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The Impact of Medicare Health Insurance Coverage on Lung Cancer Screening

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Background: Annual lung cancer screening via low-dose computed tomography can reduce lung cancer mortality among high-risk adults by 20%; however, screening take-up remains low. Inadequate insurance coverage or access to care may be a barrier to screening.

Objective: The objective of this study was to estimate the effect of nearly universal access to Medicare coverage on annual lung cancer screening.

Research Design: A regression discontinuity design was used to estimate the causal effect of nearly universal access to Medicare at age 65. Data come from the 2017 to 2019 Behavioral Risk Factor Surveillance System in 28 states that adopted the optional module on lung cancer screening and lung cancer risk.

Subjects: A total of 11,163 individuals at high risk for lung cancer just above and below age 65.

Measure: Self-reported use of low-dose computed tomography to screen for lung cancer in the past 12 months.

Results: A total of 10,951 people at high lung cancer risk (45.7% women, response rate = 98.1%) reported lung cancer screening information. Nearly universal access to Medicare increased lung cancer screening by 16.2 percentage points among men (95% confidence interval: 2.4%–30.0%, $P = 0.02$), compared with a baseline screening rate of 11.1% just younger than age 65. Women had a baseline screening rate of 18.2% and experienced no statistically significant change in screening (1.6 percentage point increase, 95% confidence interval: −19.8% to 23.0%, $P = 0.88$).

Conclusions: Gaining Medicare coverage at age 65 increased lung cancer screening take-up among men at high lung cancer risk. Lack of insurance or inadequate access to care hinders screening.

Key Words: lung cancer, computed tomography, screening, Medicare, smoking

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Lung cancer is the leading cause of cancer death in the United States, causing > 130,000 deaths each year.[1] Most patients with lung cancer are diagnosed after metastasis, at which point the 5-year survival rate is only 6%.[1] Identifying lung cancer at an early stage can reduce mortality. Screening for lung cancer annually using low-dose computed tomography can reduce lung cancer mortality by 20% among high-risk adults.[2,3] The US Preventive Services Task Force (USPSTF) has recommended annual lung cancer screening for asymptomatic high-risk adults, defined as adults age 55–80 who have a 30 pack-year smoking history and who either currently smoke or quit within the past 15 years,[4] and these screening eligibility criteria expanded in 2021.[5]

Despite the health benefits, uptake of lung cancer screening remains low. Data drawn from 2 multistate samples in 2017 and 2018 showed that only 15%–20% of high-risk adults received lung cancer screening.[6–8] National data from 2015 found that only about 5% of high-risk adults received screening.[9] Overuse of screening among lower risk adults is also a concern[9] due to the potential adverse effects of radiation exposure or physical and psychological consequences of false positives.[10,11] There is, therefore, a need to identify interventions to increase informed, guideline-concordant lung cancer screening among high-risk patients without escalating overscreening among lower risk patients.

Lack of health insurance and inadequate access to care could contribute to gaps in screening. Lung cancer screening rates are 3 times higher among the insured than the uninsured.[8] The costs of screening are high,[12–14] and health insurance reduces the cost to patients: the USPSTF level B rating ensures that qualified health insurance plans cover screening without cost-sharing for eligible, high-risk adults.[15] Prior research found associations between expanded access to health insurance and uptake of colorectal, cervical, and breast cancer screening as well as early detection of these tumors.[16–18]

Health insurance access increases at age 65 when nearly all Americans become eligible for Medicare. This change may be relevant to lung cancer screening given that approximately

half of lung cancer cases occur in individuals 55–74 years old, and Medicare has covered lung cancer screening for high-risk adults since 2015, starting after the USPSTF recommendation.[19,20] Given the potential health benefits of lung cancer screening, understanding the impact of Medicare health insurance coverage on screening is important for future policy decisions.[2,14]

Increasing lung cancer screening among high-risk men is particularly important. Lung cancer incidence and mortality are higher among men than women.[21,22] Compared with women, men are also more likely to smoke,[23,24] and less likely to use recommended health care.[25–27] Prior data on the impact of health insurance expansions find different effects by sex, suggesting that pooling data from men and women together may mask important heterogeneity.[28,29] Gaining access to Medicare at age 65 could increase lung cancer screening among high-risk adults who use care infrequently or lack a usual source of care; we hypothesized that the majority of such individuals would be men.

