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RESEARCH ARTICLE

Do Variations in State Consultation Programs Affect Construction Fatality Rates?

Wayne B. Gray[1] | John Mendeloff[2]

[1]Professor Emeritus, Department of Economics, Clark University, Worcester, Massachusetts, USA | [2]Professor Emeritus, School of Public and International Affairs, University of Pittsburgh, Pittsburgh, Pennsylvania, USA

Correspondence: Wayne B. Gray (wgray@clarku.edu)

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ABSTRACT

Background: Along with its enforcement program, the Occupational Safety and Health Administration (OSHA) has a voluntary consultation program that responds to requests from firms to identify hazards at their workplaces. We studied the effects of this program on fatal work injuries in the construction industry.

Methods: We first examined differences across states in their consultation programs using data from 2016 through 2022, during which time 47,418 consultation visits were conducted in construction. These included differences in frequency of consultation visits at construction firms, the average number of hazards identified per visit, and the scope of those visits. We then used regression analysis to identify the connection between those characteristics and the state's construction fatality rate. We distinguished between the 21 State Plan states which ran their own OSHA enforcement programs and the 29 states where Federal OSHA did the enforcement.

Results: State Plan states generally had higher rates of consultation visits that covered more of the worksite and identified higher rates of serious hazards per 1000 workers than Federal states. In regression analyses, State Plan consultation rates were negatively and significantly related to their construction fatality rates. Interactions of consultation rates and average visit hazards or visit scope showed a significant negative relationship with construction fatality rates. The relationship for Federal states was similar though not always significant.

Conclusions: More frequent consultation visits to a state's construction firms and more hazards identified or greater visit scope were associated with lower construction fatality rates.

1 | Introduction

This paper reviews the Occupational Safety and Health Administration's Consultation Program and its relevance to the goals of preventing hazards, injuries, and deaths. Each state has its own program, paid for with a mix of federal and state funds, providing consultant visits to employers upon request that help identify potential violations of OSHA standards, but do not impose penalties. We focus on the construction industry, which despite its relatively high workplace fatality rate, has had less analytic attention than other sectors, largely because it's difficult to measure the impact of a given intervention on firm-level outcomes. A construction worksite can involve many firms and

is temporary in nature, while a given construction firm can be working at many sites at the same time.

The motivation for this study of consultations came from a study by Gray and Mendeloff [1] that found construction fatality rates to be significantly lower in states with higher rates of construction consultations (i.e., consultation visits per 1000 construction employees), holding constant the inspection rate and many other variables.

In this paper, we begin with the earlier finding that states with more frequent consultation visits in construction have lower construction fatality rates [2].[1] We examine the variability across states in their visit rates and other characteristics of their consultation programs, using quantitative measures from OSHA databases covering all consultations done from 2016 to 2022 and qualitative interviews with the consultation program managers in 31 states (all of the State Plan states and 10 of the Federal states). By gaining a better understanding of differences across state consultation programs, we hope to better understand how consultation visits make workplaces safer. This lays the groundwork for a series of regression analyses that replicate and extend those in Gray and Mendeloff [1].

OSHA's consultation program offers free services, primarily to firms with fewer than 250 workers, that focus on identifying violations of OSHA standards. The program requires states to provide at least 10% of the cost of the program with Federal OSHA supplying the other 90%. About 2/3 of states provide support above the 10% level, sometimes above 50%. Among the motivations for employers to seek consultation services are: (a) preventing injuries to employees, (b) avoiding possible penalties in future OSHA enforcement inspections and (c) gaining approval of employees. As one OSHA description states: [3]

"The On-Site Consultants Will

- Help you recognize hazards in your workplace.
- Suggest general approaches or options for solving a safety or health problem.
- Identify kinds of help available if you need further assistance.
- Provide you a written report summarizing findings.
- Assist you to develop or maintain an effective safety and health programs.
- Provide training and education for you and your employees.

The On-Site Consultants Will Not

- Issue citations or propose penalties for violations of OSHA standards.
- Report possible violations to OSHA enforcement staff.
- Guarantee that your workplace will "pass" an OSHA inspection."

OSHA consultations are voluntary and, as noted, the consultation program does not assess penalties for the hazards it finds; however, the employer must commit to fixing those hazards. If the employer does not abate a serious or imminent danger hazard, the consultants must notify OSHA enforcement for a potential inspection. Such referrals to enforcement are rare—a handful per year out of perhaps 20,000 consultation visits in all sectors. The absence of referrals to enforcement testifies mostly to firms' compliance; however, employers have the right to limit the consultation visit to specific topics. About half of consultations are "limited" as a result, although the percentage varies greatly across states. The consultant can still identify any hazards that are "in plain sight." Limited consultation visits tend to identify fewer hazards than full visits which can cover the entire worksite.

Of course, firms may also obtain information about hazards from non-OSHA sources—their own in-house staff or consultants, their workers' compensation insurance carrier, or other private firms.

In any given month, about 18,300 construction projects are started, about 220,000 per year [4].[2] Over the 2016–2022 period in our data, the consultation program averaged 6774 construction visits per year, so we estimate that about 2% to 3% of these projects are visited by OSHA consultants in a typical year during this period, with considerable variation among states.

In this paper, we emphasize distinctions between Federal states and State Plan (SP) states. In the 1970s, 21 states chose to operate their own OSHA enforcement programs, under federal guidelines, rather than to turn over all enforcement authority to federal OSHA. The other 29 states chose to have the federal government carry out enforcement directly with its own employees. In the Federal states, the Federal government operates OSHA enforcement and pays for its full cost. In the SP states the Federal government pays at least 50% of the cost of enforcement. Not surprisingly, enforcement in Federal states is considerably more uniform than enforcement in SP states. One key difference is that the average penalty per inspection in Federal states is almost 3 times higher than in SP states.

