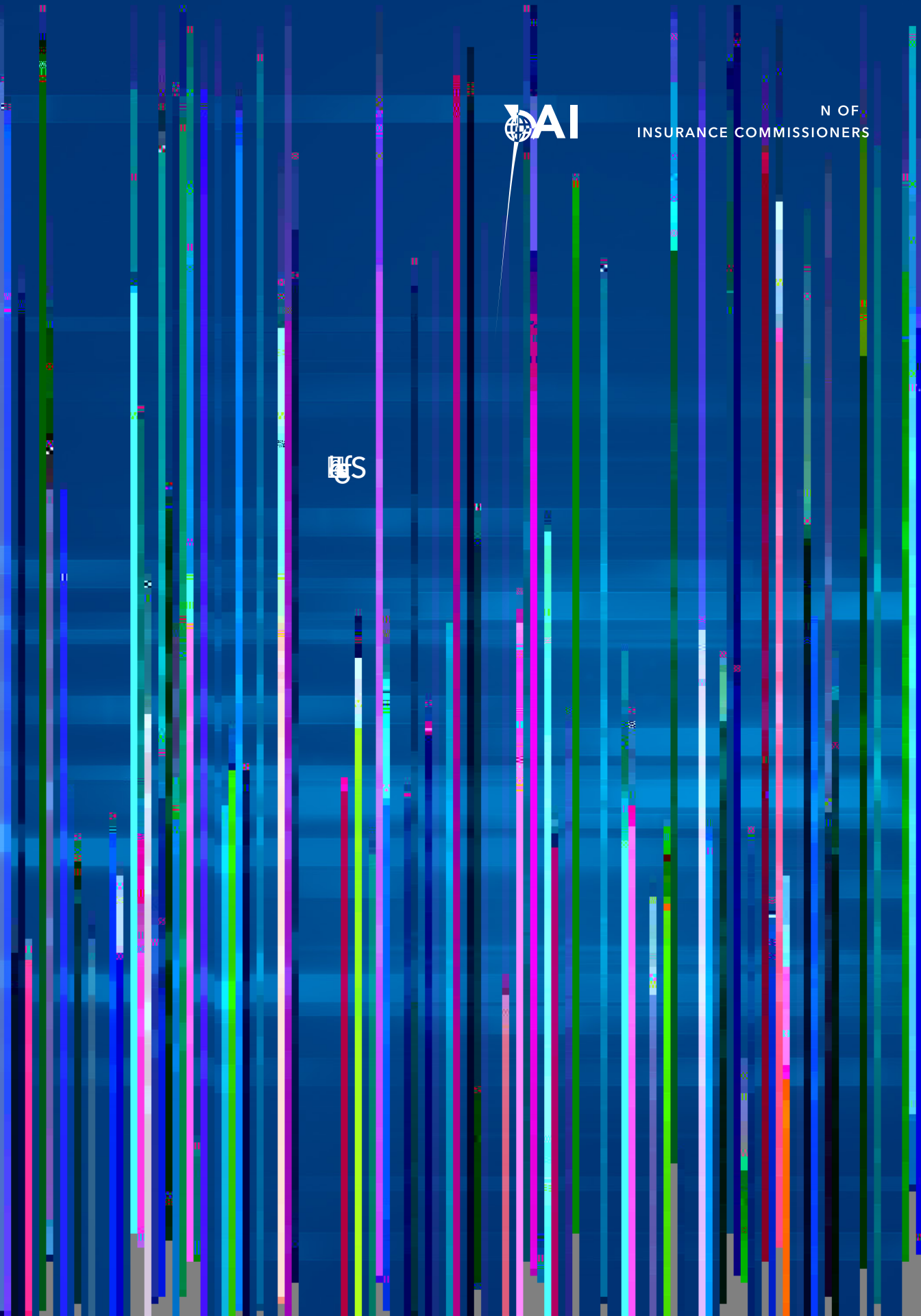
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consistent with the age group distribution of those most likely to have surgical and non-surgical procedures. The robustness checks provide evidence that the contractual relationships among insurers and hospitals are one source of surprise medical billing. Our study provides evidence that self-insured group health plans may be another source of surprise medical billing. Given the No Surprises Act is now in effect, we offer recommendations for state insurance regulators regarding implementation of the new legislation.

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ABSTRACT

This article used consumer survey data to investigate the impact of state surprise medical billing protections on consumers with employer-sponsored health insurance. State protections were categorized as comprehensive, partial, and none following the Commonwealth Fund (2019). Our results indicated that consumers with employer-sponsored health insurance who lived in states with comprehensive surprise medical billing protections were more likely to report receiving surprise medical bills than those who lived in states with no protections. We offer several explanations for this result, including that state protections do not apply to self-funded health care plans. Regarding differences across ages, we found that consumers ages 45 to 60 were more likely to receive a surprise medical bill, which is consistent with the age distribution of those receiving the highest proportion of surgical and non-surgical procedures. With these results, our study contributes to the health insurance literature by deepening our understanding of surprise medical billing regarding both consumer knowledge and the impact of state regulation.