This study estimated the causal effect of nearly universal access to Medicare coverage at age 65 on lung cancer screening utilization in 2017–2019. Data were stratified by sex and by the level of lung cancer risk, as defined based on the USPSTF criteria in place during our data period.

METHODS

Data

We used 2017–2019 data from the Behavioral Risk Factor Surveillance System (BRFSS), an annual cross-sectional survey representative at the state and national levels.[8] Starting in 2017, questions about lung cancer screening were included in an optional module. The module was adopted by 10 states in 2017, 8 states in 2018, and 20 states in 2019 (Supplemental Table 1, Supplemental Digital Content 1, http://links.lww.com/MLR/C355).

The primary outcome was the use of lung cancer screening in the past 12 months, based on participants' responses to the question, "In the last 12 months, did you have a CT or CAT scan?" Those who responded "Yes, to check for lung cancer" were categorized as having received lung cancer screening. Those who selected the response, "No (did not have a CT scan)," or "Had a CT scan, but for some other reason," were categorized as not having been screened. We extracted data on respondents' age, race, employment status, income level, education level, veteran status, state of residence, the state's Medicaid expansion status, and year of the interview as covariates in the multivariable models.

To examine potential mechanisms underlying the results, we investigated 2 secondary outcomes: having a routine checkup in the past year and foregoing health care due to cost during the past 12 months. To assess the assumption that outcomes would have remained continuous (smooth) at age 65 in the absence of the Medicare program, we examined changes in other socioeconomic variables, including retirement status, employment status (unemployed vs. employed), veteran status, and education (college-educated vs. non–college-educated).

Stratification variables in the main analysis included sex (male vs. female) and lung cancer risk (high vs. lower lung cancer risk). High lung cancer risk was defined as meeting the USPSTF criteria for lung cancer screening eligibility in place during the data period (Supplemental Method 1, Supplemental Digital Content 1, http://links.lww.com/MLR/C355). In a supplemental analysis, we identified the full set of people considered eligible for screening under the new USPSTF guidelines released in 2021.[5] Participants who turned 65 during the 12-month look-back period were excluded from the main analysis but included in robustness checks.

In supplemental analyses, we stratified the data by education (with vs. without a college education) and by geographic location (states that had vs. had not expanded Medicaid eligibility for low-income adults). The motivation for this analysis is that these groups may vary in their insurance changes at age 65.

Research Design and Statistical Analysis

Research Design

We employed a regression discontinuity design (RDD) to determine the causal relation between nearly universal access to Medicare coverage and lung cancer screening. Researchers have used this method to study the effects of policies with age-based eligibility cutoffs,[30–32] including the impact of Medicare coverage on cancer screening and mortality.[28] The internal validity of this design relies on the arbitrariness of age 65 as the threshold for Medicare eligibility. Medicare coverage is nearly universally available at age 65, but not at younger ages. When individuals cannot manipulate with precision the main eligibility criterion (age), the exposure (obtaining Medicare coverage) can be viewed as if it were random among participants close to the criterion threshold (age 65). This interpretation is possible because there is no deterministic relationship between turning 65 and receiving lung cancer screening (the outcome). However, because lung cancer screening increases with age, the design requires that regression models correctly specify the relationship between these 2 variables.[33] The validity of the design can be checked by ensuring that the discontinuity in the outcome is not caused by a discontinuity in confounders.

Statistical Analysis

We documented the characteristics of high-risk participants before gaining Medicare coverage. We first assessed differences in demographic and health-related characteristics by sex, using χ^2 tests to compare categorical variables. We then assessed the sex distribution among high-risk adults just younger than 65 who lacked a usual source of care.

