. We examined quality of care across three age groups: 21 to 44, 45 to 64, and 65 to 78. The guidelines call for annual screening of both groups of patients irrespective of age. On average, 65 percent of those ages 21 to 44 received the indicated screening, compared with 83 percent of those ages 45 to 64, and 71 percent of those ages 64 to 78. The differences are statistically significant. Among patients with diabetes, the pattern was similar, with 64 percent, 79 percent, and 73 percent receiving screening, respectively. Here, too, the differences are statistically significant.

Overall performance rates on LDL testing for CVD and diabetes patients varied significantly among different regions of the state. The bars in Figure 2 are colored to match the eight California regions. For the CVD population, quality varied by 8 percentage points. LDL testing rates for the CVD population were highest in the San Francisco Bay Area and lowest in the Central Valley. For patients with diabetes, LDL testing rates were 9 percentage points higher in Orange County, the highest-performing region, than in Sacramento/North, the lowest-performing region.

Figure 2. Overall LDL Testing Rates by Region and Condition



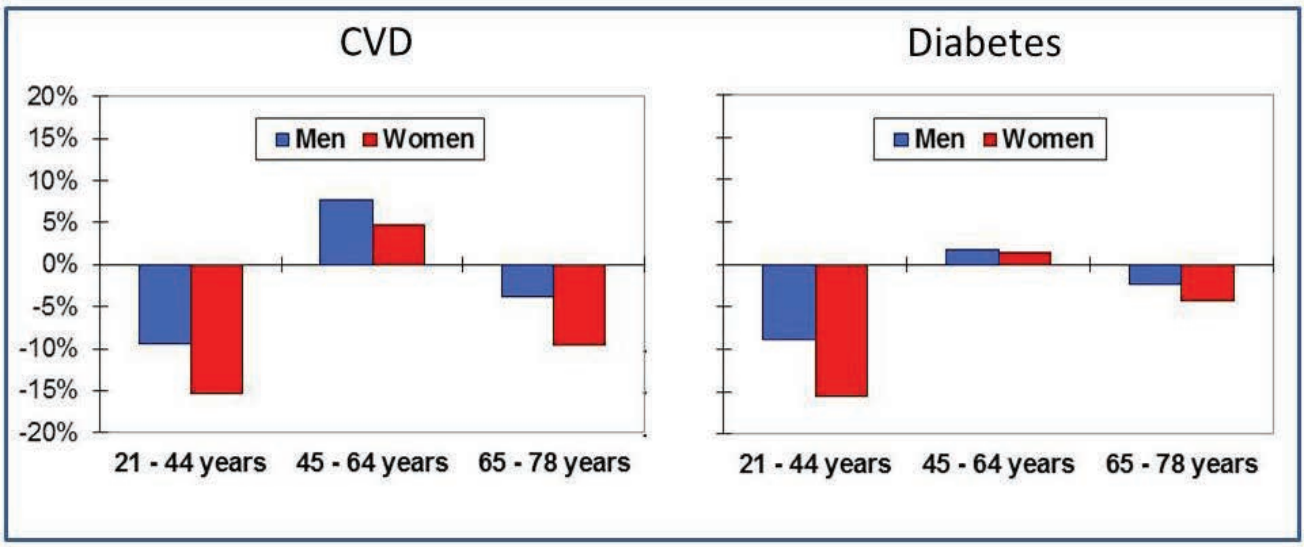
Gender differences persisted even after other factors were taken into account. We used multivariate analyses to statistically adjust for effects of age, insurance type, region, and area income. This approach allows us to assess the gender differences in screening rates of men and women after accounting for these factors. Taking these factors into account, women with CVD were 19 percent less likely than men to receive the indicated LDL screening. Among those with diabetes, women remained 6 percent less likely than men to receive the indicated screening. In these models, HMO patients remained more likely than PPO patients to receive LDL screening in both CVD and diabetes populations.

Effects of Other Factors on Gender Differences in Care

Gender differences varied depending on whether the patient had HMO or PPO insurance. We found that, among CVD patients with commercial PPO insurance, women were 7 percent less likely than men to receive LDL testing, even after adjusting for age, region, and area income. However, women in commercial HMOs were equally as likely as men to receive LDL screening. Among diabetes patients, women in commercial PPOs were 3 percent less likely than men to receive LDL testing, but those in commercial HMOs were equally as likely as men to receive LDL testing.