1. Introduction

Surprise out-of-network medical bills (e.g., Americans hit with $12,000 in surprise emergency room bills and $600 in Band-Aids [Kliff, 2017]; a $17,850 surprise out-of-network bill for a urine test at an in-network doctor's office [Rosen, 2019]) have captured the attention of both state and federal regulators. In December 2020, the U.S. Congress (Congress) enacted a $900 billion COVID-19 relief package and government funding bill (H.R. 133). Included in the measure was the federal No Surprises Act (NSA) (H.R. 133, P.L. 116-260), federal legislation designed to end the most common types of surprise out-of-network billing. Starting Jan. 1, 2022, both providers and health plans must treat many out-of-network services as if they are in-network when calculating patient cost-sharing, with the notable exception of ground transportation. This new federal surprise billing protection applies to all commercially insured patients, including, for the first time, those in self-insured group health plans. The federal law also extends to out-of-network care provided by air ambulance providers and post-stabilization services.

Prior to the federal legislation, consumers in more than half of the states were protected against surprise medical bills by some form of legislation. A key difference between state protections and the recently enacted federal legislation is that the federal law protects patients covered by employer-sponsored health plans. Thus, the goal of this research is to examine the relationship 10.0382 0 0 10 66 5iurprise m(baance

Foundation (KFF) survey, a third of the large troubling medical bills received by insured, working-age adults are charges from out-of-network providers (Hamel et al., 2016).

Surprise medical bills typically arise when an out-of-network provider treats a patient. This often happens in an emergency when the patient has no role in choosing the health care facility or providers. Or a patient may receive care at an in-network facility from an out-of-network provider (e.g., physicians who provide surgical-related services, such as anesthesiologists, radiologists, pathologists, and assistant surgeons). Physicians and hospitals independently negotiate contracts–i.e., payment terms, network participation agreements, etc.–with insurers; thus, physicians and the hospitals where they work may not contract with the same insurance company.

There are three possible outcomes when an insured patient receives an out-of-network medical bill depending on how their insurance company handles it. First, the insurer may cover the out-of-network bill in full. However, the patient may still be responsible for coinsurance, which may be substantial when a patient has seen an out-of-network provider. This likely creates a financial hardship for many; a recent Federal Reserve report found that 37% of adult Americans could not cover an unexpected $400 expense without borrowing or selling assets (Board of Governors of the Federal Reserve System, 2020). A second possible outcome when a patient receives an out-of-network medical bill is that the insurer may partially cover the cost of the out-of-network care; the amount covered is usually based on the average charges for that service (Cooper et al., 2018). Because there is no network contract between the provider and the insurer, the provider can bill the patient for the difference between the insurer's payment and the full charge. Thus, the patient can be liable for the balance; this practice is typically referred to as "balance billing." In a third possible outcome, when a patient uses an out-of-network provider, the insurer may not pay any of the out-of-network medical bill, leaving the patient responsible for the entire bill, which can amount to thousands of dollars. According to a Federal Reserve report, more than 20% of adult Americans had major unexpected medical bills in 2019, with median expenses between $1,000 and $1,999 (Board of Governors of the Federal Reserve System, 2020).

Data about the prevalence of surprise medical bills and costs to consumers are limited. According to Cooper et al. (2018), there has been no systematic examination of the frequency with which out-of-network surprise billing occurs. A 2015 survey by the Kaiser Family Foundation reported that charges from out-of-network providers account for a third of medical bill problems among insured, non-elderly adult Americans (Hamel et al., 2016). In the survey, the authors also found that bills from emergency medicine physicians made up the largest share of medical debt that patients struggle to repay. A more recent survey found that more than 40% of the consumers surveyed received a surprise medical bill, with half of those reporting that the bill was more than $1,000 (Families USA, 2019). Another Kaiser Family Foundation survey found that surprise bills are the most-cited concern related to health care costs and other household expenses among insured working-age adults, with two-thirds saying they were "very worried" or "somewhat worried" about being able to afford a surprise medical bill if they or a family member received one (Kirzinger et al., 2018).

Mitchell's (2014) widely-used Big 3 and Big 5 financial literacy questions. Tennyson (2011) used this approach to measure insurance literacy broadly. Norton et al. (2014), Villagra et al. (2019), and Loewenstein et al. (2013) all measured health insurance literacy as knowledge. Loewenstein et al. (2013) used four items to measure health insurance literacy; i.e., deductibles, copays, coinsurance, and out-of-pocket maximums. Our research also used four items; i.e., one about deductibles one about copays, and two about coverage required in ACA health plans.

The second type of control variable included in this research is demographic characteristics. Previous research has identified several characteristics relevant to

with employer-sponsored insurance (ESI) would have been lower by 3.4%. Together, these two reductions would have amounted to savings of approximately $40 billion annually.

3. State Surprise Billing Protections

State action to protect consumers from surprise medical bills focuses on setting requirements for state-regulated health plans and providers. A 2017 study by the Commonwealth Fund (Lucia et al., 2017) reported that 21 states had laws that offer at

compensated by SurveyMonkey. SurveyMonkey calculated a margin of sampling error on the total results as +/- 2.229 percentage points.