The main RDD specification used a bandwidth of 9 around age 65. We estimated linear probability models for ease of interpretation, although our conclusions are the same using logistic models. The outcome was an indicator of lung cancer screening receipt in the last 12 months. The exposure of interest was an indicator variable equal to 1 for individuals who were over age 65 throughout the 12-month look-back period and 0 for those who were under 65 throughout the look-back period. Following standard practice,[32,33] the models controlled for age and were centered at age 66, the age of the youngest respondents who were over 65 throughout the

12-month look-back period. The main model used a quadratic specification for age and, to increase the precision of estimates, respondent's race, employment status, income level, education level, veteran status, indicator variables for interview year and for state of residence, and state's Medicaid expansion status.[34] We allowed differential age trends above and below the cutoff by including interactions between age and exposure. Thus, the coefficient of interest captures the discontinuity in lung cancer screening at the cutoff point.

Following previous studies,[31] the RDD model used Eicker-Huber-White heteroscedasticity-robust SEs for inference, based on their superior coverage properties for a discrete running variable.[35] Sample weights were incorporated to account for the complex sampling design of the BRFSS data. See Supplemental Method 2 (Supplemental Digital Content 1, http://links.lww.com/MLR/C355) for additional details.

Our main analysis used the definition of high-risk from the USPSTF recommendations in place during our data period, corresponding to the people for whom Medicare-covered lung cancer screening at the time. To provide additional context, we also extracted health insurance coverage rates among nonelderly participants eligible for screening under the 2021 guidelines.

Robustness Checks

We conducted a series of robustness checks to assess the plausibility of the assumptions underlying the model and the sensitivity of findings to model specification. First, we tested for discontinuities at age 65 in potential confounders, following similar studies.[31] Second, we implemented alternate model specifications, including removing covariates from the model; using different windows of data around age 65; using linear trends, rather than a quadratic polynomial to adjust for age; using interacted models rather than stratified models; using logistic regression rather than linear regression; employing a nonparametric modeling approach, which does not assume a functional form a priori and places a higher weight on observations closer to age 65[36]; and including data from individuals who were partially treated during the 12-month look-back period while adding an indicator variable to flag these participants. Third, we assessed balance in the characteristics of people with and without missing data on lung cancer screening. Fourth, we examined whether comparable changes in lung cancer screening were found at ages other than 65. Fifth, we examined potential mechanisms underlying the findings by examining changes in access to care variables at age 65. Sixth, we conducted stratified analyses to examine the relationship between change in insurance coverage and change in lung cancer screening, using conceptually derived subgroups.

Analyses were conducted using Stata SE, version 16.1 software (StataCorp). We assessed statistical significance at the 0.05 level using 2-sided tests and calculated 95% confidence intervals (CIs). The research was approved by the University of Wisconsin-Madison Institutional Review Board.

RESULTS

The study sample included 11,163 high-risk and 80,501 low-risk participants, using the categorization from the USPSTF guidelines; risk level could not be calculated for 11,907 participants (11.50%). Overall, 98.10% of high-risk participants (10,951 individuals) and 84.64% of low-risk participants (68,140 individuals) replied to survey questions about their use of lung cancer screening. Women accounted for 45.7% of the high-risk respondents and 57.6% of the low-risk participants.

Table 1 reports the characteristics of the high-risk respondents in the sample at ages 56–64, just before becoming eligible for Medicare; these data show that women were more likely than men to receive preventive care and to be diagnosed with comorbid conditions. Specifically, women were more likely than men to be diagnosed with chronic obstructive pulmonary disease (41.6% vs. 26.3%, $P < 0.001$), to be diagnosed with asthma (24.7% vs. 11.6%, $P < 0.001$), to have a personal doctor or health care provider (89.7% vs. 81.6%, $P < 0.001$), and to have had a routine checkup in the past year (83.3% vs. 78.2%, $P = 0.006$). Men accounted for 69% of high-risk adults aged 56–64 who lacked a usual source of care.