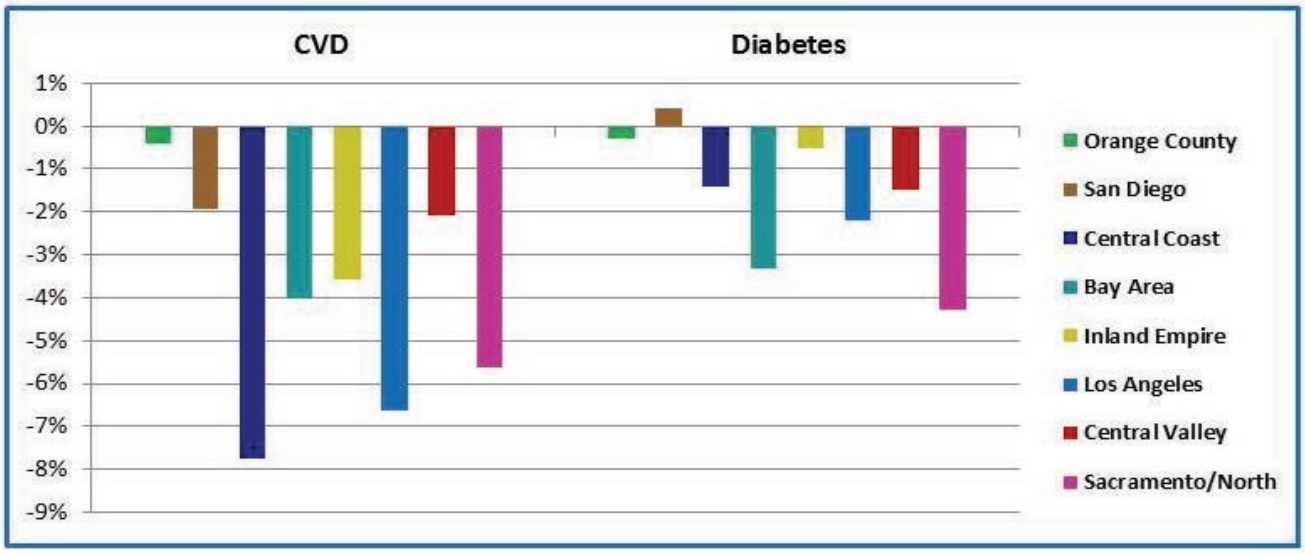
Gender gaps varied by age group and whether the patient had CVD or diabetes. Figure 3 shows the difference between the average testing rates for men and women in the three age groups described earlier. Though CVD and diabetes patients in the youngest group had considerably lower rates of LDL testing, regardless of their gender, the disadvantage was even larger for women (a 10-percentage-point deficit for men and a 15-percentage-point deficit for women). Though there were also notable gender gaps for CVD patients in the other two age groups, there were no significant gender gaps for 45- to 64-year-olds with diabetes and only a small gap for those in the oldest group.

Figure 3. Difference from Average LDL Testing Rate by Gender, Age, and Condition



Gender differences in care also varied across the eight regions. As shown in Figure 4, among CVD patients, the size of the gap ranged from 8 percentage points in the Central Coast to less than 1 percentage point in Orange County. The gaps for diabetes patients were slightly smaller, ranging from an advantage for men of just over 4 percentage points in the Sacramento/North region to an advantage for women of less than 1 percentage point in San Diego.