In this study, we report responses only from the 840 respondents who indicated that they had health insurance through an employer (employer-sponsored insurance) or Consolidated Omnibus Budget Reconciliation Act of 1986 [COBRA]).[8] We excluded the 450 respondents with Medicare, Medicaid, or military or veteran's coverage, as these programs generally limit patient exposure to surprise billing. We also excluded respondents who indicated that they purchased private insurance, because there were only 100 in the sample, as well as those who said they had no health insurance coverage (70). A logistic regression using the full (1,505) sample supports this decision. With the source of insurance as the only variable in the regression, the Medicare/Medicaid/Military group and those with private health insurance were significantly less likely to report the receipt of surprise bills than the omitted/reference category; i.e., ESI/COBRA (see Appendix Table 4A).

4.2 Descriptive Statistics

Table 1 provides summary statistics for all the questions used in this study for both the 1,505 who provided complete responses for the variables of interest and the 840 observations in the final cross-sectional employer-sponsored/COBRA-insured subsample. The primary differences between the full sample and the subsample reflect the restriction of the subsample to those covered by employer-sponsored health insurance. Relative to the full sample, the subsample was younger, had higher incomes, and were more likely to be employed.

Looking specifically at the subsample (Columns 2 and 4 of Table 1), at least 70% of respondents chose the correct responses to each of the four health insurance literacy questions. Only 20% correctly defined the term "surprise medical bill." About 40% of the respondents or their family members in the subsample (37% in the larger sample) had received a surprise out-of-network medical bill; recall that we gave the correct definition to respondents immediately before they answered this question. In our data, about 49% of respondents lived in states with comprehensive surprise billing protection; 20% were residents in states with limited protection, and 30% of the respondents were in states with no surprise billing protection.

Approximately 52% of respondents in the subsample were ages 18 to 44. Another 38% were ages 45 to 60, and 9.5% were older than 60. Slightly more than half of the respondents were women (52%). About 28% of the respondents' households earned less than $50,000 a year; 45% earned between $50,000 and $99,999 annually, which was the highest proportion among all income groups. About 72.5% of the respondents in the subsample were employed and worked full-time; the second highest proportion (11.6%) were employed and worked part-time.

8. COBRA is a law mandating an insurance program, which gives some employees the ability to continue health insurance coverage after leaving employment by paying both their share and the employer's share of the insurance premium.

Table 1: S[illegible] a Sa[illegible] ç f[illegible] S[illegible] e Re[illegible]

Variables	N = 1,505		N = 840	
	(1) n	(2) Percent	(3) n	(4) Percent
Have you or a family member ever received a surprise out-of-network medical bill?				
Yes	563	37.41	336	40.00
No	702	46.64	375	44.64
Unsure	240	15.95	129	15.36
How would you define health insurance deductible?				
The amount you have to pay for your covered health care before your health insurance policy starts to pay for medical services	1,122	74.55	640	76.19
The amount the insurance company subtracts from the total bill	157	10.43	87	10.36
The amount subtracted from your paycheck each month to pay for your policy	126	8.37	80	9.52
I don't know	100	6.64	33	3.93
How do you define copay?				
A fixed amount that you pay each time you use most covered medical services	1,125	74.75	667	79.40
The amount of your medical bill that you pay after discounts are applied.	234	15.55	111	13.21
The part of your medical bill your insurer pays	86	5.71	43	5.12
Don't know	60	3.99	19	2.26
Regular health insurance/ comprehensive policies must cover pre-existing conditions (health problems that you had before your coverage started, like asthma, diabetes, or cancer)				
True (Correct)	1,097	72.89	605	72.02
False (Incorrect)	408	27.11	235	27.98
Regular health insurance/ comprehensive policies must cover preventive care, such as wellness visits or vaccinations				
True (Correct)	1,169	77.67	667	79.40
False (Incorrect)	336	22.33	173	20.60
How would you define a "surprise medical bill?"				
A bill for the charges when you use a provider who is outside your health insurance network, even if you didn't choose the outside	319	21.20	165	19.64
A bill for charges you think your insurance company has already paid	396	26.31	235	27.98
A bill for services or medications that you don't think you ever received	204	13.55	100	11.90
A bill for services or medications that the insurance company said it would pay but now it won't	586	38.94	340	40.48
Type of surprise billing protections in respondents' states				
Comprehensive	737	48.97	408	48.57

Partial	313	20.80	172	20.48
None	455	30.23	260	30.95
What is your primary source of health insurance?				
Employer-sponsored/COBRA	840	55.82	840	100.00
Medicare/Medicaid/Military	450	29.91		
Private insurance	100	6.64		
No insurance	70	4.65		
Other	45	2.99		
Age				
18–29	318	21.13	197	23.45
30–44	347	23.06	241	28.69
45–60	511	33.95	322	38.33
>60	329	21.86	80	9.52
Gender				
Male	696	46.25	404	48.10
Female	809	53.75	436	51.90
Household Income				
$0–$49,999	624	41.46	236	28.10
$50,000–$99,999	557	37.01	380	45.24
$100,000–$149,999	206	13.69	142	16.90
$150,000+	118	7.84	82	9.76
Employment Status				
Employed, working full-time	743	49.37	609	72.50
Disabled, not able to work	90	5.98	8	0.95
Not employed, NOT looking for work	112	7.44	55	6.55
Not employed, looking for work	122	8.11	44	5.24
Employed, working part-time	228	15.15	97	11.55
Retired	210	13.95	27	3.21