Figure 1 depicts the sharp increase in health insurance coverage at age 65. Health insurance coverage increased from around 90% before age 65 to over 98% after age 65 for both men and women. Adjusted estimates, shown in Table 2, also reflect this jump in coverage.

Changes in lung cancer screening at age 65, the age of nearly universal access to Medicare coverage, and the baseline rates at slightly younger ages are shown in Table 2. In adjusted models, lung cancer screening increased among high-risk men by 16.2 percentage points (95% CI: 2.4%–30.0%; $P = 0.02$). In contrast, high-risk women experienced no additional change at age 65 (1.6 percentage point increase, 95% CI: −19.8% to 23.0%, $P = 0.88$). Fewer than 5% of low-risk men and women were screened before age 65. Low-risk women experienced an additional change at age 65, while low-risk men did not (3.7 percentage point increase, 95% CI: −0.5% to 8.0%, $P = 0.09$ for low-risk men; 3.9 percentage point increase, 95% CI: 0.3% to 7.6%, $P = 0.04$ for low-risk women, respectively). Figure 2 and Supplemental Figure 1, Supplemental Digital Content 1, http://links.lww.com/MLR/C355, depict unadjusted lung cancer screening uptake rates among high-risk and low-risk adults, respectively, corresponding to the findings reported in Table 2. These data also show that, even after nearly universal access to Medicare coverage, 80.2% of high-risk men and 80.9% of high-risk women did not receive lung cancer screening.

Secondary analyses suggested the plausibility of our main findings. First, we found no significant change at age 65 in potential confounders such as the proportion of survey participants who were at high risk for lung cancer, retired, unemployed, veterans, or college-educated (Supplemental Fig. 2. Supplemental Table 2, Supplemental Digital Content 1, http://links.lww.com/MLR/C355). Second, our estimates for high-risk adults were qualitatively similar in 8 alternate specifications including omitting some or all covariates, employing interacted models, specifying the model using logistic regression or with a nonparametric specification, using a wider bandwidth or using an indicator variable to flag people partially treated during the look-back period. However, the treatment

TABLE 1. Summary Statistics for People at High Risk for Lung Cancer

Characteristics	Raw # of Patients* (N = 6560) [n (Weighted %)]		P†	SMD
	Men (n = 3504)	Women (n = 3056)		
Ages 56–64				
Age [median (IQR)] (y)	60 (4)	60 (4)	0.27	0.027
Race/ethnicity				
Non-Hispanic White	3055 (85.4)	2681 (88.7)	0.21	0.039
Non-Hispanic Black	128 (7.0)	116 (4.8)		
Hispanic	67 (3.1)	44 (1.9)		
Others	193 (4.4)	175 (4.6)		
Income				
< $25,000	1153 (34.5)	1182 (40.2)	0.06	0.173
$25,000 to < $50,000	822 (25.4)	654 (25.2)		
≥ $50,000	1122 (40.1)	773 (34.6)		
Employment status				
Unemployed	211 (8.3)	189 (12.0)	0.007	0.125
Employed	1683 (67.2)	1094 (58.2)		
Retired	680 (24.5)	558 (29.7)		
Education				
College-educated	1507 (39.1)	1497 (42.5)	0.17	0.122
Non–college-educated	1991 (60.9)	1550 (57.5)		
Veteran status				
Veteran	979 (26.5)	125 (4.3)	< 0.001	0.689
Nonveteran	2517 (73.5)	2930 (95.7)		
Health insurance status				
Insured	3030 (88.1)	2729 (89.3)	0.45	0.088
Uninsured	462 (11.9)	317 (10.7)		
State's Medicaid expansion status				
Expanded	1722 (40.7)	1529 (43.2)	0.29	0.018
Not expanded	1782 (59.3)	1527 (56.8)		
Ever diagnosed with COPD				
Yes	1027 (26.3)	1210 (41.6)	< 0.001	0.216
No	2441 (73.7)	1826 (58.4)		
Ever diagnosed with asthma				
Yes	448 (11.6)	730 (24.7)	< 0.001	0.290
No	3039 (88.4)	2314 (75.3)		
Having personal doctor(s) or health care provider(s)				
Yes	2873 (81.6)	2736 (89.7)	< 0.001	0.214
No	622 (18.4)	317 (10.3)		
Routine checkup within the past year				
Yes	2669 (78.2)	2484 (83.3)	0.006	0.122
No	794 (21.8)	546 (16.7)		
Skipping care because of costs in the past 12 mo				
Yes	562 (16.6)	598 (19.7)	0.09	0.093
No	2932 (83.4)	2444 (80.3)		
Having a CT or CAT scan in the last 12 mo				
Yes	414 (12.6)	428 (15.8)	0.07	0.067
No	3040 (87.4)	2575 (84.2)		