Figure 4. Gender Gaps in LDL Testing Rates by Region and Condition

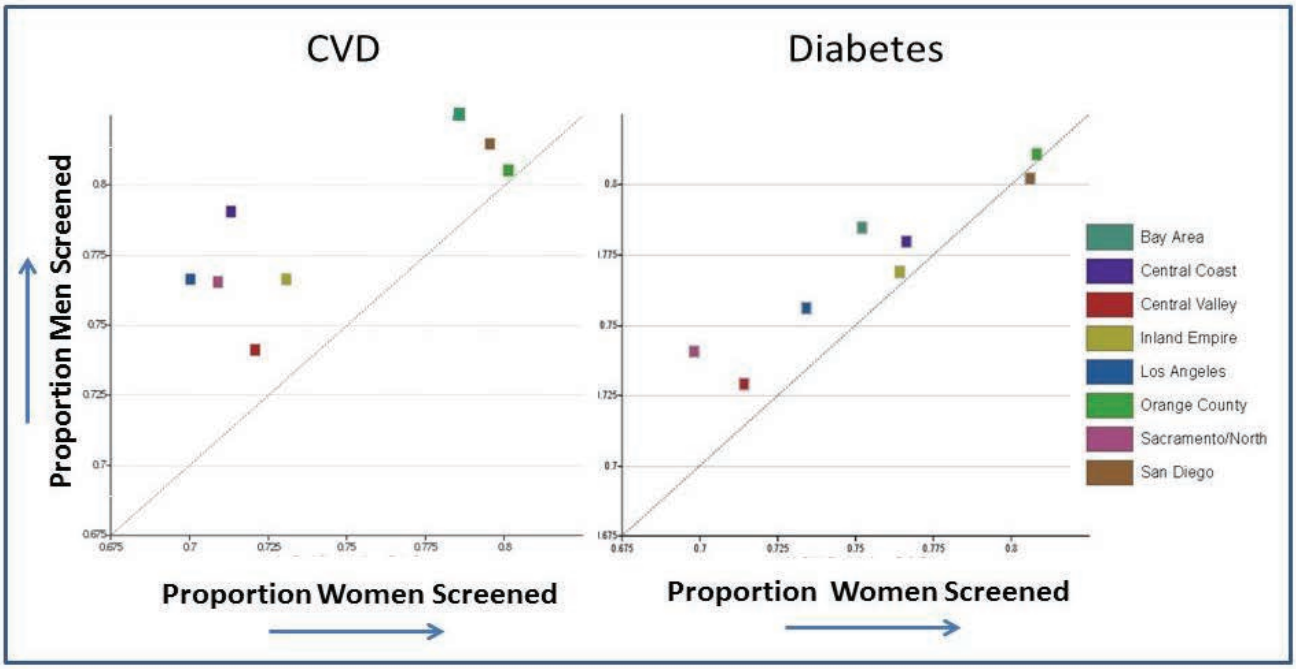


NOTE: Negative ranges indicate an advantage for men; positive ranges indicate an advantage for women.

Gender gaps in LDL screening rates tended to vary somewhat with regions' overall performance rates, with larger gaps in the regions with the lowest average performance. This

pattern can be seen more clearly in Figure 5, which shows the testing rate for men on the vertical axis and for women on the horizontal axis. Squares above the diagonals denote regions with gender gaps favoring men, and those below the diagonal denote regions with gender gaps favoring women. For example, Orange County, the region with the best overall performance for CVD and diabetes, is indicated by the bright green square in the upper right corner of the CVD and diabetes figures. In both cases, there is almost no gender gap, and the green square is plotted very close to the diagonal line. In contrast, the purple square for the Sacramento/North region is shown above the diagonal to the far left of the figures. Gender disparities within each of the eight regions were larger for CVD than for diabetes.

Figure 5. LDL Testing Rate for Men and Women by Region and Condition



Mapping Gender Disparities in Care

Although it can be instructive to present comparative information on gender differences in LDL testing rates in bar charts and scatterplots, displaying the data in maps, such as those that follow, can be more meaningful and useful for some stakeholders.

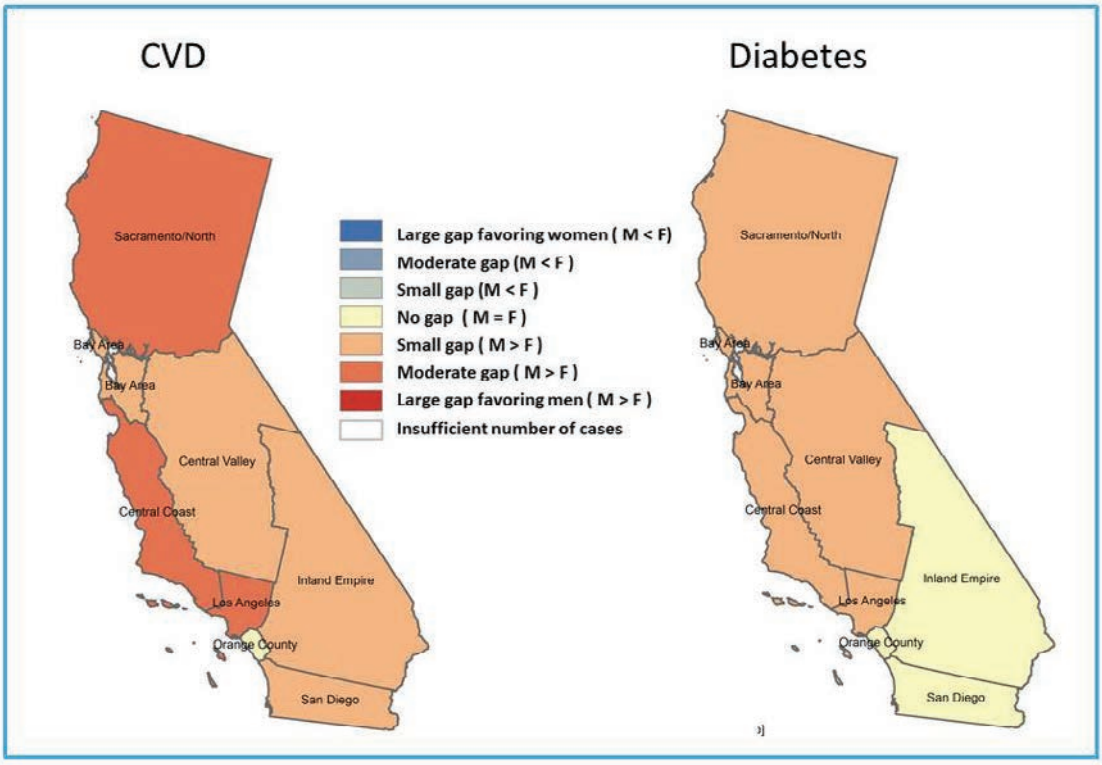
LDL Testing Rates by Region

Figure 6 uses maps to highlight gender gaps in LDL testing rates by region for CVD and diabetes patients. These maps convey the same basic information as the bar charts in Figure 4 but may be easier to interpret for some stakeholders. In addition, these maps can be tailored to focus on specific regions of interest, rather than providing national or statewide averages.