4.3 Construction of Respondents' Health Insurance Literacy Indices

We constructed health insurance literacy measures from the four health insurance knowledge questions in the survey. First, we created an overall health insurance literacy index by aggregating the coded values (1 for a correct answer and 0 for an incorrect or don't know response) for the four knowledge questions for each respondent. However, the Cronbach's alpha, a measure of the internal reliability of the index, was 0.33, far below the commonly accepted rule of greater than 0.7 (Adeniran, 2019).[9] We then conducted a factor analysis, as the Bartlett test result indicated that sufficient intercorrelation existed. The factor analysis results suggested two factors; i.e., one about knowledge of deductibles and copays and a second about knowledge of ACA health plan coverage. Thus, we created two health insurance literacy indices, each with scores ranging from 0 to 2. A score of 0 indicated that the respondent answered

9. The Cronbach's alpha was even lower, at 0.2895, when we included the definition of surprise medical billing variable in a five-item health insurance literacy index.

both questions incorrectly, 1 meant the respondent answered one question correctly, and 2 meant the respondent answered both questions correctly.

definitions, no protection, limited protection, and comprehensive protection were the categories.

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compared to the reference group for this independent variable, controlling for the remaining variables; the odds ratio quantifies the predicted change. The odds ratio is greater than 1 if the estimated coefficient is positive; if the odds ratio is less than 1, the estimated coefficient is negative. The target group is those who have received a surprise out-of-network medical bill; the reference group is those who have not received a surprise out-of-network bill or were not sure.

Table 3: Logistic Regression Results for Experience with Surprise Medical Billing and COBRA Continued Coverage Under the Affordable Care Act

	Have you or a family member ever received a surprise out-of-network medical bill?	
	(1)	(2)
Variables	Coefficient	Odds Ratio
State Surprise Billing Protections (Reference group = No protection)		
Limited Protection	-0.1198	0.8871
	(0.2101)	(0.1864)
Comprehensive Protection	0.3679**	1.4447**
	(0.1704)	(0.2461)
Definition of a "surprise medical bill?" (Reference group = Incorrect or don't know response)		
Bill for services from out-of-network provider	0.7823***	2.1865***
	(0.1848)	(0.4041)
Health Insurance Literacy Index 1 (Reference group = 0)		
1	-0.0549	0.9466
	(0.2881)	(0.2727)
2	0.0904	1.0946
	(0.2716)	(0.2973)
Health Insurance Literacy Index 2 (Reference group = 0)		
1	-0.1234	0.8839
	(0.2663)	(0.2354)
2	0.8871	

Gender (Reference group = Male)		
Female	0.1402	1.1505
	(0.1531)	(0.1761)
Household Income (Reference group = $0–$49,999)		
$50,000–$99,999	-0.0820	0.9212
	(0.1834)	(0.1689)
$100,000–$149,999	0.1226	1.1304
	(0.2295)	(0.2594)
$150,000+	-0.1844	0.8316
	(0.2823)	(0.2347)
Employment Status (Reference group = Employed, working full-time)		
Disabled, not able to work	-0.8332	0.4347
	(0.7400)	(0.3216)
Not employed, NOT looking for work	-0.4199	0.6571
	(0.3137)	(0.2061)
Not employed, looking for work	-0.1157	0.8907
	(0.3546)	(0.3159)
Employed, working part-time	-0.0713	0.9312
	(0.2424)	(0.2257)
Retired	0.3068	1.3591
	(0.4211)	(0.5723)
Constant	-0.8892**	0.4110**
	(0.3588)	(0.1475)
Observations	840	840
Pseudo R^2	0.0351	0.0351

NOTE: Robust Standard Errors in parentheses; asterisk denotes significance levels with *** p<0.01, ** p<0.05, * p<0.1

Our estimation results show that comprehensive state-based consumer protection is a positive and significant predictor of receipt of a surprise medical bill. Respondents with employer-sponsored health plans who live in states that have taken a comprehensive approach to surprise billing protection were 1.4 times more likely to report having received a surprise out-of-network medical bill than respondents who live in states that had no out-of-network state-based surprise billing protections.

An analysis was conducted to investigate whether the State Protection Approach variable was endogenous. In the test, three state-level health care structure measures–number of hospitals per 50 square miles, emergency department physician ratio to the total number of physicians, and the number of health insurers in the state–were used as instruments for the State Protection Approach variables in an extended ordered probit model (see Section 5.2 for a more complete explanation of these variables). The test results, which are reported in the Appendix Table 5A, indicated that the State Protection Approach variable was not endogenous for the subsample of respondents covered by employer-sponsored insurance.