*Weighted percentages were estimated using data from Behavioral Risk Factor Surveillance System (BRFSS) 2017–2019. Percentages have been rounded and may not total 100.
†P-value for age is from the Wilcoxon rank-sum test, and P-values for other characteristics are from the χ^2 test.
COPD indicates chronic obstructive pulmonary disease; CT/CAT, computed tomography; IQR, interquartile range; SMD, standardized mean difference.

effect for high-risk men was no longer statistically significant when we used a smaller bandwidth (P = 0.06), and became smaller and not statistically significant when we use a linear specification for age (P = 0.05) (Supplemental Table 3, Supplemental Digital Content 1, http://links.lww.com/MLR/C355). Third, while the differences in characteristics between participants who did and did not answer the lung cancer screening question were statistically significant, they were qualitatively small; the standardized difference did not exceed 0.25 for any variable among low-risk participants, and the nonresponse rate was low (1.9%) among high-risk participants (Supplemental Table 4, Supplemental Digital Content 1,

http://links.lww.com/MLR/C355). Fourth, we did not find comparable changes in lung cancer screening use at ages other than 65 (Supplemental Fig. 3, Supplemental Digital Content 1, http://links.lww.com/MLR/C355). Finally, we found subgroups with larger gains in insurance coverage also experienced larger gains in lung cancer screening (Supplemental Fig. 4, Supplemental Table 5, Supplemental Digital Content 1, http://links.lww.com/MLR/C355). Taken together, these findings support the plausibility that changes in Medicare eligibility at age 65 explain the findings.

We also examined changes in access to care at age 65. Men experienced a decline in skipping needed health care due
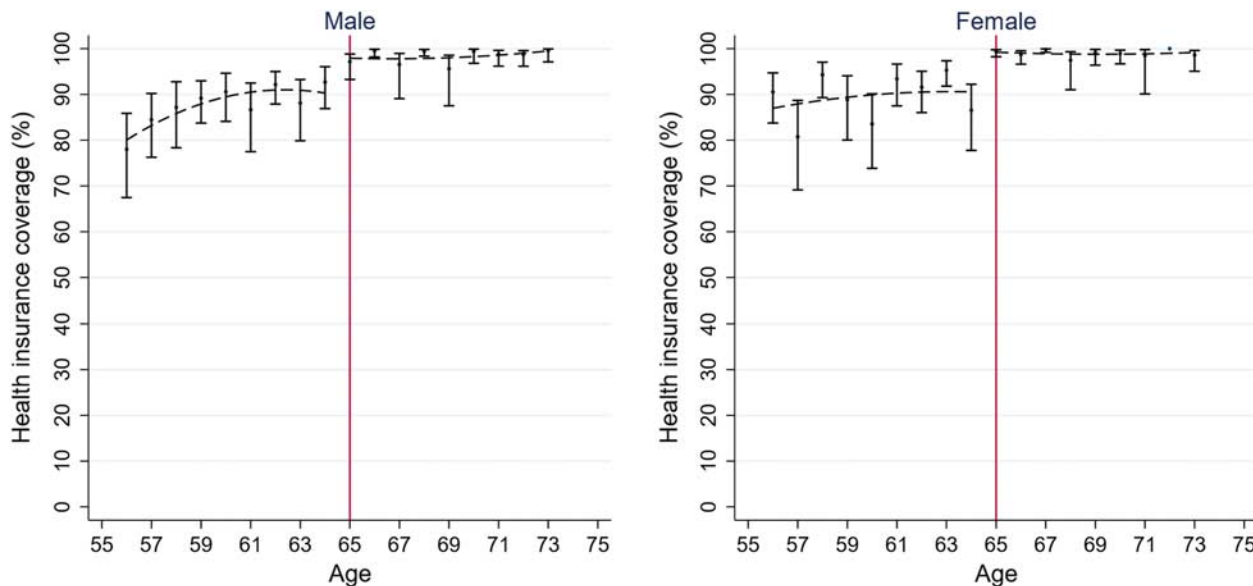
FIGURE 1. Health insurance coverage among men and women at high risk for lung cancer, above and below age 65. These graphs show the proportion of people at high risk for lung cancer who report currently having health insurance coverage. Age 65 is the age of nearly universal access to Medicare coverage. The scatterplots were fit separately by sex, above and below this age cutoff. Data are from Behavioral Risk Factor Surveillance System (BRFSS) 2017–2019.