For CVD patients, there are three regions (Sacramento/North, Central Coast, and Los Angeles) with moderate-sized gender gaps favoring men, indicated by the orange shading. Four

of the remaining regions show only small gaps favoring men. One region, Orange County, has no gap. For diabetes patients, the map shows that there are no apparent gender gaps in three regions (Orange County, San Diego, and the Inland Empire), while there are small gaps favoring men in the other five regions.

Figure 6. Gender Gaps in LDL Testing by California Region



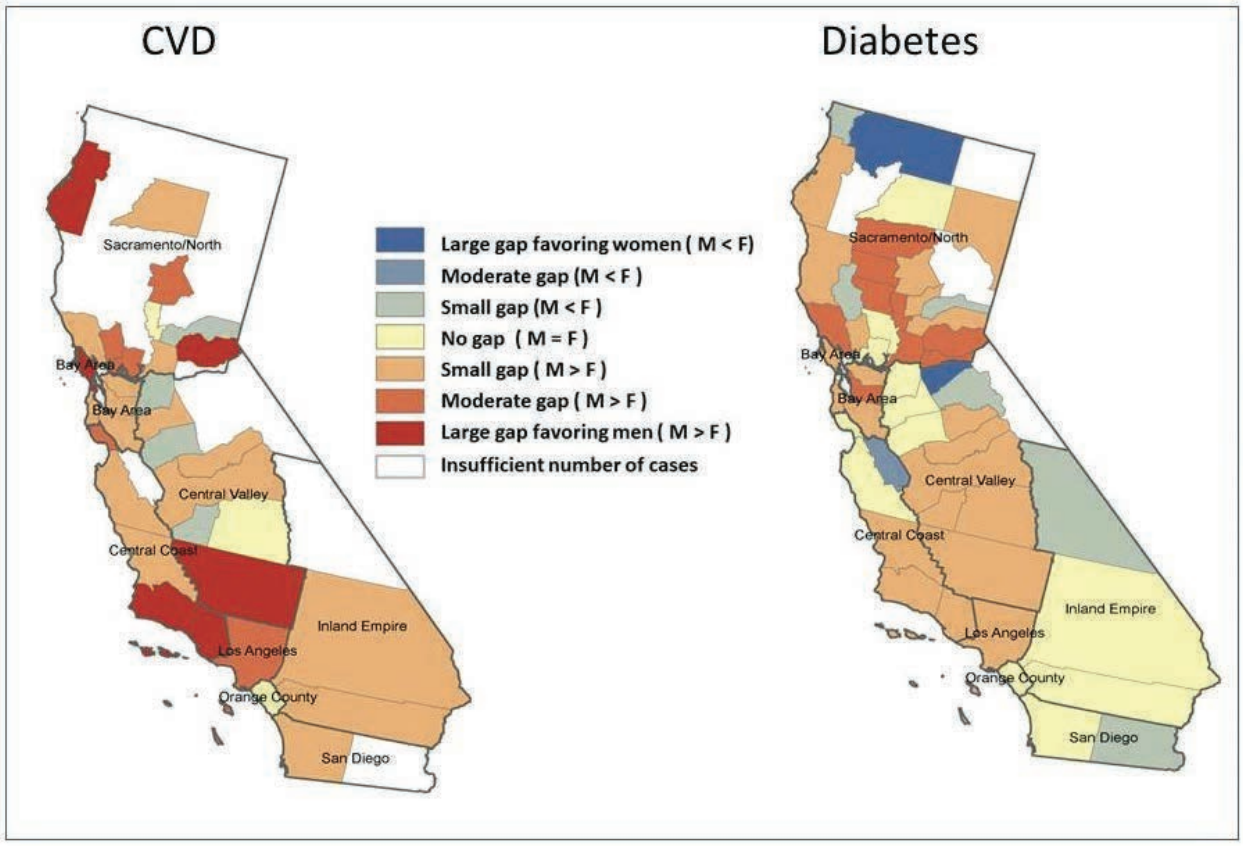
NOTE: The size and type of gender gap is determined by comparing the percentage of men with CVD or diabetes in an area who received the LDL cholesterol test with the percentage of women who received the test. For example, if 80 percent of men and 74 percent of the women were tested, there would be a 6-percentage-point gap favoring men. We classify gender differences in testing rates that are less than 1 percentage point as having no gaps, 1 to less than 5 percentage points as small gaps, 5 to less than 10 percentage points as moderate gaps, and 10 or more percentage points as large gaps.