There are at least three possible explanations for the seemingly unexpected result that consumers encountered *more* surprise medical billing in states that have taken a comprehensive approach to protect consumers. One possible explanation is that surprise medical billing happens more often in these states. A higher incidence of surprise billing may explain why a state implemented more stringent legislation. Another possible explanation is that consumers in states with comprehensive protections, compared to those in states with no protections, have greater awareness of surprise out-of-network medical bills and are more likely to recognize when they receive one. We do not have the data to test either explanation.[10]

Another possible explanation is that a substantial number of respondents were in self-insured group health plans to which state protections did not apply. According

experienced an out-of-network surprise bill compared with those who chose a wrong answer, suggesting awareness and knowledge are related.[13,14]

Definition of a "surprise medical bill?"	
Incorrect or don't know responses	0.3633***
	(0.0183)
Bill for services from out-of-network provider	0.5502***
	(0.0397)
Health Insurance Literacy Index 1	
0	0.3896***
	(0.0571)
1	0.3772***
	(0.0330)
2	0.4103***
	(0.0209)
Health Insurance Literacy Index 2	
0	0.4279***
	(0.0536)
1	0.3994***
	(0.0308)
2	0.3958***
	(0.0212)
Age	
18–29	0.3462***
	(0.0359)
30–44	0.4085***
	(0.0318)
45–60	0.4398***
	(0.0279)
>60	0.3459***
	(0.0512)
Gender	
Male	0.3835***
	(0.0243)
Female	0.4155***
	(0.0238)
Household Income	
$0–$49,999	0.4079***
	(0.0334)
$50,000–$99,999	0.3892***
	(0.0246)
$100,000–$149,999	0.4364***
	(0.0401)
$150,000+	0.3662***

	(0.0523)
Employment Status	
Employed, working full-time	0.4087***
	(0.0197)
Disabled, not able to work	0.2371*
	(0.1280)
Not employed, NOT looking for work	0.3162***
	(0.0622)
Not employed, looking for work	0.3823***
	(0.0773)
Employed, working part-time	0.3923***
	(0.0510)
Retired	0.4811***
	(0.0987)
Observations	840

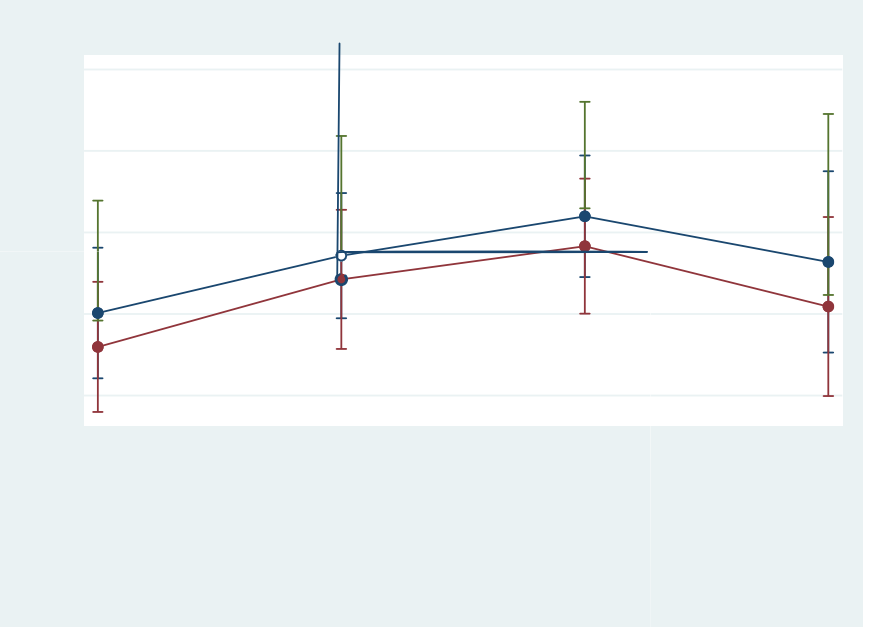
NOTE: Standard Errors in parentheses; asterisk denotes significance levels with *** p<0.01, ** p<0.05, * p<0.1

Figure 1 visualizes the predicted probability of having received a surprise bill for each level of state surprise billing protection for those who correctly defined surprise billing and those who did not. Consumers who chose the correct definition and lived in a state with comprehensive consumer protection had the highest probability (60%) of having reported a surprise bill.

Figure 1: Predicted Probability of Having Received a Surprise Medical Bill by State Surprise Billing Protection Approach and Respondents' Chosen Definition of Surprise Billing

Figure 2 visualizes the predicted probability for each level of state surprise billing protection in each age group. It is obvious that the states with comprehensive balance billing protections and the age group of 45 to 60 are the two categories with the highest probability of having received a surprise medical bill. There was a 49% probability that a consumer ages 45 to 60 who was covered by an employer-sponsored health plan and lived in a state with comprehensive surprise billing protection would have received a surprise medical bill.

Figure 2: Predicted Probability of Having Received a Surprise Medical Bill by Age and State Surprise Billing Protection Approach



50 square miles (American Hospital Directory, 2020; States101.com, 2020);[15] the ratio of emergency medicine physicians to the total number of physicians in a state (KFF, 2021);[16] and the number of insurance companies that provide health coverage (NAIC, 2020)[17] in each state, respectively. Appendix Table 1A provides the emergency medicine physicians ratio and the number of hospitals in each state.[18] Appendix Table 2A provides descriptive statistics for these three new variables.