While there is no *legal* distinction between consultation programs in Federal and SP states, we nonetheless find large differences between them. Despite having only 43% of the American population, the 21 SP states conducted 2.6 times as many consultations in construction from 2016 to 2022 as the 29 Federal states. Nine of the 10 states with the highest construction visit rates over this period were SP states. In addition, 72% of construction consultations in SP states were "full" while 69% of construction consultations in Federal states were "limited" in scope, suggesting greater worksite coverage in SP states.

The distinction between Federal and SP states also played a part in Gray and Mendeloff's findings [1]. While a significant negative relationship between consultation frequency and fatality rates in construction was found overall, this relationship was much stronger in SP states. The relationship between consultation frequency and fatality rates in Federal states was negative, but smaller and statistically nonsignificant.

Our regression analysis began by confirming that the results from Gray and Mendeloff [1] hold in our data. We again found a significant negative relationship between state-level consultation frequency and state-level fatality rates, stronger for SP states and weaker for Federal states. We then addressed the interaction of consultation frequency with state-level average hazards reported per visit or the share of visits in the state that covered the full worksite. These interactions also had a significant negative relationship to state-level fatality rates for SP states. Federal states showed similar relationships in sign and magnitude but these were not significant.

2 | Prior Research

The most relevant research was the doctoral dissertation by Read [5], which examined consultations in 49 states over 7 years ending in September 2011. The study used propensity scoring methods to examine changes at establishments participating in the OSHA consultation program compared to a nationally representative sample of all establishments. The final sample included 9842 establishments that received consultations in multiple years during the study period. Over these years "establishments participating in the OSHA consultation program had average reductions in their total recordable case rate of 35.8% and days away, restricted, or transferred rate of 25.2% [These reductions were] larger than a nationally representative sample of all establishments."

A study in Washington State by Foley [6] reported that consultations in non-fixed site workplaces, which had been associated with declines in workers compensation claims before 2017, showed positive, not negative, effects from 2017 to 2021. Mendeloff and Gray [7] examined OSHA consultation programs in the late 1990s in manufacturing industries and presented evidence that lost workday injury rates declined after those interventions; however, they could not rule out that some or all of the effect was due to regression to the mean. A study in manufacturing in Ontario, Canada [8] examined the effects of consultation programs from 2004 to 2008 and found no effects. OSHA published an economic evaluation of the consultation program in 2023 [9] but its calculation of benefits relied on estimated injury reductions from other types of safety interventions such as OSHA enforcement inspections, rather than any direct measure of the impact of a consultation visit.

3 | Methods

OSHA provided us with several data sets about the consultation program, including: (a) a Request file that identified each request by a firm that sought a consultant visit; (b) a Visit file that included the characteristics of every consultation visit; and (c) a Hazard file that included all the hazards that were identified on each visit by the consultant. These came from the OSHA Information System (OIS) database which covers consultations in all states from 2016 to 2022. For this study we did not have access to the names of the firms which received consultations or the address of the project they were working on. The general contractor at a site usually requests the consultation; however, in many cases, the consultant who visits the site asks subcontractors to submit their own requests for visits. If so, the subcontractor requests are recorded separately in the database. Without the project address we cannot identify which requests or visits apply to the same worksite, so all of our analyses are run at the state level, which is identified in our data.

The Request file includes the state where the consultation took place, the request date, the firm's NAICS code, and whether the firm requested a "full" or "limited" visit. The Visit file includes a link to the initial request, the visit date, and the number of workers covered by the visit. The Hazard file includes a link to the visit, the specific OSHA standard related to the hazard, and the hazard type (e.g., serious).

We first carried out a descriptive analysis of the consultation programs in construction in each state, comparing the number of visits that were conducted, as well as the characteristics of those visits such as the number of hazards identified and the number of workers covered. This analysis also took advantage of qualitative interviews we conducted with the consultation program managers in 31 states (all of the State Plan states and 10 of the Federal states) to gain additional insights into the way their consultation programs operated and any differences across states.

Having identified dimensions along which state consultation programs differed, we turned to a regression analysis, patterned after the regression analysis done in Gray and Mendeloff [1]. We started with the same data set covering 1992–2016 that contained state-year consultation visit rates in construction and a long list of state-year control variables that might be expected to affect construction fatality rates. These variables included OSHA enforcement activity, workers' compensation program characteristics, employment growth, wage, unionization, shares of different subsectors, various construction worker demographics (age, experience, ethnicity, education), and state attitudes towards risk (smoking prevalence and seatbelt use). We followed the earlier analysis by lagging the variables related to OSHA consultation and OSHA enforcement activity by 2 years. This avoided potential endogeneity if a high rate of fatalities in a year leads to more consultation requests or greater enforcement activity in that year or the following year. Appendix Table A1 presents descriptive statistics for all the variables used in the regression analysis along with brief descriptions of each and a list of data sources. With annual data for 50 states over 1992–2016 the data set contained 1250 observations—a balanced panel.

