

# Is Anyone Paying Attention to Physician Report Cards? The Impact of Increased Availability on Consumers' Awareness and Use of Physician Quality Information

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**Objective.** To determine if the release of health care report cards focused on physician practice quality measures leads to changes in consumers' awareness and use of this information.

**Primary Data Sources.** Data from two rounds of a survey of the chronically ill adult population conducted in 14 regions across the United States, combined with longitudinal information from a public reporting tracking database. Both data were collected as part of the evaluation for Aligning Forces for Quality, a nationwide quality improvement initiative funded by the Robert Wood Johnson Foundation.

**Study Design.** Using a longitudinal design and an individual-level fixed effects modeling approach, we estimated the impact of community public reporting efforts, measured by the availability and applicability of physician quality reports, on consumers' awareness and use of physician quality information (PQI).

**Principal Findings.** The baseline level of awareness was 12.6 percent in our study sample, drawn from the general population of chronically ill adults. Among those who were not aware of PQI at the baseline, when PQI became available in their communities for the first time, along with quality measures that are applicable to their specific chronic conditions, the likelihood of PQI awareness increased by 3.8 percentage points. For the same group, we also find similar increases in the uses of PQI linked to newly available physician report cards, although the magnitudes are smaller, between 2 and 3 percentage points.

**Conclusions.** Specific contents of physician report cards can be an important factor in consumers' awareness and use of PQI. Policies to improve awareness and use of PQI may consider how to customize quality report cards and target specific groups of consumers in dissemination.

**Key Words.** Public reporting, consumer awareness, physician quality information, health care report cards, health care quality

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The lack of transparent health care quality information has been identified as an important contributor to low-quality care (Lansky 2002; Fung et al. 2008), and the benefits of making comparative quality information available to the public have been increasingly recognized in research, policy, and practice (Sage 1999; De Brantes and Galvin 2001; Sinaiko, Eastman, and Rosenthal 2012). Significant resources have been devoted to reporting quality measures pertaining to health plans, hospitals, nursing homes, and, more recently, physician practices. In the public sector, this has been historically exemplified by the Centers for Medicare and Medicaid Services' "Hospital Compare" website. The Affordable Care Act has mandated the addition of "Physician Compare," which began reporting physician performance data in 2014 (Centers for Medicare & Medicaid Services 2013).

The public availability of provider performance information may contribute to quality improvement by encouraging providers to increase their internal quality monitoring and improvement efforts and to maintain or enhance their reputations in the community (Berwick, James, and Coye 2003). Purchasers and payers can create financial incentives by tying performance to payment (Lindenauer et al. 2007), and performance data also can be used to support accreditation standards (Marshall et al. 2000; Ito and Sugawara 2005). Consumers' awareness and use of performance data may also drive quality improvement through several "pathways" (Mehrotra et al. 2012). First, consumers equipped with this information can make decisions about health care services and providers with a better understanding of the qualities associated with the available choices, potentially raising the level of quality competition among providers. Second, when consumers' choices are limited due to various factors (e.g., geographic location or limited provider availability), standardized provider quality information may enable consumers to interact with their current providers in ways that lead to better care (e.g., expressing concerns over certain aspects of care based on published provider performance). To date, the effectiveness of public reporting in

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contributing to improved quality through any of these channels is still in question (Fung et al. 2008; Schlesinger et al. 2014).

Research findings are mixed regarding the degree to which public quality reporting affects consumer choice of providers, referral patterns, quality improvement, and market outcomes of providers (Scanlon et al. 2002; Uhrig and Short 2002; Jung, Feldman, and Scanlon 2011; Hibbard et al., 2012). Some studies report minimal or no impact (Epstein 2010; Grabowski and Town 2011), whereas others find small or modest impact (Hirth et al. 2003; Chernew, Gowrisankaran, and Scanlon 2008; Werner et al. 2009). When statistically significant effects were found, they tended to be heterogeneous across different outcomes (Mukamel et al. 2008), different consumers (Jin and Sorensen 2006), and different providers (Clement, Bazzoli, and Zhao 2012), as well as different market conditions (Chou et al. 2014).