In the robustness check analyses, the number of hospitals per 50 square miles was added to the regression first (results in Column 1) in Table 5. Then, the ratio of emergency medicine physicians to the total number of physicians in the state was added (results in Column 2), followed by the number of health insurers in the state (results in Column 3).

Table 5 presents the results of the robustness check. The primary findings from our main logistic regression were preserved. As in the main regression analysis, respondents with employer-sponsored health plans were more likely to report surprise medical bills if they lived in states that have taken a comprehensive approach to surprise billing consumer protections (relative to states with no regulation), were ages 45 to 60 (relative to those ages 18 to 29), and correctly defined surprise billing (relative to those who did not).

The three models reported in Table 5 show that the number of hospitals per 50 square miles was a positive and weakly significant predictor of the incidence of surprise medical billing. The results suggest that as the number of hospitals increases, contracting friction increases, which in turn increases the odds that a patient will be treated by an out-of-network provider. However, neither the ratio of emergency medicine physicians to the total number of physicians in a state nor the number of health insurers in a state was significant.[19] Perhaps neither is an ideal measure of contracting friction. There are two possible reasons for this. First, an emergency medicine physician could see patients from across the country, so a state-level measurement might not be sufficient. Second, physicians who face inelastic demand, such as emergency medicine physicians, may deliberately choose to stay out-of-network as a strategy to negotiate higher in-network payments with insurers as a profit-maximizing strategy (Adams, 2021). Thus, simply using the ratio or the number of such physicians may not capture the influence on unexpected out-of-network bills. Research by Sen et al. (2021) suggests that laboratory services might be another potential measure. The researchers used data from Truven MarketScan Commercial Claims databases and reported that out-of-network laboratory services were five times more common than out-of-network emergency department visits and 34 times more common than out-of-network anesthesiology services.

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15. Number of hospitals is from the American Hospital Directory; land area of each state is from *states101.com*.

16. Number of physicians is from the Professionally Active Specialist Physicians by Field as of March 2021.

17. Number of health insurance companies is from NAIC 2020 Schedule T Health Financial Fillings as of June 22, 2020.

18. We do not disclose the insurer numbers in the Appendix Table 1A, as it is confidential data acquired via the NAIC.

19. We also used the number of emergency medicine physicians, as well as the ratio (and the number) of emergency medicine physicians, radiologists, and anesthesiologists. The variables were insignificant in all analyses, and the estimation results were similar to those presented here. These regression results are available upon request.

Table 5: L· g, c Reg e, ·· R· b, ·· e, Chec

Variables	(1) Received a surprise out-of-network medical bill?	(2) Received a surprise out-of-network medical bill?	(3) Received a surprise out-of-network medical bill?
State Surprise Billing Protections (Reference group = No protection)			
Limited Protection	-0.0344	-0.0366	-0.0567
	(0.2269)	(0.2270)	(0.2279)
Comprehensive Protection	0.4298**	0.4330**	0.3973**
	(0.1891)	(0.1894)	(0.1917)
How would you define a "surprise medical bill?" (Reference group = Incorrect or don't know response)			
Bill for services from out-of-network provider	0.7812*** (0.1855)	0.7720*** (0.1863)	0.7722*** (0.1864)
Health Insurance Knowledge Index 1 (Reference group = 0)			
1	-0.0625	-0.0601	-0.0506
	(0.2875)	(0.2884)	(0.2880)
2	0.0880	0.0864	0.0860
	(0.2718)	(0.2725)	(0.2716)
Health Insurance Knowledge Index 2 (Reference group = 0)			
1	-0.1403	-0.1465	-0.1362
	(0.2672)	(0.2668)	(0.2668)
2	-0.1375	-0.1417	-0.1306
	(0.2503)	(0.2502)	(0.2502)
Age (Reference group = Ages 18–29)			
30–44	0.3159	0.3140	0.2995
	(0.2172)	(0.2172)	(0.2163)
45–60	0.4432**	0.4466**	0.4375**
	(0.2086)	(0.2088)	(0.2080)
>60	0.0325	0.0332	0.0218
	(0.2974)	(0.2978)	(0.2980)
Gender (Reference group = Male)			
Female	0.1143	0.1155	0.1136
	(0.1538)	(0.1539)	(0.1540)
Household Income (Reference group = $0–$49,999)			

$50,000–$99,999	-0.0848	-0.0795	-0.0805

disputes between payers and out-of-network providers. With much at stake for patient out-of-pocket costs and premiums, federal and state officials are likely to closely monitor and adjust these requirements as needed.