LDL Testing Rates at the County and Local Levels

While assessing and reporting gender differences in care at the regional level can be compelling, restricting the reporting of quality differences to this geographic level may obscure important differences at the county and local levels. As shown in the set of figures that follows, mapping the gender gaps in LDL testing at the county and local level reveals additional variation in rates and highlights local areas with notable gaps that could be investigated in more detail. For many stakeholders, including women and their health care providers, local data are more meaningful than state or regional averages. For some areas, data from additional health plans may be needed to show whether there are local gender gaps. Following the standard reporting practice for HEDIS measures, we left mapping areas blank if there were fewer than 30 men and 30 women plan members who were eligible for the quality measure (e.g., LDL testing for CVD or for diabetes).

The gender disparities in care differ across the state for patients with CVD from those with diabetes. It appears that achieving gender equity for patients with one diagnosis does not guarantee that equity will be achieved for patients in the same county with a different diagnosis (Figure 7). See, for example, the Inland Empire in the southeastern portion of the state, which has a small gap in LDL testing favoring men among CVD patients and no gender gap among patients with diabetes. These differences occur not only for the least populated areas in the northern and eastern sections of the state, but also for some of the urban centers. However, the variation in gender differences in care across the state suggests that lessons could be learned both from areas with the highest quality of care and from areas with the fewest gender disparities.

Figure 7. Gender Gaps in LDL Testing by California County

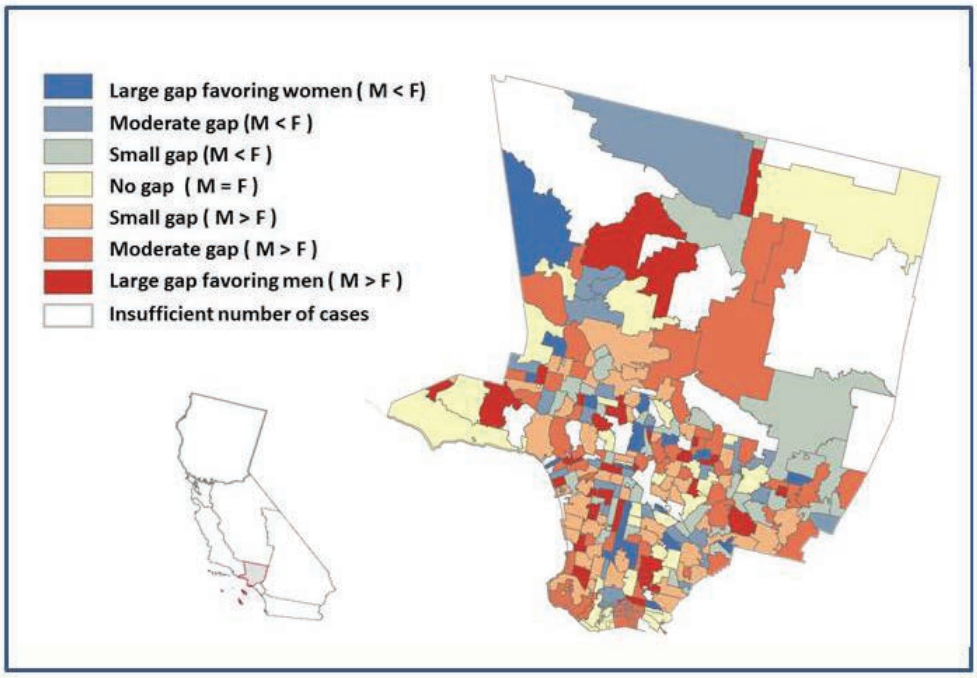


NOTE: In mapping the data, we show the gender differences only in areas for which there are at least 30 men and 30 women in the eligible population (i.e., health plan members with CVD or diabetes, respectively). White sections of the map indicate those areas with insufficient numbers of patients to assess gender differences. We consider gender differences in LDL testing rates of 10 or more percentage points as a large gap, 5 to less than 10 percentage points as a moderate gap, 1 to less than 5 percentage points as a small gap, and less than 1 percentage point as no gap.

The lack of shading in many more counties on the CVD map than in the diabetes map reflects the fact that there are approximately five times as many plan members with diabetes as with CVD. Consequently, in some of the less-populated counties that the plan serves, there may be too few members with CVD to allow gender gaps to be estimated, although there are enough cases of diabetes to assess gender gaps for that condition.