The literature examining consumers' awareness and use of publicly available physician quality information (PQI) is limited, given the relative newness of these reports, with some existing evidence suggesting that awareness of PQI is low (Schneider and Epstein 1998; Abraham, Feldman, and Carlin 2004; Sinaiko, Eastman, and Rosenthal 2012; Christianson et al. 2014; Scanlon et al. 2015). A handful of articles analyzing the factors associated with PQI awareness and/or use have found a number of predictors, including gender, education, chronic illness, self-rated health, communication strategies, size of employer, and propensity to use information (Schneider and Epstein 1998; Farley et al. 2002; Abraham, Feldman, and Carlin 2004; Christianson et al. 2014). However, all of these studies have examined associations with cross-sectional designs, and to our knowledge, no study has used longitudinal data to analyze if and how much consumers' awareness and use of PQI increases in response to the changes in the amount and content of publicly reported PQI.

In an earlier article, Christianson et al. (2010) proposed a framework for analyzing public reporting of PQI that includes three dimensions: availability (the amount of quality information available), applicability (the degree to which the quality information in public reports is applicable to a specific person), and credibility (whether the quality information comes from a credible source using credible data and methods). The same article also reported substantial regional variations in all three dimensions. As advocacy for greater PQI transparency continues to be strong, it is important to understand which factors influence consumers' awareness and use of this information. In this article, we focus on the effects of increased availability and applicability on awareness and use of PQI. Using an individual-level fixed effects modeling approach, and a sample that is

representative of chronically ill adults from 14 geographic regions across the United States, we find that, among consumers who were previously not aware of PQI, when public reports on physicians in their local region became available, along with applicable measures, the likelihood of awareness increased by 3.8 percentage points. For the same group of consumers, the impacts on their two types of uses of PQI (use PQI in choosing doctors and discuss PQI with doctors) is similar, although the magnitudes of the increased likelihood is smaller, between 2 and 3 percentage points.

Our study is important for several reasons. First, we extend the existing literature by examining consumers' awareness and use of PQI using a longitudinal design, the importance of which has been noted in previous studies (Christianson et al. 2014; Hanauer et al. 2014). Second, while prior research mostly has examined consumer characteristics and behaviors associated with PQI awareness and use, our study links awareness and use directly to regional changes in public reporting. Third, we focus on individuals with chronic illnesses for which PQI may be even more important as this group interacts with health care providers frequently and is often the intended target of quality reports. Finally, the fixed effects modeling approach allows us to control for unobserved time-invariant factors and, hence, make relatively robust inferences.

### *Consumer Awareness and Use of PQI—a Motivating Framework*

Physician quality information may be considered as a particular type of health information, which potentially contributes to consumers' utility by reducing uncertainty and improving decision making on medical care (Kenkel 1990; Schmid 2015). In turn, the demand for health information by consumers is driven by the expected benefits and costs, typically characterized by utility gain from PQI relative to the various costs of accessing PQI, such as time spent on searching (Bundorf et al. 2006). In the context of this study, building on the existing literature, we consider consumers' awareness and use of PQI as the result of both their active information seeking—PQI “pulled” by consumers, and their passive information receiving—PQI “pushed” by external sources, including those who create PQI, toward consumers. We further hypothesize that increases in the availability and applicability of PQI led to increases in consumers' awareness and use, through both the “pull” and “push” mechanisms.

When PQI becomes more available, the likelihood of consumers receiving such information (e.g., through printed media or electronic social media) increases and the expected costs of searching for such information (mostly time and effort) potentially decreases; hence, consumers are more likely to become active PQI seekers. When applicability of PQI increases, consumers are more likely to receive signals (e.g., newspaper articles discussing PQI) of the usefulness of such information and therefore have higher expected benefits of finding and using PQI. Among consumers who already are aware of and/or using PQI, increases in applicability may induce them to “push” this information toward others who are new to PQI.