Our basic regression Equation (1) involved regressing the log of the construction fatality rate (Yst) in state s and year t on the state's consultation visit rate in construction (VISITst) and the set of control variables (Xst), along with year fixed-effects (Tt) and an error term (Est). While the mean of the fatality rate is over 10, about 5% of the state-year observations have zero fatalities, so the regressions used the log(fatality rate + 1), similar to the earlier analysis.

$$\log(Yst + 1) = a + b*VISITst + c*Xst + Tt + Est. \quad (1)$$

A key difference with the earlier analysis was that we did not have access to the Census of Fatal Occupational Injuries microdata from the Bureau of Labor Statistics to calculate state-year fatality rates. Instead, we used OSHA's inspections of all fatal occupational injuries over the 1992–2016 period to calculate the state-year number of fatalities in construction. This was then divided by state-year construction employment data from the Quarterly Census of Employment and Wages to yield a fatality rate per 100,000 workers. A key question was whether the OSHA measure of fatality rates would give similar regression results to those obtained earlier using CFOI. Since we didn't have the CFOI numbers, we couldn't directly compare the CFOI and OSHA fatality rates.

We then extended the analysis in Gray and Mendeloff [1] in two ways. First, we used our OSHA data on construction activity to calculate state-level average visit characteristics (CONs) over the 2016–2022 period such as hazards reported per consultation visit and visit scope. Interactions of those state-level averages with the state-year consultation visit rates were addressed in the

regression. The results test whether states' construction fatality rates respond more to their consultation visit rates when those visits tend to report more hazards or cover more of the worksite.

Second, we added state fixed-effects (Ss) to the regression model. There could be concerns about the earlier results being driven by unobserved state characteristics, despite all the control variables included in the regression. Fixed-effects absorb any such time-invariant state characteristics, reducing concerns about omitted variable bias. The downside is that the state fixed-effects also absorb cross-state variation in consultation visit rates and other characteristics, potentially reducing the explanatory power of their regression coefficients.

Equation (2) shows the full extended model, with both the interaction of visit rates with state visit characteristics and the state fixed-effects. Note that we don't include the separate components of the interaction term, the state-average visit characteristic and the state's consultation visit rate. The state-average visit characteristics would be absorbed by the state fixed-effects term. The visit rate is highly collinear with the interaction term and it provides all of the time-series variation in the interaction term. This made it difficult for the regression to estimate separate coefficients when both variables were included in the regression, so we focus here on comparisons across regressions rather than trying to include both the visit rate and the interaction term in the same model.

$$\log(Yst + 1) = a + b*VISITst*CONs + c*Xst + Tt + Ss + Est. \quad (2)$$

3.1 | Findings

Table 1 provides basic facts about the consultation program in construction for each state for the seven years from 2016 to 2022 as well as, at the end, comparisons between SP and Federal states. (Data for SP states in the Table are in bold type.) Column 1 gives the total number of consultation visits in a state during these years for all industries, while Column 2 provides the number for the construction industry and Column 3 shows the percentage in construction.

- The correlation between the percentage of consultations taking place in construction in a state and the annual consultation visit rate in construction per 1000 workers in the state was +0.73; not surprisingly, states which do more of their consultations in construction tend to have higher consultation visit rates in construction. The correlation between the construction visit rate per 1000 workers and the state's financial contribution to consultation was +0.47, suggesting that the state's subsidies for consultations did affect the number of consultations in construction.
- Column 3 shows that 14 states had more than 40% of their consultation visits in construction, including 11 of the 21 SP states but only 3 of 29 Federal states. At the other extreme, 6 of the 8 states with fewer than 10% of consultations in construction were federal states.
- Column 4 shows that 11 of 21 SP states had consultation visit rates in construction ranging from 2.0 to 6.6 per 1000 workers; 20 of the 29 Federal states, including the seven largest federal states, had visit rates below 0.5 per 1000 workers.
- The summary data at the bottom of Table 1 shows that the 21 SP states accounted for 72% of construction consultations (34,200 of 47,418) during these seven years despite employing only 43% of construction workers.
- Although the consultation visit rates in SP states were generally higher than in federal states, they also had a bigger range. Vermont and Alaska had annual visit rates above 5%, while Indiana, Kentucky, New Mexico, and Tennessee all had visit rates below 0.5%. As Column 3 indicates, for New Mexico the reason was the small number of consultations conducted for all industries; for Kentucky, it was because the construction sector received only 8% of the consultations. Indiana and Tennessee had bigger consultation programs but devoted no more than 15% of their consultations to construction.
- As Column 5 shows, states frequently contributed funds for the consultation program beyond the 10% match required by federal OSHA, an average contribution of 32% for SP states versus 15% for Federal states. On the low end, 19 states always contributed only the minimum 10%, including 16 Federal states and three SP states (Hawaii, New Mexico, and South Carolina). Among the 20 states with the largest percentage contributions to the consultation budget, only four were Federal states. If we calculate the dollar amounts states paid beyond 10% of their consultation budgets, we find that four SP states-California, Washington, Oregon and Nevada—accounted for over 75% of the total extra state spending on consultations.
- Figure 1 shows that states that contribute more than the minimum 10% towards their consultation budget tend to do more frequent consultation visits in construction. It also shows the patterns described above from Table 1, with SP states generally doing more visits and contributing more than Federal states. Finally, SP states have more variability than Federal states along both dimensions, with several SP states on the lower end as well as the higher end, while nearly all of the Federal states are concentrated on the lower end.

3.2 | Visits Per Request

We focus mainly on state visit rates, but the consultation process starts with a request by a firm, and a single request can result in one or more consultant visits. Table 2 lists the states with the 10 highest and 10 lowest visits per consultation request. While it is most common for a request to result in a single visit, there are substantial differences across states, with a handful of states averaging two or more visits per request. Table 2 also shows the visit rate for each state, and we find a correlation of −0.27 between the visit rate per 1000 workers and the number of visits per request. In other words, states that make more visits per request tend to be states with lower visit rates. Nearly all the states with the most visits per request were Federal states; nearly all of the states with the fewest visits per request were SP states.