The extent of local variation can be most clearly seen in more densely populated areas, such as Los Angeles County, where the majority of the zip codes have enough plan members with CVD or diabetes to estimate gender gaps. Recall that in Los Angeles County, there appears to be only a small gender gap of about 2 percentage points favoring men. However, a closer examination at the zip code level (Figure 8) suggests that there is wider variation in the size and even in the direction of the gender gaps in some zip codes. For example, there are many instances of adjacent zip codes within the same county, as shown here for Los Angeles County, having very different patterns of gender gaps. One area might have a large gender gap favoring men, while a neighboring area has a large gap favoring women.

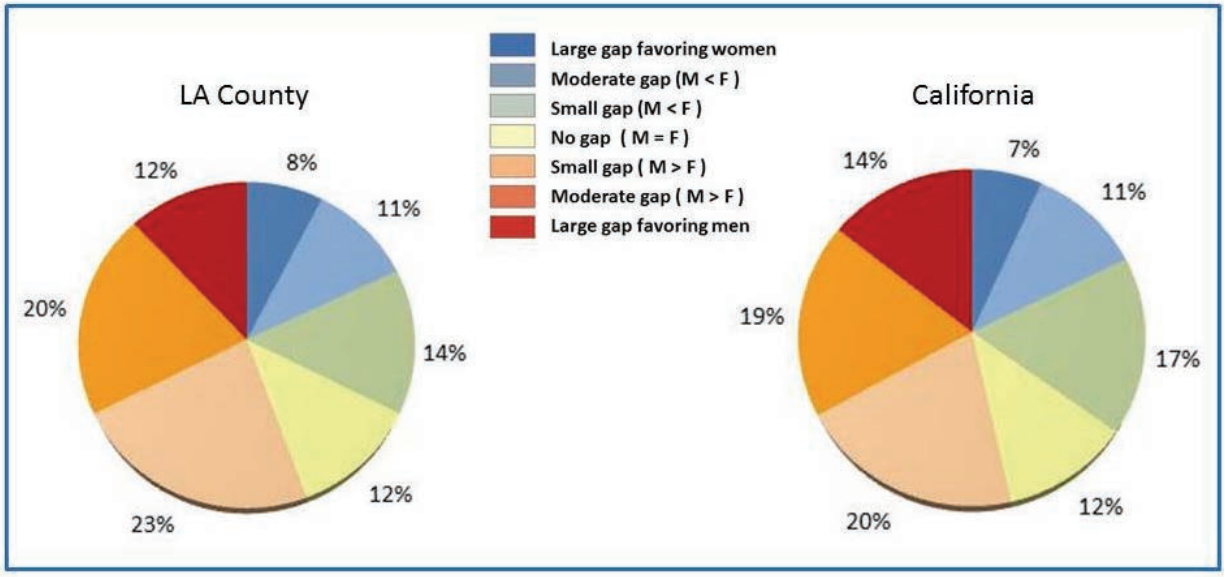
Figure 8. Gender Gaps in LDL Testing of Diabetics in Los Angeles County by Zip Code



NOTE: We classify gender difference in testing rates for an area as follows: less than 1 percentage point is no gap, 1 to less than 5 percentage points is a small gap, 5 to less than 10 percentage points is a moderate gap, and 10 or more percentage points is a large gap. For example, a zip code with 80 percent of men and 74 percent of the women tested would have a 6-percentage-point gap and would be classified as having a moderate gap favoring men.

Of the 250 zip codes in Los Angeles County with enough cases to assess gender gaps, 81, or nearly one-third of all zip codes (32 percent), had moderate or large gaps favoring men. Another 45 zip codes (18 percent) had moderate or large gender gaps favoring women. These basic patterns are not unique to Los Angeles County (see Figure 9). Indeed, among the 725 zip codes throughout California with sufficient numbers of diabetic members to assess gender gaps, 33 percent and 18 percent of the zip codes, respectively, had moderate or large gender gaps favoring women or men. The ability to map gender differences by zip code shows that gender differences exist even when such disparities are not apparent on a regional or statewide scale. Although some zip codes are more densely populated than others, taking the distribution of patients across zip codes into account did not change the basic pattern shown here.