### *Background and Data*

This study was conducted under the setting of Aligning Forces for Quality (AF4Q), a nationwide initiative funded by the Robert Wood Johnson Foundation (RWJF) with the goal of improving health care quality through multi-stakeholder (payers, providers, purchasers, and consumers) collaboration at the community level. The AF4Q grantees were communities from 17 regions across the United States, representing states (e.g., Wisconsin), small cities or rural areas (e.g., York, Pennsylvania and Humboldt County, CA), and large metropolitan areas (e.g., Detroit, Memphis). Over the life of the program, RWJF provided significant financial resources and technical assistance to the AF4Q “alliances” (the multistakeholder partnerships in each AF4Q community). Performance measurement and public reporting was a central component of the program, with all alliances required to produce and release physician practice PQI to the public in the form of “report cards.” Alliances were also encouraged to develop a sustainable infrastructure for updating and reporting PQI into the future (Scanlon et al. 2012). Three AF4Q communities (Boston; Albuquerque, New Mexico; and Central Indiana) are excluded from our analysis because of their later program initiation and different survey timing. This study is a part of the AF4Q evaluation, which has been reviewed and approved by the Institutional Review Board of The Pennsylvania State University.

There is substantial variation in the history of public reporting efforts across the 14 AF4Q regions included in this study (Christianson et al. 2010). Some have long histories of public reporting prior to the program (e.g., Wisconsin and Minnesota), whereas others produced their communities’ first physician quality reports as late as 2011 (e.g., Western New York). In 2008, 6 of the 14 regions still did not have any physician quality reports publicly

available in the communities. By 2012, there was at least one physician quality report in each of the 14 regions, although the specific measures included in these reports varied. For example, by 2012, all 14 regions had reports with quality measures related to diabetes care, while only 4 regions had reports with measures related to the care of depression. Table 1 provides a summary of the evolution of physician quality reporting across the 14 AF4Q regions. Although this study is under the context of AF4Q, the report cards included in our data are not exclusively produced or sponsored by the AF4Q alliances; instead, the longitudinal changes in the numbers of reports are potentially due to different sources. For example, the increase of reports available in Humboldt County is due to both the community quality report sponsored by the AF4Q alliance and statewide quality reports released by others in California.

The main data sources used in this study are the AF4Q Consumer Survey (AF4QCS) and the AF4Q Community Quality Reporting Tracking Database (AF4QTD), both collected as a part of the AF4Q evaluation. AF4QCS is a random-digit-dial survey initially conducted by a professional survey research firm between June 2007 and August 2008 for chronically ill adults (18 or older) in the 14 AF4Q regions. To be included, respondents were required to have at least one of five chronic conditions (diabetes, hypertension, asthma, heart disease, and depression) and to have visited health care professionals during the previous 2 years for their conditions. The response rate for the initial survey was 27.6 percent based on the American Association of Public Opinion Research standard and 45.8 percent based on the Council of American Survey Research Organizations standard. The same respondents were surveyed again between July 2011 and November 2012, with a panel response rate of 63.3 percent; our sample includes 4,235 individuals who responded in both waves. The AF4QCS data have been described and analyzed in several previous studies (Maeng et al. 2012; Scanlon et al. 2015).

The AF4Q evaluation team regularly reviews websites of various public and private organizations that sponsor public reports and conducts periodic interviews with key public reporting personnel of the AF4Q alliances (Christianson et al. 2010). These data are used to track the evolution of public reporting in AF4Q regions. The AF4QTD database contains information on physician quality measures for all tracked reports, regardless of whether they are produced by the AF4Q alliances or other organizations.