Another notable difference across state consultation programs which emerged from discussions with consultation program managers is that some states try to get each individual subcontractor at the worksite to request their own consultation visit, rather than having the whole worksite covered by a single

TABLE 1 | Consultation visits across states, 2016–2022.

State	(1) All industries	(2) Construction visits	(3) Construction share	(4) Annual visits per 1000 employees	(5) Avg State financial contribution
AK	**2070**	**639**	**31%**	**5.6**	**53%**
AL	2528	928	37%	1.4	10%
AR	1791	237	13%	0.6	12%
AZ	**3550**	**2349**	**66%**	**2.0**	**18%**
CA	**11,300**	**3551**	**31%**	**0.6**	**52%**
CO	1681	167	10%	0.1	10%
CT	2559	1070	42%	2.6	58%
DE	771	207	27%	1.3	10%
FL	3510	1124	32%	0.3	10%
GA	2244	417	19%	0.3	10%
HI	**585**	**162**	**28%**	**0.6**	**10%**
IA	**2257**	**1364**	**60%**	**2.5**	**25%**
ID	906	139	15%	0.4	10%
IL	1706	137	8%	0.1	10%
IN	**2641**	**382**	**14%**	**0.4**	**23%**
KS	2330	261	11%	0.6	28%
KY	**1778**	**150**	**8%**	**0.3**	**50%**
LA	2752	652	24%	0.7	10%
MA	2044	499	24%	0.4	13%
MD	**2325**	**1155**	**50%**	**1.0**	**20%**
ME	1890	195	10%	0.9	19%
MI	**2501**	**588**	**24%**	**0.5**	**22%**
MN	**6195**	**3568**	**58%**	**4.0**	**46%**
MO	3783	340	9%	0.4	20%
MS	1245	75	6%	0.2	10%
MT	1451	196	14%	0.9	46%
NC	**8902**	**3787**	**43%**	**2.3**	**34%**
ND	1017	279	27%	1.4	10%
NE	1147	67	6%	0.2	10%
NH	1259	450	36%	2.3	10%
NJ	2456	174	7%	0.2	14%
NM	**549**	**163**	**30%**	**0.5**	**10%**
NV	**4643**	**2384**	**51%**	**3.6**	**71%**
NY	6253	459	7%	0.2	14%
OH	4741	691	15%	0.4	14%
OR	**1395**	**301**	**22%**	**0.4**	**11%**
PA	4470	303	7%	0.2	10%
RI	445	62	14%	0.4	15%
SC	**4146**	**3234**	**78%**	**4.3**	**10%**
SD	1090	193	18%	1.2	12%
TN	**2386**	**353**	**15%**	**0.4**	**33%**
TX	13,224	1265	10%	0.2	10%
UT	**2664**	**1678**	**63%**	**2.2**	**47%**
VA	**2650**	**1253**	**47%**	**0.9**	**22%**

(Continues)

TABLE 1 | (Continued)

State	(1) All industries	(2) Construction visits	(3) Construction share	(4) Annual visits per 1000 employees	(5) Avg State financial contribution
VT	**1144**	**712**	**62%**	**6.7**	**27%**
WA	**14,870**	**6037**	**41%**	**4.2**	**50%**
WI	2552	273	11%	0.3	10%
WV	1470	195	13%	0.8	10%
WY	**1023**	**390**	**38%**	**2.4**	**43%**
Total	157,178	47,418	28%	1.4	22%
Total SP States	**79,574**	**34,218**	**43%**	**1.6**	**32%**
Total Fed States	77,604	13,200	17%	0.5	15%

Note: Annual visit rate = the state's average annual construction visits over 2016–2022, divided by the state's QCEW construction employment in 2019. SP states, bolded in Table 1, are the 21 states that run their own OSHA enforcement program in the private sector. States are required to contribute at least 10% of the cost of the 21d consultation program. OR and OH also operate additional consultation programs that they fund on their own. Smaller additional programs are operated by Michigan and New York.
Source: OSHA Information System, authors' calculations.

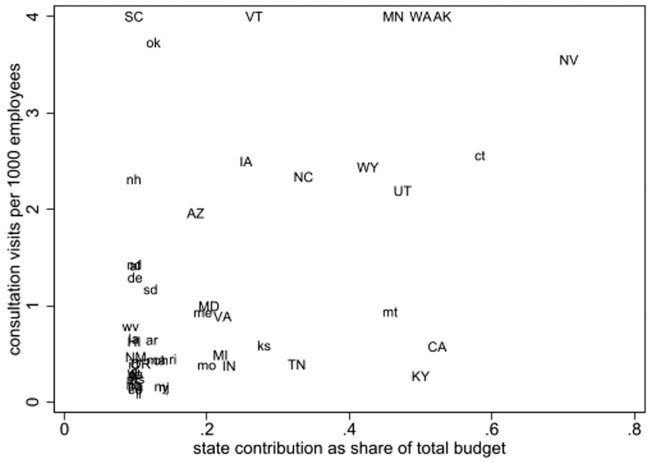

FIGURE 1 | State consultation visit rates in construction vs state budget contributions. Average consultation visits per 1000 workers in construction 2016–2022 from OSHA data, capped at 4.0 to improve legibility. State contribution is shown as a percentage of total consultation budget, 2016–2022. State Plan states are shown in upper-case, Federal states in lower-case.

request from the general contractor. Since our data didn't include firm and worksite identifiers, we can't quantify these differences across states, but this also has the effect of recording multiple visits at the same worksite.