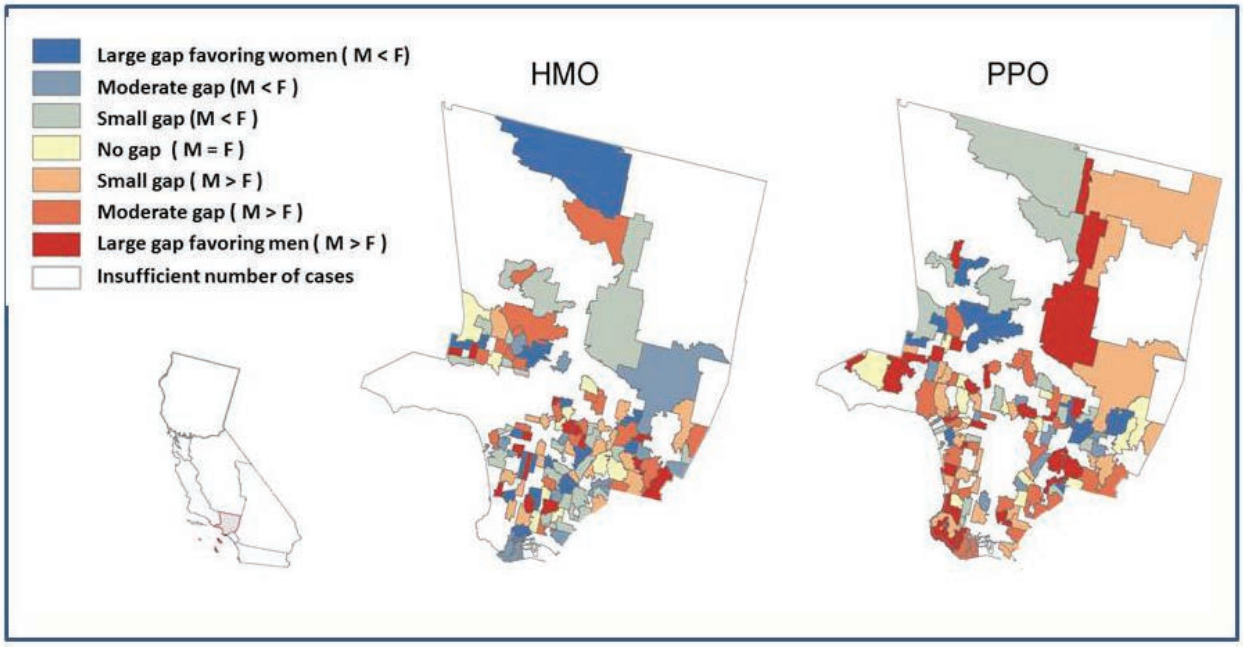
Figure 9. Percentage of Zip Codes with Each Type of Gender Gap in LDL Testing for Diabetics in Los Angeles County and Statewide



NOTE: We classify the type of gender gaps in an area as follows: areas with less than a 1-percentage-point difference between the LDL testing rate for men and women have no gap, 1 to less than 5 percentage points is a small gap, 5 to less than 10 percentage points is a moderate gap, and 10 or more percentage points is a large gap. For example, a zip code with 80 percent of men and 74 percent of the women tested would have a 6-percentage-point gap and would be classified as having a moderate gap favoring men.

The final map below (Figure 10) shows gender gaps in LDL screening rates among diabetics at the zip code level but this time shows separate maps for plan members with commercial HMO and commercial PPO insurance, respectively. Here we see that, among plan members with commercial insurance, gender differences in LDL screening rates appear to depend not only on where a person lives, but also on whether their insurance type is HMO or PPO.

Figure 10. Gender Gaps in LDL Testing in Los Angeles County by Insurance Type and Zip Code



IV. Conclusion and Implications

This research has important implications for women, their clinicians, other stakeholders, and policymakers. Although the deficits in women's cardiovascular care may have developed unintentionally, their persistence as indicated by prior research and this study suggests that efforts to address them need to be both intentional and focused.

The research revealed variation in the overall quality of care for patients with CVD and diabetes in California, as well as gender disparities in care. Among the most striking findings is that gender differences in care varied by age, with larger gender gaps in care among both younger and older adults than those ages 45–64. Gender gaps in screening and treatment of younger adults in the general population might be due in part to poor recognition of women's cardiovascular risk at younger ages. However, age should be irrelevant among those diagnosed with CVD or diabetes, which increases women's CVD risk more than men's, particularly in premenopausal women (Roche and Wang, 2013). Meaningful gender disparities exist among those with a CVD and diabetes diagnosis. Moreover, the fact that gender disparities were larger among patients with CVD suggests the need for targeted efforts to improve the quality of women's routine care for CVD.

The better quality of care and smaller gender disparities among patients with commercial HMO insurance compared with those with commercial PPO insurance suggest that gender disparities are actionable via systematic efforts to improve quality of care. The greater oversight and use of quality improvement efforts to ensure that routine screenings are carried out in HMOs are likely responsible for higher rates of screening and smaller gender differences compared with PPOs. This suggests that gender differences in quality of care can be reduced. This finding is consistent with the Veterans Health Administration's success in reducing gender differences in quality of care for CVD and diabetes and for other aspects of care (Veterans Health Administration, 2012). Although California is among the states with the highest penetration of HMOs (managed care) in the country, nearly half of commercially insured women in California still receive their care through PPOs (Henry J. Kaiser Family Foundation, 2013).