Additional measures in the analysis were constructed with information from the HealthLeaders InterStudy Health Plan Enrollment Database (InterStudy), the Dartmouth Atlas Database (Dartmouth), the County Data on Internet Access Services released by the Federal Communications Committee

Table 1: Physician Quality Reports in 2008 and 2012, by Included AF4Q Region

Region	Any Report		Reports with Diabetes Measures		Reports with Hypertension Measures		Reports with Heart Disease Measures		Reports with Asthma Measures		Reports with Depression Measures	
	2008	2012	2008	2012	2008	2012	2008	2012	2008	2012	2008	2012
All regions combined	16	41	9	25	3	9	12	22	8	14	5	7
By region												
Cincinnati, OH	0	2	0	2	0	0	0	2	0	0	0	0
Cleveland, OH	0	1	0	1	0	1	0	1	0	0	0	0
Detroit, MI	1	4	1	3	0	1	1	1	1	3	1	1
Humboldt County, CA	3	6	1	2	0	0	3	4	2	2	0	0
Kansas City, MO	0	2	0	1	0	0	0	0	0	1	0	1
Maine	1	2	1	1	0	1	1	1	0	1	0	0
Memphis, TN	0	3	0	2	0	0	0	1	0	0	0	0
Minnesota	4	7	4	5	1	4	3	4	4	4	3	4
Puget Sound, WA	0	1	0	1	0	0	0	1	0	1	0	1
South Central PA	1	2	0	1	0	0	1	2	0	0	0	0
West Michigan	1	3	1	3	1	1	0	0	1	1	1	0
Western New York	2	3	0	1	0	0	2	2	0	0	0	0
Willamette Valley, OR	0	1	0	1	0	0	0	1	0	1	0	0
Wisconsin	3	4	1	1	1	1	1	2	0	0	0	0

(FCC), and RWJF's Comparing Health Care Quality: A National Directory. The InterStudy data provide enrollment information for commercial health plans and this dataset has been used in other studies to estimate commercial health plan penetration rates (Adams and Herring 2008). The Dartmouth data were used to construct estimates of physician supply at zip code levels, similar to previous studies (Lewis et al. 2013). The FCC data report the number of residents having Internet connections in each county, which can be used to measure the "regional connectedness" of the consumers in AF4QCS, a potentially important enabling characteristic for accessing PQI via the Internet and using social media. RWJF's National Directory (Robert Wood Johnson Foundation 2013) provides a consistency check of the regional physician quality reports included in the AF4QTD, as well as information on the quality reports with national coverage (e.g., reports produced by organizations such as the National Committee for Quality Assurance), which are not tracked in the AF4QTD.

### *Measuring Awareness and Use of Physician PQI*

The primary focus of this article was the impact of availability and applicability of publicly reported PQI on consumers' awareness and use of this information. Measures of awareness and use are constructed from responses to the following three survey questions from AF4QCS in wave 1 and wave 2:

1. "Did you see any information comparing the quality among different doctors in the past 12 months?" (Yes=1, No=0)
2. "Did you personally use the information you saw comparing the quality among doctors in making any decisions about doctors?" (Yes=1, No=0)
3. "Did you talk with your doctor about the report?" (Yes=1, No=0)

The second and third questions are follow-up questions, focusing on two specific uses of PQI (choice of providers and communication with providers) that correspond to the hypothesized consumer pathways discussed earlier. All three questions have a recall period of 12 months. The second and third questions are only asked for respondents who answer "yes" to the first question. It is important to note that "awareness" and "use" in our analysis have very specific definitions based on these survey questions. For example, awareness could mean things other than "seeing" (e.g., "hearing" from media). Visual exposure to PQI is an important aspect of awareness that can directly influence the respondents, but likely underestimates the overall level of awareness.



The use of a 12-month question frame also creates a conservative estimate of awareness and use. Finally, while the survey asks about quality data relating to “doctors,” public reports typically contain data on physician performance measured at the medical group or practice level, rather than individual physician level.

### *Measuring Availability and Applicability of PQI*

The availability and applicability of PQI are measured using the information from the AF4QTD and the RWJF National Directory. Physician quality reports vary significantly in terms of the proportion of physicians or practices included in the reporting region. Reports are excluded from our analysis if they only cover a narrow or selected group of physicians, consistent with the approach used in a previous study (Scanlon et al. 2015). It should also be noted that the quality reports examined in this study mostly included measures for ambulatory physician practices, rather than for individual physicians, a common feature of publicly reported PQI due to concerns about the minimum patient counts necessary for producing valid and reliable quality measures.