3.3 | Delays in Responding

Another notable feature of consultation visits in some states is the delay in responding to requests for consultations from construction firms. Table 3 shows the 10 states with the highest "average wait times" in 2019, ranging from 101 to 238 days. The median percent rural for US states is 30%, so these states are not particularly rural. The delays in other states are usually much shorter (the median delay across all 50 states is 26 days). These long delays are troubling, especially given the often rapidly changing construction environment. It is possible that consultants distinguish between serious and less serious hazards and delay responding only to the latter, but that is unlikely to explain the differences in the *average* wait across states. Many of these states with lengthy delays also have very low visit rates, suggesting firms may be reluctant to request visits when they might be delayed.

3.4 | Full Visits Versus Limited Visits

Although OSHA recommends "full" visits of the worksite, employers may limit the scope of the consultation to certain processes or areas. As evidence that this distinction is meaningful, "full" visits identified an average of 3.3 serious hazards and 4.5 total hazards in our 2016–2022 OSHA consultation data; "limited" visits identified an average of 2.2 serious hazards and 2.5 total hazards. While this characteristic is nominally at the discretion of employers, we see substantial differences across states, with full visits comprising over 90% in some states and less than 10% in others. This suggests some discretion on the part of the state consultation programs to influence the designation. "Full" visits were much more common in SP states: 8 of the 10 states where more than 75% of the consultations were "full" are SP states, while 8 of the 10 states where less than 10% of the consultations were "full" are Federal states.

3.5 | Comparing Construction Hazards Reported in SP and Federal Consultations

Table 4 shows, separately for SP and Federal states, the average number of serious and total hazards identified per consultation (many consultations reference no hazards, varying from 5% to 70% across states, correlated with these averages). For comparison purposes, Table 4 also shows the number of serious and total violations found in inspections, along with the average penalties imposed in inspections for serious violations and for all violations. We see little difference between SP and Federal states in the number of serious and total hazards identified per consultation.

TABLE 2 | States doing more construction visits per request do fewer visits overall.

States with most visits per request				States with fewest visits per request			
	Visits per request	Visits per 1000 workers	Requests per 1000 workers		Visits per request	Visits per 1000 workers	Requests per 1000 workers
ND	2.94	1.4	0.5	**KY**	**1.00**	**0.3**	**0.3**
AL	2.79	1.4	0.5	**SC**	**1.00**	**4.3**	**4.3**
CO	2.53	0.1	0.04	**WA**	**1.01**	**4.2**	**4.2**
LA	2.40	0.7	0.3	**OR**[a]	**1.06**	**0.4**	**0.4**
MO	2.13	0.4	0.2	**VT**	**1.11**	**6.7**	**6.0**
WI	2.07	0.9	0.2	**MI**[a]	**1.11**	**0.6**	**0.5**
WY	**2.04**	**2.4**	**1.2**	OK	1.11	3.7	3.3
GA	1.83	0.3	0.2	**MD**	**1.12**	**1.0**	**0.9**
NJ	1.81	0.2	0.1	**IN**	**1.14**	**0.4**	**0.4**
MT	1.66	0.3	0.2	**MN**	**1.15**	**4.3**	**3.7**
Average		0.8	0.34			2.6	2.4

Note: Visits per 1000 workers is equal to Requests per 1000 workers multiplied by Visits per request. SP states shown in bold.
[a]OR and MI also have separate state consultation programs that are not counted here.
Source: OSHA Consultation Data, 2016–2022.

TABLE 3 | States with the longest wait times (days) between request date and visit date for construction firms, 2019.

	Mean wait	Median wait	Annual visits per 1000 workers	State % rural population
ID	238	200	0.4	31%
NE	221	99	0.2	27%
ND	202	196	1.4	39%
KY	**190**	**178**	**0.3**	**41%**
IL	156	125	0.1	13%
GA	121	78	0.3	26%
AL	112	97	1.4	42%
PA	110	81	0.2	24%
IA	**110**	**77**	**2.5**	**37%**
MO	101	43	0.4	31%

Note: Wait times in days for visits in 2019; annual visit rate is the average rate for 2016–2022. SP states shown in bold. Excludes Hawaii, which had fewer than 10 construction visits in 2019. State % rural population from https://www.Americashealthrankings.org/explore/measures/pct_rural_b.

In contrast, we see notable differences for the enforcement inspection data, averaging 1.7 serious violations per inspection in federal states vs. 1.2 in SP states. Penalties are also much higher per inspection in Federal states, driven primarily by higher penalties per serious violation. This difference in penalties per inspection may reflect the SP states' greater sensitivity to imposing costs on their state's employers.

In summary, states where federal OSHA operates enforcement and states which conduct their own enforcement differ across several dimensions in their consultation programs in construction, although the average number of hazards identified per visit are similar across the two groups of states. Table 5 reviews these differences:

3.6 | Regression Analysis

Having characterized differences in consultation programs across states, we then explored whether those differences were related to construction workplace fatality rates. We began by examining the state-year consultation visit rate. Table 6 compares the results from the earlier regressions in Gray and Mendeloff [1] using CFOI fatality data with our new regressions using fatality data from OSHA inspections. For the full sample, we see a significant negative relationship between the consultation visit rate and both of the fatality rate measures, with a somewhat larger coefficient using the OSHA fatality measure. The same pattern appears when we consider only the State Plan states—a significant negative relationship, somewhat larger for the OSHA fatality measure. The coefficients in the models for Federal states are also negative, but smaller than for the other models and not significant.