to cost at age 65, while women did not experience a significant change in this measure (5.3 percentage point decrease, 95% CI: −10.4% to −0.3%, $P = 0.04$ for men; 3.9 percentage point decrease, 95% CI: −9.2% to 1.4%, $P = 0.15$ for women). The use of a routine checkup did not significantly change at age 65 in our sample (Supplemental Table 6, Supplemental Digital Content 1, http://links.lww.com/MLR/C355).

The USPSTF expanded the population for whom lung cancer screening is recommended in new guidelines issued in

2021. Among nonelderly participants who would be eligible for screening under the new guidelines, 11.2% of women (705 individuals) and 14.1% of men (910 individuals) were uninsured.

DISCUSSION

Nearly universal access to Medicare health insurance coverage increased lung cancer screening among men at high risk of lung cancer. These findings are important for public

TABLE 2. Changes in Health Insurance Coverage and Lung Cancer Screening at Age 65: A RD Analysis

	Men			Women		
		RD at Age 65			RD at Age 65	
Outcome	Age 63–64 Baseline	Unadjusted	Adjusted	Age 63–64 Baseline	Unadjusted	Adjusted
Health insurance coverage						
People with high lung cancer risk (meet USPSTF criteria for screening)	90.4	8.7 (1.6–15.8)	10.4 (3.6–17.2)	90.4	9.4 (0.9–18.0)	8.8 (0.1–17.5)
P		0.02	0.003		0.03	0.05
People with lower risk (do not meet USPSTF criteria)	91.2	6.0 (2.6–9.3)	5.6 (2.3–8.8)	92.0	6.1 (3.3–8.8)	6.5 (3.9–9.2)
P		< 0.001	< 0.001		< 0.001	< 0.001
Lung cancer screening						
People with high lung cancer risk (meet USPSTF criteria for screening)	11.1	14.8 (0.7–28.9)	16.2 (2.4–30.0)	18.2	2.7 (−20.0 to 25.4)	1.6 (−19.8 to 23.0)
P		0.04	0.02		0.82	0.88
People with lower risk (do not meet USPSTF criteria)	4.0	4.3 (−0.1 to 8.6)	3.7 (−0.5 to 8.0)	4.5	3.8 (0.1–7.5)	3.9 (0.3–7.6)
P		0.05	0.09		0.05	0.04