Survey respondents are classified as having PQI available at a particular time if there is at least one publicly available physician quality report for that region at that time. We consider a report applicable to a respondent if it includes at least one measure relevant to that respondent’s specific chronic condition(s). Note that applicability implies availability, but not vice versa. Moreover, availability varies only across regions, whereas applicability varies across both regions and individual survey respondents. Based on the numbers of publicly available physician quality reports and the included measures for specific chronic conditions (Table 1), we construct an ordered trichotomous measure for each respondent for each time: PQI not available=0; PQI available but not applicable=1; and PQI both available and applicable=2.

## METHODS

For each consumer “ $i$ ” living in region “ $j$ ” at time “ $t$ ,” we model the probability of seeing PQI ( $A_{ijt}$ ), using PQI in choosing doctors ( $U_{ijt}$ ), and discussing PQI with doctors ( $D_{ijt}$ ) as functions of availability ( $V_{jt}$ ), applicability ( $K_{ijt}$ ), consumers’ health-related characteristics ( $H_{it}$ ) and sociodemographic characteristics ( $X_{it}$ ), the characteristics of the health care market in which the consumer

resides ( $M_{ijt}$ ), and a time-invariant individual specific effect ( $\beta_i$ ). The three probability equations below correspond to the three outcome measures:

$$\begin{aligned} \text{Prob}(A_{ijt} = 1 | V_{jt}, K_{ijt}, H_{it}, X_{it}, M_{ijt}) \\ = \mathbf{F}(\beta_i + \beta_1 V_{jt} + \beta_2 K_{ijt} + \beta_3 H_{it} + \beta_4 X_{it} + \beta_5 M_{ijt}) \end{aligned}$$

$$\begin{aligned} \text{Prob}(U_{ijt} = 1 | V_{jt}, K_{ijt}, H_{it}, X_{it}, M_{ijt}) \\ = \mathbf{F}(\beta_i + \beta_1 V_{jt} + \beta_2 K_{ijt} + \beta_3 H_{it} + \beta_4 X_{it} + \beta_5 M_{ijt}) \end{aligned}$$

$$\begin{aligned} \text{Prob}(D_{ijt} = 1 | V_{jt}, K_{ijt}, H_{it}, X_{it}, M_{ijt}) \\ = \mathbf{F}(\beta_i + \beta_1 V_{jt} + \beta_2 K_{ijt} + \beta_3 H_{it} + \beta_4 X_{it} + \beta_5 M_{ijt}) \end{aligned}$$

The two dummy variables for availability and applicability (V and K) are generated from the trichotomous measure discussed earlier. The characteristics of consumers may also be associated with the awareness and uses of comparative PQI (Christianson et al. 2014). We control for two different types of consumer characteristics (health-related and sociodemographic) in the analysis. The health-related characteristics (H) include self-reported health (poor=1, fair=2, good=3, very good=4, excellent=5); indicators of specific chronic conditions (diabetes, hypertension, heart disease, asthma, and depression); overall satisfaction with care during the past 12 months (1–10, 10 being the most satisfied); the perceived importance of PQI (1–4, 4 being very important); care utilization (the number of primary care provider visits during the past 3 months); and the Patient Activation Measure (PAM, 1–100, 100 being the most activated). PAM is designed to measure patients' knowledge, attitude, skill, and confidence in managing their own health (Hibbard et al. 2005). We also include a set of time-varying sociodemographic characteristics (X): family income, education, employment, and health insurance (uninsured, private, and public).