The OSHA enforcement measures, inspection rate, and penalty size do not show a strong connection to lower fatality rates. The state workers' compensation measures, a longer waiting period for collecting benefits or an exemption for small firms, are associated with higher fatality rates. The coefficients on the other control variables in the regressions vary in magnitude across the two fatality measures, but generally agree in sign. Overall, the general consistency between our results and the earlier regressions helps validate the use of fatality rates based on OSHA inspections in our analysis.

Since the dependent variable is measured as a logarithm, the coefficients can be interpreted as the percentage change in the construction fatality rate associated with a one-unit change in the explanatory variable. It should be noted that the mean consultation visit rate in our sample is only 0.012 (Table A1), so the coefficient of −6.865 in model 2 would correspond to an 8.2 percent reduction in the fatality rate from those consultation visits.

Our next set of results extends the earlier analysis. We focus on the differences between SP and Federal states, given the differences between those groups seen in Table 6. Table 7 reports

TABLE 4 | Comparing consultation hazard rates and inspection violation rates, 2016–22.

State	1 Consultation visits per 1000 employees	2 Av. serious hazards per visit	3 Av. total hazards per visit	4 Av. serious violations per inspection	5 Av. total violations per inspection	6 Penalties per inspection (serious viols)	7 Penalties per inspection (all violations)
AK	**5.6**	**2.2**	**2.8**	**1.8**	**2.4**	**$5586**	**$6524**
AL	1.4	1.1	1.2	2.1	2.3	$7842	$8193
AR	0.6	1.5	1.6	1.7	1.9	$7852	$8540
AZ	**2.0**	**1.5**	**1.7**	**0.9**	**1.3**	**$1126**	**$1329**
CA	0.6	**2.9**	**7.5**	**0.5**	**2.2**	**$3989**	**$5619**
CO	0.1	2.3	3.4	1.1	1.3	$4248	$4984
CT	2.6	4.7	4.7	2.0	2.2	$6374	$6715
DE	1.3	2.5	3.6	2.5	2.9	$12,178	$13,896
FL	0.3	2.0	2.4	1.3	1.6	$8442	$8999
GA	0.3	5.5	7.1	1.6	1.8	$6644	$6900
HI	**0.6**	**3.9**	**4.0**	**1.3**	**2.1**	**$3487**	**$3758**
IA	**2.5**	**3.6**	**3.8**	**0.9**	**1.4**	**$2021**	**$3143**
ID	0.2	6.7	11.0	1.6	1.8	$4877	$5278
IL	0.1	1.8	2.0	2.1	2.6	$9631	$10,061
IN	**0.4**	**1.5**	**1.5**	**2.2**	**2.3**	**$2347**	**$2498**
KS	0.6	1.6	1.7	1.7	2.0	$6990	$7587
KY	**0.3**	**6.7**	**9.5**	**1.0**	**1.3**	**$4160**	**$4402**
LA	0.7	1.7	1.7	1.1	1.4	$4797	$5550
MA	0.4	5.8	6.1	1.6	1.8	$8541	$9271
MD	**1.0**	**1.6**	**2.3**	**3.0**	**4.1**	**$2890**	**$2971**
ME	0.9	4.7	5.1	1.3	1.7	$9267	$10,184
MI[a]	**0.5**	**4.2**	**4.3**	**1.0**	**2.0**	**$1046**	**$1140**
MN	**4.0**	**4.3**	**4.6**	**1.1**	**1.3**	**$1555**	**$1678**
MO	0.4	3.5	3.7	1.9	2.1	$9434	$9989
MS	0.2	3.0	3.2	1.4	1.7	$6049	$6291
MT	0.9	2.7	3.6	0.8	1.0	$2071	$2534
NC	**2.3**	**2.5**	**2.6**	**1.8**	**2.2**	**$2824**	**$2941**
ND	1.4	2.4	2.7	1.0	1.2	$7676	$7903
NE	0.2	5.5	5.6	2.0	2.1	$8253	$8569
NH	2.3	5.1	5.4	2.1	2.4	$8993	$9673
NJ	0.2	1.4	1.8	1.9	2.0	$11,051	$11,443
NV	**3.6**	**2.9**	**3.6**	**0.6**	**1.1**	**$3137**	**$3529**
NY[a]	0.2	3	3.8	1.5	1.7	$6364	$6886
OH[a]	0.4	2.2	2.7	2	2.2	$10,826	$11,331
OK	3.7	1.2	1.2	1.1	1.2	$4170	$4737
OR[a]	**0.4**	**1.1**	**3.2**	**1.2**	**1.5**	**$1294**	**$1322**
PA	0.2	4.4	5.9	1.4	1.7	$6239	$6889
RI	0.4	5.1	5.1	1.7	2.1	$5879	$6288
SC	**4.3**	**3.4**	**3.7**	**0.9**	**1.4**	**$1582**	**$1727**
SD	1.2	4	4.4	1.8	2.2	$6637	$7803
TN	**0.4**	**4.6**	**5**	**2.3**	**3.1**	**$3919**	**$4153**
TX	0.2	1.6	1.9	1.7	1.9	$6217	$6873
UT	**2.2**	**3.9**	**4**	**1.6**	**1.8**	**$2018**	**$2070**

(Continues)

TABLE 4 | (Continued)

State	1 Consultation visits per 1000 employees	2 Av. serious hazards per visit	3 Av. total hazards per visit	4 Av. serious violations per inspection	5 Av. total violations per inspection	6 Penalties per inspection (serious viols)	7 Penalties per inspection (all violations)
VA	**0.9**	**2.6**	**2.8**	**1.4**	**1.7**	**$3068**	**$3449**
VT	**6.7**	**4.5**	**4.5**	**1.5**	**1.9**	**$3881**	**$4911**
WA	**4.2**	**2.3**	**4.1**	**1.2**	**2.1**	**$3518**	**$3581**
WI	0.3	4.4	5.6	1.7	2.1	$6505	$6964
WV	0.8	3.1	4.3	1.9	2.1	$8143	$8798
WY	**2.4**	**1.8**	**2.3**	**1.3**	**1.8**	**$4192**	**$4763**
SP States							
Median	**1.0**	**2.9**	**3.7**	**1.2**	**1.8**	**$2890**	**$3143**
Fed States							
Median	0.4	2.7	3.6	1.7	1.9	$7676	$7803

[a]State also operates another consultation program completely funded by the state. SP states shown in bold.