In the meantime, state insurance regulators will continue to play a prominent role in protecting consumers from out-of-network surprise medical bills. First, the NSA affirms that states remain the primary regulators of fully insured health insurance products. As such, state insurance departments can choose to enforce the NSA's requirements on insurers that offer group or individual health insurance coverage. If a state fails to substantially enforce the NSA, federal officials will step in to do so. The U.S. Department of Labor (DOL) will continue to regulate self-insured group health plans. Second, the NSA extends the same cooperative enforcement framework to health care providers

As with all research based on survey data, our study has limitations. An important one is the phrasing of the question about receipt of out-of-network surprise medical bills. The question asked respondents if they had *ever* received a surprise medical bill (emphasis added). No doubt we would have more confidence in our results if the question had specified a time period. There is debate in the literature about the optimal recall period for survey research (Clarke et al., 2008). The wording of the survey question introduces the possibility that the respondent may have recalled a surprise medical billing from the past, perhaps before a state passed legislation or when the respondent was covered by a different type of insurance. Another limitation is the limited number of questions used to measure health insurance literacy. A best practice in measuring knowledge is to identify the relevant domains that make up that knowledge and include three to five items to measure each (Huston, 2010). In addition, more recent research regarding financial literacy indicates that self-assessed financial knowledge may be as or more important than objectively measured financial knowledge in predicting behaviors (Nicolini, 2022).

A potential area of future study could be to analyze the impact of the NSA on several areas, including health care costs, especially the physician markets that have historically had a higher incidence of surprise bills. Future research could also monitor and investigate potential gaps in the scope of the NSA.

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Appendix

Table 1a: S a e S ᴌ ᴑ , e B ⁻ g P ˙ ec ˙⁻ A ᴑᴑ ˙ ach, Ph , c a ˙ , ⁻ E e ge ˙ c Med - c ⁻ e Re a ᴌ e ˙ N ᴌ be ˙ f Ph , c a ˙ , ⁻ he S a e, N ᴌ be ˙ f H ˙ , ᴑ a , ᴑ e ◢ – S ᴌ a e M ę

State Name	State Protection Approach	Emergency Department Physician/Total Number of Physicians	Hospitals/50 Square Miles
California	Comprehensive	10%	0.109450
Colorado	Comprehensive	13%	0.027016
Connecticut	Comprehensive	9%	0.351059
Florida	Comprehensive	10%	0.199535
Illinois	Comprehensive	13%	0.127885
Maine	Comprehensive	14%	0.030801
Maryland	Comprehensive	7%	0.272988
New Hampshire	Comprehensive	11%	0.078190
New Jersey	Comprehensive	10%	0.530318
New Mexico	Comprehensive	13%	0.015252
New York	Comprehensive	9%	0.197341
Oregon	Comprehensive	12%	0.019273
Texas	Comprehensive	10%	0.069096
Washington	Comprehensive	11%	0.045895
Arizona	Limited	12%	0.033893
Delaware	Limited	15%	0.205269
Indiana	Limited	10%	0.142355
Iowa	Limited	8%	0.035806
Massachusetts	Limited	8%	0.461537
Minnesota	Limited	10%	0.034536
Mississippi	Limited	12%	0.073524
Missouri	Limited	10%	0.060371
Nebraska	Limited	8%	0.017573
Nevada	Limited	13%	0.014119
North Carolina	Limited	11%	0.111070
Pennsylvania	Limited	12%	0.197798
Rhode Island	Limited	16%	0.531925
Vermont	Limited	8%	0.037975
West Virginia	Limited	14%	0.068640

Alabama	No Protection	8%	0.007886
Alaska	No Protection	15%	0.009873
Arkansas	No Protection	9%	0.049005
District of Columbia	No Protection	9%	5.737705
Georgia	No Protection	11%	0.096499
Hawaii	No Protection	12%	0.108987
Idaho	No Protection	12%	0.010890
Kansas	No Protection	8%	0.033636
Kentucky	No Protection	11%	0.094970
Louisiana	No Protection	10%	0.124988
Michigan	No Protection	17%	0.092857
Montana	No Protection	11%	0.006527
North Dakota	No Protection	7%	0.007246
Ohio	No Protection	13%	0.178655
Oklahoma	No Protection	13%	0.065603
South Carolina	No Protection	12%	0.111441
South Dakota	No Protection	6%	0.016488
Tennessee	No Protection	8%	0.121256
Utah	No Protection	11%	0.021297
Virginia	No Protection	11%	0.115219
Wisconsin	No Protection	10%	0.072012
Wyoming	No Protection	13%	0.007210

NOTES: The information in this table is as of January 2020. It would be interesting to investigate whether there are observable differences between states based on when surprise billing protections were in place. However, it is challenging to make that determination, given that it may have taken multiple laws to create a state's protections, particularly for those states using a comprehensive approach.

Since January 2020, four other states have passed legislation that the Commonwealth Fund considers comprehensive; i.e., Georgia, Michigan, Ohio, and Virginia. For the most current information about state surprise billing legislation, visit the Commonwealth Fund's website at *https://www.commonwealthfund.org/sites/default/files/2021-03/Hoadley_state_balance_billing_protections_table_02052021.pdf*.