Characteristics of the regional health care markets (M) also can affect awareness and use. We include two variables that capture the supply of physicians and the commercial health plan penetration rates at the county level. Physician supply affects the competitiveness of the local market and the choices available to consumers in the area, and thus the potential demand for PQI. We estimate the number of physicians per 1,000 people for each of the counties included in AF4QCS, using the Dartmouth data. Commercial health plans often provide PQI that is accessible to plan enrollees and can also affect consumers' awareness and use of PQI. Our analysis controls for the percentage of the population enrolled in commercial health plans that provide PQI only to their members. This is estimated at the county level, using the

InterStudy Database. Finally, to control for the “regional connectedness” in the areas where the consumers in our study sample reside, we include in our model the proportion of residents having fixed point Internet connections in each county, using data from FCC (Federal Communications Committee 2015). Similar measures were used in previous studies (Kiiski and Pohjola 2002).

Employing the linear probability specification, we estimate the three equations by ordinary least squares with individual-level fixed effects, allowing us to control for any unobserved time-invariant factors. Robust standard errors are calculated with clustering by AF4Q regions. As a baseline analysis, we first estimate all three equations with the whole sample. Then, we estimate each equation with three different subsamples: (1) respondents who did not report seeing PQI at baseline; (2) those who did not use the information to make decisions on doctors at baseline; and (3) those who did not discuss the information with doctors at baseline. The baseline analysis examines the overall change in awareness and use, whereas the subsample analysis examines “gaining awareness of PQI,” “starting to use PQI,” and “starting to discuss PQI with doctors.” The subsample analysis is motivated by our particular interest in understanding how changes in PQI availability and applicability potentially affect consumers who have not seen or used such information previously, as those consumers may be the target of future public reporting efforts. Using subsamples based on outcomes may lead to sample selection bias (Heckman 1979). However, in this case, bias is likely to be negative, as the unobserved factors that contribute to the selection of the subsamples may be negatively correlated with the unobserved factors in the subsample regressions. For example, consumers with low levels of trust in public information are less likely to be aware and/or use PQI at baseline, and therefore are more likely to be “selected” into our subsamples. Assuming that the level of trust does not change significantly over the two survey periods, those consumers also are less likely to become aware of or start using PQI in the second period. Therefore, the results from the subsample analysis may be considered as underestimates.

## RESULTS

Table 2 presents the respondents’ characteristics and their level of awareness and use of PQI in 2008 and in 2012. Most are 51 or older (73 percent) with a college education (63 percent), while 7 percent do not have health insurance.

Table 2: Respondent Characteristics, and Awareness and Use of Physician Quality Information ( $N = 4,179$ )

<i>Variable</i>	<i>2008 Mean (SD)</i>	<i>2012 Mean (SD)</i>
Awareness of physician PQI	12.63	16.27
Use of physician PQI	3.33	5.17
Discussed quality report with physician	3.51	4.76
Access to health plan PQI (%; county level)	21.48 (13.07)	40.22 (23.35)
Perceived importance of PQI (range 1–4)	2.92 (0.67)	2.89 (0.71)
Age		
18–40	10.07	6.61
41–50	17.05	12.76
51–65	42.24	40.27
>66	30.63	40.37
White	65.72	65.16
Black	24.39	24.46
Hispanic	4.01	3.10
Other	6.04	7.6
Family income (in 1,000\$)	45.34 (29.14)	43.05 (28.89)
Education (college or more)	63.12	61.01
Female	67.64	67.23
Employed	48.85	41.26
Uninsured	6.60	6.78
Private insurance	40.71	31.91
Public insurance	52.22	60.79
Self-rated health (range 1–5)	2.96 (0.96)	2.95 (0.94)
PAM score (range 1–100)	65.70 (15.44)	68.77 (15.53)
Number of physician visits	1.53 (2.48)	1.35 (2.40)
Diabetes	28.81	30.66
Hypertension	65.89	59.49
Heart disease	16.07	15.67
Asthma	16.79	15.02
Depression	26.98	22.66
Proportion of residents with Internet, by county	0.63 (0.11)	0.68 (0.08)
Number of physicians per capita, by county	3.21 (1.60)	3.33 (1.72)
Overall satisfaction with received care	8.33 (1.68)	8.46 (1.67)

The overall satisfaction with care is on average high and steady (8.3 out of 10 in 2008 and 8.5 in 2012). In 2008, only 12.6 percent of the respondents reported having seen PQI; 3.5 percent reported using PQI to make decisions about doctors; and 3.6 percent reported having discussed PQI with their doctors. Awareness and use of PQI increased in 2012, but still only one in six respondents were aware of such information and about 1 in 20 used it when making decisions about doctors and/or discussed it with doctors.