TABLE 5 | Summary comparison of consultations in federal and SP states.

Construction CNs in 21 SP states	Construction CNs in 29 federal states
• 9 of the 10 states with top visit rate	• Only 1 of the 10 states with the highest visit rate
• 72% of CN visits from 43% of workers	• 28% of CN visits from 57% of workers
• States contributed 32% of the costs	• States contributed 15% of costs
• Construction share of CNs was 43%	• Construction share of CNs was 17%
• Consultation scope - 72% "full"	• Consultation scope—69% "limited"

the coefficients related to consultation visits from these models, but the underlying regressions include all the control variables from Table 6. The full sets of coefficients are shown in Appendix Tables A2–A5. Column 1 shows the results from Table 6 separately for SP and Federal states, with a stronger negative relationship between consultation visit rates and workplace fatality rates. Column 2 shows the results when state fixed effects are added to the model. The estimated consultation impact for SP states is somewhat smaller than in the original regression but still negative and significant. For Federal states, the coefficient's sign and magnitude remain about the same and it continues to be statistically nonsignificant.

The remaining columns in Table 7 show the results of interactions between the state's consultation visit rate with a measure of the average characteristics of that state's consultation visits. These characteristics include the average number of serious hazards identified on the state's consultation visits and the share of those consultation visits that were "full"—covering the entire workplace rather than being "limited" in scope. We calculated a single number for each state as the average of the measure across all of their visits during 2016–2022. We multiplied this number times the state's annual consultation visit rates in our regression data set to create the interaction variable.[3]

The interaction coefficient magnitudes change from the original variable in predictable directions. The average number of serious hazards per visit exceeds 1, so the magnitude of the visit variable becomes larger and the interaction coefficient is smaller than the original visit coefficient. The share of visits that are full is less than 1, so its interaction coefficient gets larger. The results for the consultation rate variables in this interaction analysis are similar to those obtained for the original visit rate variable. All of the coefficients are negative, but only significant for the SP states. Unlike the original consultation rate coefficients, the magnitudes of the interaction coefficients are a bit larger for the Federal states than for the SP states.

In order to compare the impacts of consultation visits more consistently across these models, Figure 2 shows the estimated impact on the construction fatality rate of a one-standard-deviation change in each visit rate variable. The standard deviations used here were calculated from the full sample (the numbers given in Table A1), so the quantitative adjustment is the same for the SP and Federal coefficients. The results shown here include two additional interactions with average consultation characteristics—the average total number of hazards reported and the average number of workers covered by the visit. All of the coefficients from these regressions are provided in Appendix Tables A2–A5.

Adjusting the original coefficients for a one-standard-deviation increase in the consultation variable brought their magnitudes much closer together. For SP states, the estimated impacts were about a 10%–15% reduction in injury rates for the OLS model.

TABLE 6 | Determinants of workplace fatality rates in construction comparing data sources for fatalities (50 states, 1992–2016).

Sample:	(1) All states	(2) All states	(3) State plan	(4) State plan	(5) Federal	(6) Federal
Fatality Source:	CFOI	OSHA	CFOI	OSHA	CFOI	OSHA
Model:	OLS	OLS	OLS	OLS	OLS	OLS
Consultation rate	−5.224***	−6.865***	−5.550***	−8.329***	−3.674	−3.700
	(−2.90)	(−3.79)	(−3.18)	(−4.70)	(−1.04)	(−0.91)
Inspection rate	−0.559	0.223	−0.695	0.646	1.745	−0.170
	(−0.90)	(0.36)	(−1.05)	(0.91)	(0.71)	(−0.08)
Log(penalty)	−0.0258	0.0566	−0.108*	−0.0338	0.0943	0.124*
	(−0.54)	(1.15)	(−1.82)	(−0.46)	(1.12)	(1.71)
WC waiting period	0.0453**	0.0419**	0.0474	0.00580	0.0531**	0.0532**
	(2.35)	(2.16)	(0.94)	(0.16)	(2.42)	(2.39)
WC size exemption	0.420***	0.452***	0.248	0.638***	0.519***	0.451***
	(4.20)	(3.91)	(1.27)	(3.48)	(3.73)	(3.48)
Employment change	0.726	1.590**	0.345	0.519	0.724	2.226**
	(1.26)	(2.63)	(0.36)	(0.74)	(0.92)	(2.49)
Unionization	0.0141***	0.00941	0.0116	0.00935	0.0135**	0.00824
	(2.76)	(1.67)	(1.24)	(1.13)	(2.30)	(1.43)
Log(wage)	−0.143	−0.179	−0.00117	−0.0678	−0.0901	0.0385
	(−0.51)	(−0.65)	(0.00)	(v0.14)	(−0.25)	(0.09)
Employment share of:						
General construction	−4.141***	−4.161***	−3.068	−6.671***	−5.210**	−2.656*
	(−3.04)	(−2.78)	(−1.36)	(−3.01)	(−2.70)	(−1.71)
Employment share of:						
Specialty trades	−2.925***	−2.266***	−1.799*	−1.059	−3.697***	−2.358***
	(−4.20)	(−4.04)	(−1.93)	(−1.39)	(−3.78)	(−4.16)
New workers	0.265	0.0574	0.36	−0.0859	0.256	0.383
	(0.92)	(0.18)	(0.67)	(−0.17)	(0.76)	(1.12)
Older workers	0.28	0.190	−1.783**	−1.108	1.849**	0.734
	(0.53)	(0.43)	(−2.79)	(−1.50)	(2.47)	(1.23)
Total Hispanic	0.0536	0.0329	0.019	0.881	1.499	2.279
	(0.13)	(0.07)	(0.03)	(1.56)	(1.41)	(1.62)
Foreign Hispanic	0.652	0.878	−0.563	−1.530	−0.103	−1.546
	(1.21)	(1.41)	(-0.46)	(−1.61)	(−0.09)	(−0.93)
HS grads	−0.0904	1.135*	−0.857	0.961	0.75	1.089
	(0.570)	(−0.16)	(0.682)	(−1.26)	(0.92)	(1.35)
Non-production workers	0.187	−0.340	0.778	−0.187	−0.743	−0.783
	(0.30)	(−0.54)	(1.03)	(−0.26)	(−0.75)	(−0.87)
Seatbelt use	−0.332*	−0.0498	−0.368	0.917**	−0.493**	−0.243
	(−1.99)	(−0.20)	(−1.20)	(2.57)	(−2.64)	(−0.94)
Smoking	0.232	0.0255	0.0986	0.0815	0.666**	0.368
	(0.88)	(0.13)	(0.28)	(0.28)	(2.12)	(0.93)
N	1250	1250	525	525	725	725
R^2	0.252	0.180	0.258	0.252	0.303	0.216