The columns include findings from stratified analyses, including only men or women as noted in the headlines. Models were centered at 65, so estimates apply to age 65. "Unadjusted" estimates control only for age. Models allowed age trend terms to vary above versus below the cutoff. Adjusted estimated regression discontinuities at age 65 adjusted for respondents' age, race, employment status, income level, education level, veteran status, state of residence, state's Medicaid expansion status, and year of the interview. 95% confidence intervals calculated using robust SEs are in parentheses.
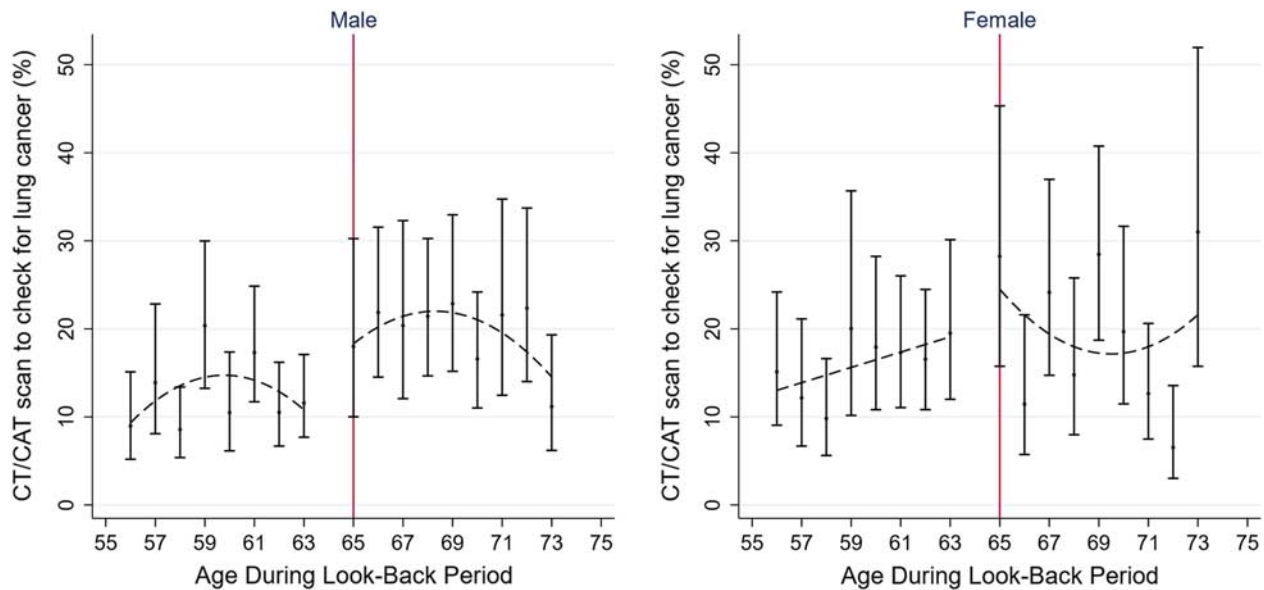RD indicates regression discontinuity; USPSTF, US Preventive Services Task Force.

FIGURE 2. Lung cancer screening among men and women at high risk for lung cancer, above and below age 65. These graphs show the proportion of people at high risk for lung cancer who reported having a CT/CAT scan check for lung cancer in the past 12 months. Age 65 is the age of nearly universal eligibility for Medicare coverage. The scatterplots were fit separately by sex, above and below this age cutoff. Data from people who turned 65 during the 12-month look-back period (eg, who had partial exposure to nearly universal access to Medicare coverage) were excluded from the analysis. Data are from Behavioral Risk Factor Surveillance System (BRFSS) 2017–2019. CT/CAT indicates computed tomography.

health because low-dose computed tomography can reduce lung cancer mortality by 20% among high-risk adults and because—according to our data—> 1 in 10 nonelderly adults eligible for lung cancer screening are uninsured.[2,3]

The increase in recommended lung cancer screening was significant among high-risk men but not high-risk women. In our sample, men accounted for about 7 in 10 high-risk adults just younger than age 65 who lacked a usual source of care. Among high-risk adults just younger than age 65, women were not only more likely than men to have had a recent checkup or to have a personal doctor, but also more likely than men to be diagnosed with asthma or chronic obstructive pulmonary disease, diagnoses associated with higher use of lung cancer screening.[7,8]