Table 3: Results from Linear Probability Models with Individual-Level Fixed Effects

Variable	Change in Awareness (N = 4,179)	Change in Use (N = 4,179)	Change in Discussion with Doctors (N = 4,179)	Gaining Awareness (N = 3,654)	Starting Use (N = 4,038)	Starting Discussion with Doctors (N = 4,032)
Availability and applicability	Ref	Ref	Ref	Ref	Ref	Ref
No report available	-0.002	0.019	0.022*	0.020	0.022*	0.020*
Report available but not applicable	0.004	0.020	0.012	0.038*	0.026**	0.026**
Commercial health plan enrollment (%)	0.001	0.001**	0.001**	0.002**	0.001**	0.001**
Perceived importance of PQI	-0.001	0.012*	0.006	-0.001	0.008*	0.000
Family income (in 1,000\$)	0.000	0.000	0.000	0.000	0.000	-0.016
Education (college or more)	-0.005	-0.025	-0.031*	0.000	-0.011	0.002
Employed	0.004	0.018*	0.003	0.004	0.013*	0.0019
Health insurance	Ref	Ref	Ref	Ref	Ref	Ref
Private insurance	-0.017	0.008	0.006	-0.017	-0.007	-0.004
Public insurance	-0.050	-0.015	-0.011	0.000	0.001	-0.008
Uninsured	-0.011	-0.006	-0.003	-0.002	-0.004	0.000
Self-rated health	0.000	0.000	0.000	0.000	0.000	0.000
PAM score	0.003	0.003**	0.002	0.003	0.001	0.001
Number of physician visits	Ref	Ref	Ref	Ref	Ref	Ref
Chronic conditions	-0.006	-0.023	0.001	-0.030	-0.034**	-0.013
Diabetes	0.032	0.007	-0.003	0.032*	0.014	-0.004
Hypertension	0.000	-0.008	0.011	-0.007	-0.008	0.011
Heart disease	0.047	0.028	0.026	0.029	0.022	0.013
Asthma	-0.008	-0.007	0.002	-0.008	-0.010	-0.001
Depression						

Continued

Table 3. *Continued*

<i>Variable</i>	<i>Change in Awareness (N = 4,179)</i>	<i>Change in Use (N = 4,179)</i>	<i>Change in Discussion with Doctors (N = 4,179)</i>	<i>Gaining Awareness (N = 3,654)</i>	<i>Starting Use (N = 4,038)</i>	<i>Starting Discussion with Doctors (N = 4,032)</i>
Proportion of residents with Internet, by county	-0.076	0.058	-0.015	-0.061	0.028	-0.002
Number of physicians per capita, by county	0.007	-0.005	0.014	0.037	-0.008	0.018
Overall satisfaction with received care	0.002	-0.001	0.000	-0.001	-0.002	0.001
Within $R^2$	0.0132	0.0148	0.0108	0.1412	0.0582	0.0505

\* $p < .05$ , \*\* $p < .01$ .

Table 3 presents the results from the linear probability models with individual-level fixed effects. The coefficients from the baseline model, estimated using the whole sample, indicate that changes in availability and applicability are not associated with changes in awareness and use of PQI. The only exception is the discussion of PQI with doctors, which has an increase of 2.2 percentage points associated with PQI availability. The subsample analysis indicates that among the consumers who had not seen PQI in 2008 and lived in regions where public quality reports were previously unavailable, the subsequent release of such reports is not related to an increased probability of seeing PQI. However, for the same group of consumers, if the newly available reports also included applicable measures, the increase in the probability of seeing PQI becomes statistically significant (3.8 percentage points). Among consumers who had not used the information to make decisions about physicians and among those who had not discussed the information with their physicians, availability and applicability of public quality reports are associated with an increased likelihood of starting to use PQI and starting to discuss PQI with doctors, although the effects are smaller in magnitude, ranging from 2 to 2.6 percentage points, compared with the effects on “gaining awareness.” As we discussed earlier, estimates from the subsample analysis are likely to be underestimates, with the true effects being potentially larger; thus, we consider our findings to be conservative. Collectively, our results suggest that changes in availability and applicability of public reports may induce behavioral changes among consumers for whom PQI is “new.”