Moreover, the study demonstrates that mapping can be used to assess gender disparities in care and to make this information accessible and actionable by identifying regional and local targets for intervention. The maps indicate considerable variation in gender differences in quality of care across the state, with women in some areas experiencing far larger gaps in care than reflected by the averages. The existence of a gender gap in LDL screening for patients with CVD and those with diabetes indicates that, despite some gains in overall quality of care over the last decade, efforts are needed to improve women's care. Moreover, variation in gender disparities suggests that women in some areas are receiving markedly inferior routine care at the most basic levels, compared with men in the same geographic area.

The study demonstrates the need for and potential value to decisionmakers of gender-stratified reporting and analyses. Given that women comprise the majority of the adult

population—and constitute the majority of adults living with CVD and of adults dying of CVD annually—gender-based reporting is warranted. Whereas the lower prevalence of CVD events among women compared with men has in the past been used to argue against gender-stratified reporting, pooling data across geographic areas, insurance types, health plans, or years can overcome such limitations.

The findings in this report become more important in light of new guidelines for lowering cholesterol in patients with CVD. In November 2013, the American College of Cardiology and the American Heart Association Task Force on Practice Guidelines issued a new guideline for statin use to reduce cholesterol in four groups of patients: individuals (1) with *clinically established* atherosclerotic cardiovascular disease (ASCVD), (2) with primary elevations of LDL cholesterol greater than 190 mg/dL, (3) with diabetes aged 40 to 75 years with LDL cholesterol from 70 to189 mg/dL and without clinical ASCVD, or (4) without *clinical* ASCVD or diabetes with LDL cholesterol from 70 to189 mg/dL and estimated ten-year risk of an ASCVD event that is greater than 7.5 percent (Stone et al., 2013). Given the significant gender differences in meeting the guidelines for cholesterol screening, disparities are likely to persist under the new guideline. Systematic assessment of gender differences in this treatment of these four patient groups will be critical to ensuring that women and men receive high quality of care for CVD and diabetes.

Though the analyses were limited to one health plan, they reveal meaningful findings and new insights into issues regarding gender differences in quality of care that are not currently "on the radar" for decisionmakers (either for health plans or for quality improvement organizations). This study also provides a proof of concept demonstrating the need for and potential value to decisionmakers of gender-stratified reporting and analyses. While working with a single plan is revealing, this work will become much more informative and impactful when we are able to build on this study by obtaining access to data from multiple plans to better characterize regional gender differences in care across the state, as well as differences within smaller areas and communities. Expansion of these types of analyses to more plans across the state will also serve as a model for examining care in other states.

Finally, the rest of the country is currently looking to California as a model for expanding coverage under the Affordable Care Act (ACA). California is seen as a bellwether for the success of the ACA. The ability to track and address disparities in routine care will be critical to serving both the newly insured and the entire population of women.

Next Steps

- **Gender-stratified reporting of quality of care is needed.** Without data, gender gaps in quality of care are invisible and intractable. Women and their providers need to know where there are gaps in care in order to seek higher quality of care and to attain better outcomes.

- **Mapping of quality of care and disparities in care can improve understanding of data.** Quality-of-care maps are easy to read and readily understandable by diverse audiences,

including women patients and their providers, as well as decisionmakers and other stakeholders. Maps also provide additional insight into variation in overall quality and disparities in care beyond what is observed in conventional statistical models.

- **Mapping of quality of care can make gaps actionable.** Variation in quality-of-care gaps across and within regions and counties in California suggests the need to act locally to improve quality of care for women and for patients overall.

- **Geographic variation in quality of care and disparities suggests the need to map care in other California health plans.** Additional insights and opportunities for improving women's cardiovascular care are possible by examining and mapping quality of care across health plans, in order to see whether and how quality varies within and across geographic areas. Analyses of individual health plans can provide additional plan insights. Moreover, analyses of pooled data from multiple health plans are needed to assess gender disparities in care for CVD and diabetes for managed care patients and to determine whether the size and patterns of disparities differ across plans.

Conclusion

Health plans can use the kind of analysis and mapping presented in this report to assess gender differences in quality of care and to motivate improvements in quality of care and in related treatment and outcome measures. Moreover, attention to the gaps in quality of care can inform a broader discussion of the prevalence and burden of CVD in women and the need for improvements in prevention and diagnosis, as well as treatment. By assessing and mapping gender differences in CVD care, the study aims to make disparities in care more visible and actionable than has been previously possible. We also hope to create demand for gender-stratified reporting of quality of care and, in turn, for higher quality of cardiovascular care for women who experience lower quality of care and gender gaps. Understanding the patterns of gender disparities in quality of care and sharing this information with women, their clinicians, other stakeholders, and policymakers can facilitate and accelerate improvement in women's quality of care and outcomes for CVD.

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