Even after gaining access to Medicare coverage, more than three quarters of high-risk adults did not receive annual screening. These data suggest persistent barriers to screening. Patient-side contributors to low uptake may include gaps in patients' awareness of the option to be screened, knowledge of the benefits of screening, smoking-related stigma, and lack of access to care despite having health insurance.[37–39] Physicians' lack of knowledge about screening recommendations and reimbursement may also contribute to low screening rates.[6,40] Multilevel interventions beyond health insurance coverage may be needed to promote uptake of lung cancer screening. Education and outreach to physicians, promoting standardized shared decision-making, and education materials for high-risk individuals with a history of smoking may improve lung cancer screening uptake.[11] Electronic medical records may also be used to systematically identify high-risk patients and prompt repeated offers of screening.[41]

Alternate specifications and robustness checks suggest the plausibility of our main estimates and the importance of model specification. Our estimates for high-risk adults were qualitatively similar in a range of alternate specifications, although the point estimates and, occasionally, statistical significance changed with bandwidth or the model used for age. We were limited by survey sample sizes, but the magnitude of effects was large in all model specifications used. Several other findings supported the plausibility that changes in coverage at age 65 account for our results. We found no significant discontinuity in potential confounders and no comparable changes in lung cancer screening use at ages other than 65; found that subgroups with larger gains in coverage also experienced larger gains in lung cancer screening; and documented improvements in access to care at age 65, which might result from changes in coverage. Finally, the characteristics of individuals with and without missing lung cancer screening data are well-balanced, and the response rate is high, so missing data is unlikely to bias our findings.

Among low-risk patients, gaining access to Medicare coverage significantly changed screening for women but not for men. The significance of the increase for low-risk women was inconsistent across alternate specifications, however, suggesting this finding should be interpreted with caution. Shared decision-making is required for Medicare coverage of lung cancer screening, and the Choosing Wisely campaign supports conversations between physicians and patients about the risks and potential harms of screening low-risk adults.[20,42]

It is likely that both the previously uninsured and previously insured benefit from gaining access to Medicare. Medicare provides a free Annual Wellness Visit as well as a

Welcome to Medicare Visit at age 65 that help ensure patients are up-to-date with recommended screenings[43,44] and make a personalized screening schedule.[45,46] Second, Medicare provides relatively generous coverage that is useful even for the already insured.[47] Patients may be more willing to be screened if they think subsequent procedures and treatment will be available and affordable.[48,49] Among people with Medicaid or high-deductible health plans coverage, gaining access to Medicare could result in more utilization of high-cost services. However, we are unable to examine differential effects by type of insurance among the previously insured using our data. A key limitation of the BRFSS data is that type of insurance coverage is captured in optional state modules and therefore is only available for only 16% of our sample.

This study has other important limitations. First, data were self-reported and therefore subject to recall and social desirability bias. Yet, such biases would not account for the results unless they changed sharply at age 65. Second, subpopulations who lacked phone access may be underrepresented. We accounted for the sampling scheme by incorporating the recommended sample weights. Third, we used data from BRFSS modules that were not available in every state. We used sample weights to ensure data were representative at the state level and focused on the impacts of Medicare health insurance within the sample. Fourth, our study design identifies changes in lung cancer screening associated with Medicare insurance coverage at age 65, and the results may not generalize to people in other age groups. Finally, sample size limitations in the BRFSS data prevented us from examining variation in the findings by race or ethnicity; these topics are important to examine in future research.

In summary, inadequate insurance coverage or access to care hinders lung cancer screening, especially for high-risk men. To reach the full population with recommended screening under the new 2021 guidelines, multilevel intervention strategies including access to insurance may be needed. Further improving insurance access and access to care may reduce lung cancer mortality.

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