The newly available and/or applicable reports seem to have only small impacts on awareness of PQI, the use of PQI in choosing doctors, and discussion of PQI with doctors; among the subsamples the magnitudes of the effects are substantial relative to the baseline levels of awareness and uses in the general population of chronically ill adults (12.7 percent; 3.5 percent; and 3.6 percent). Among other covariates, consistent with intuitions, the perceived importance of PQI and the proportion of population with access to commercial health plan PQI show positive but small effects on awareness and use.

## DISCUSSION

Publicly reported PQI may reach consumers through various channels (e.g., media coverage, recommendations by family or friends, promotion by community groups, or professional associations). When regional public quality reports become newly available, consumers in that region may have increased

opportunities to be exposed to the actual PQI as well as secondary information related to PQI (e.g., newspaper articles discussing a new report). Moreover, when applicable measures are included in quality reports, the usefulness of PQI is more likely to be perceived by consumers, thus potentially leading to broader awareness and use. It is also important to note that PQI still can be useful even if it is not directly employed in choosing doctors or discussed during doctor appointments. In a related survey question from AF4QCS, those respondents who reported seeing PQI, but not using it, were asked to give reasons why they did not use PQI. More than 50 percent of these respondents said they did not use PQI because they were satisfied with their current doctors. Less than 1 percent reported that the information they saw was not understandable or useful. Some of these respondents might have a broader interpretation of use than the two specific types of use defined in the survey. Moreover, the consumer awareness of PQI, even without use, may have a direct impact on the quality of care, as the intended “reputation” effect of public reporting on physicians may also depend on how widely the information has been spread among consumers, as an increase in the level of consumer awareness by itself may incentivize providers to improve.

Our study has several limitations. First, observed changes in availability and applicability may be correlated with unobserved time-varying factors, and thus confound our results. For example, if the demand for PQI, which varies across regions as well as changes over time, is also correlated with regional public reporting efforts, our estimates may be biased. This is a concern because the participation of community alliance in AF4Q is based on a nonrandom selection process (Scanlon et al. 2012). However, our longitudinal design with a fixed effects model is a significant improvement over the existing research on this topic, most of which has employed cross-sectional designs. Second, some important consumer characteristics (e.g., providing care for family members), potentially with important implications for PQI awareness and use, are not available in our data. Third, dissemination is an important component of public reporting. Limited by our data, we have not examined the relative effectiveness of the different strategies used to disseminate PQI in the 14 regions we study. Future studies should collect and analyze information on PQI dissemination efforts and examine their impact on awareness and use of PQI. Finally, the PQI that the survey respondents saw was not necessarily generated by AF4Q alliances, especially as various websites (e.g., WebMD) started to provide physician ratings or rankings, often based on a small number of consumer reviews. While the amount of PQI has grown over recent years, without knowing the actual information seen and used by the respondents, our models assume that the



change in information from sources other than quality report cards is similar across the regions included in the study. Analyzing and quantifying the variation and impact of PQI that includes other less formal information sources is an important topic for future study.

Applicability of reports appears to be potentially important in increasing awareness and use, a finding that points directly to one of the identified key factors influencing awareness and use (Shaller, Kanouse, and Schlesinger 2013). Consideration should be given to targeting specific subgroups of consumers (e.g., diabetes patients) with selected information (e.g., diabetes measures) when the reports are released and in subsequent marketing efforts.

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## SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.