Table 2a: Descriptive Statistics of the Sample Data

Variable	Mean	Standard Deviation	Min	Max	N
Hospitals per 50 square miles	0.140	0.223	0.007	5.738	840
Emergency department physician ratio by state	10.79	1.88	5.64	16.69	840
Number of health insurers by state	59.79	23.72	18	109	840

Table 3a: L g c Reg e, Re f ESI a d COBRA C e ed Re de , U g a Se a e Ca eg f he F S a e h O -I O , f Se f-F ded P a , f he S a e P ec Va ab e

	Have you or a family member ever received a surprise out-of-network medical bill?	
	(1)	(2)
Variables	Coefficient	Odds Ratio
State Surprise Billing Protections (Reference group = No protection)		
Limited Protection	-0.1306	0.8776
	(0.2115)	(0.1856)
Four States with Opt-In Option	0.3455	1.4126
	(0.3244)	(0.4583)
Comprehensive Protection	0.3710**	1.4492**
	(0.1745)	(0.2529)
Definition of a "surprise medical bill" (Reference group = Incorrect or d0=d C		

$50,000–$99,999	-0.0764	0.9265
	(0.1829)	(0.1695)
$100,000–$149,999	0.1304	1.1393
	(0.2291)	(0.2610)
$150,000+	-0.1864	0.8299
	(0.2831)	(0.2350)
Employment Status (Reference group = Employed, working full-time)		
Disabled, not able to work	-0.8299	0.4361
	(0.7394)	(0.3224)
Not employed, NOT looking for work	-0.4252	0.6536
	(0.3139)	(0.2052)
Not employed, looking for work	-0.1135	0.8927
	(0.3549)	(0.3168)
Employed, working part-time	-0.0689	0.9334
	(0.2424)	(0.2263)
Retired	0.3066	1.3588
	(0.4215)	(0.5728)
Constant	-0.8895**	0.4109**
	(0.3590)	(0.1475)
Observations	840	840
Pseudo R^2	0.0353	0.0353

NOTE: Robust Standard Errors in parentheses; asterisk denotes significance levels with *** p<0.01, ** p<0.05, * p<0.1

Table 4a: L g c Reg e Re f Re de E e ce h S e Med ca B g

	Have you or a family member ever received a surprise out-of-network medical bill?
Variables	**Coefficient**
What is your primary source of insurance (Reference group = ESI/COBRA)	
Medicare/Medicaid/Military	-0.2381**
	(0.1217)
Private Insurance bought myself/I don't have health insurance/Other	-0.2807*
	(0.1587)
Constant	-0.4055***
	(0.0705)
Observations	1,505
Pseudo R^2	0.0028

NOTE: Robust Standard Errors in parentheses; asterisk denotes significance levels with *** p<0.01, ** p<0.05, * p<0.1

Table 5a: P b Reg e, h S a e S, e B g P ec , Be g h, e ed b S a e Hea h Ca e S c e Mea e, ESI a d COBRA S b a e

Variables	Coefficient	Robust Standard Error	z	P>z	[95% Confidence Interval]	
Have Received Surprise Bills						
State Protection (Reference group: No protection)						
Limited	0.258	0.296	0.870	0.382	-0.321	0.838
Comprehensive	0.893	0.568	1.570	0.116	-0.220	2.006
Health Insurance Literacy Index 1 (Reference group = 0)						
1	-0.034	0.169	-0.200	0.843	-0.365	0.298
2	0.055	0.159	0.350	0.728	-0.257	0.367
Health Insurance Literacy Index 2 (Reference group = 0)						
1	-0.069	0.158	-0.440	0.663	-0.378	0.241
2	-0.071	0.148	-0.480	0.629	-0.361	0.218
Definition of a “surprise medical bill?” (Reference group = Incorrect or don’t know)						
Bill for services from out-of-network provider	0.466	0.112	4.170	0.000	0.247	0.686
Age (Reference group = 18–29)						
30–44	0.172	0.128	1.340	0.179	-0.079	0.424
45–60	0.253	0.124	2.050	0.041	0.011	0.496
>60	0.002	0.176	0.010	0.989	-0.343	0.348
Gender (Reference group = Male)						
Female	0.073	0.092	0.800	0.424	-0.106	0.253
Household Income (Reference group = $0–$49,999)						
$50,000–$99,999	-0.057	0.108	-0.530	0.599	-0.269	0.1410$50,0006$49,960

Employed, working part-time	-0.036	0.143	-0.250	0.800	-0.317	0.245
Retired	0.170	0.252	0.670	0.500	-0.324	0.665
State Protection						
Hospitals (per 50 square mile)	0.266	0.358	0.740	0.458	-0.437	0.968

Definition of a "surprise medical bill?" (Reference group = Incorrect or don't know)						
Bill for services from out-of-network provider	0.319	0.813	0.390	0.695	-1.274	1.912
Definition of a "surprise medical bill?"						
Health Insurance Literacy Index 1 (Reference group = 0)						
1	0.358	0.221	1.620	0.105	-0.075	0.790
2	0.435	0.202	2.160	0.031	0.040	0.831
Health Insurance Literacy Index 2 (Reference group = 0)						
1	0.291	0.208	1.400	0.162	-0.117	0.700
2	0.445	0.197	2.260	0.024	0.059	0.830
Correlation (error.StateProtection, error. HaveReceivedSurpriseBill)	0.089	0.457	0.200[21]	0.845	-0.672	0.759

Observations	840	Wald chi2(15)	20.54	Prob>Chi2	0.1523

21. Not significant; thus, the definition of surprise medical bill variable is not endogenous in the ESI/COBRA subsample.