Note: All models include year dummies. Dependent variable = log(fatality rate+1). Models 1 + 3 + 5 results from [1] using CFOI fatality rates; Models 2 + 4 + 6 using OSHA fatality inspections. t statistics in parentheses, clustered by state.
*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

TABLE 7 | Determinants of workplace fatality rates in construction including interactions with state consultation characteristics (21 SP states, 29 federal states, 1992–2016).

Model:	(1) OLS	(2) FE	(3) OLS	(4) FE	(5) OLS	(6) FE
Panel A—State Plan States						
Consultation Visit Rate	−8.329***	−5.971***				
	(−4.70)	(−3.60)				
Visits* Avg Serious Hazards			−2.285***	−1.509**		
			(−3.70)	(−2.18)		
Visits* %Full Visits					−10.83***	−7.458***
					(−3.30)	(−3.25)
State Fixed-Effects		*X*		*X*		*X*
N	525	525	525	525	525	525
R^2	0.252	0.183	0.247	0.180	0.257	0.182
Panel B - Federal States						
	(1)	(2)	(3)	(4)	(5)	(6)
Model:	OLS	FE	OLS	FE	OLS	FE
Consultation Visit Rate	−3.700	−3.968				
	(−0.91)	(−1.31)				
Visits* Avg Serious Hazards			−2.882*	−2.109		
			(−2.03)	(−1.57)		
Visits* %Full Visits					−14.22	−8.019
					(−1.45)	(−1.35)
State Fixed-Effects		*X*		*X*		*X*
N	725	725	725	725	725	725
R^2	0.216	0.124	0.222	0.126	0.222	0.124

Note: Models contain all variables from Table 5. Full details shown in Tables A2–A5.
Dependent variable = log(OSHA fatality rate+1). *t* statistics in parentheses, clustered by state
*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

Moving to the model with state fixed-effects reduced the estimated impacts by about one-third. These impacts were sufficient to reject a zero impact as seen by the confidence intervals. By contrast, while the Federal states had estimated impacts for the interacted variables of a similar magnitude to the SP states, most of their confidence intervals included zero.

4 | Discussion

In comparing OSHA consultation programs in construction in SP and Federal states, we have noted several major differences, summarized above in Table 5.

The number of consultation visits per 1000 construction workers has been much higher in most SP states. SP states also tend to put more of their own money into their consultation programs. It might seem logical that those two points would be connected, but since consultations are voluntary, firms still need to request the visits. Having a larger consultation staff by itself cannot guarantee a larger number of requests in a state. SP states also put a larger share of their consultations into the construction sector, helping drive their higher visit rates in construction.

Why would so many SP states contribute more funds to their consultation programs than Federal states? Based on our interviews with state consultation program managers, some of the states that contribute additional money are funding their consultation programs from the state's workers' compensation (WC) program, rather than from general state revenues. This raises the question of how states choose their funding mechanism. One possible explanation is that when SP states decided back in the 1970s to assume the extra (up to 50%) cost of running their own OSHA enforcement, charging those costs to the state WC program was a natural source of funds. Once that funding mechanism was in place, it could be natural to fund their consultation program in the same way. It is also possible that the political climate within SP states that leads their OSHA enforcement to impose lower penalties might be more supportive of the voluntary encouragement of workplace safety improvements associated with the consultation program. These are possible explanations, but more research will be needed to develop and test a model of a state's decision about how much to spend on its consultation program.

Other things equal, we would expect that the much higher penalties for non-compliance in Federal states' inspections should make firms there more likely, not less, to request consultations that could reduce the number of violations that inspectors might find. Yet we find the opposite here: firms request more OSHA consultations in SP states than in Federal states. What could explain this more welcoming behavior on the

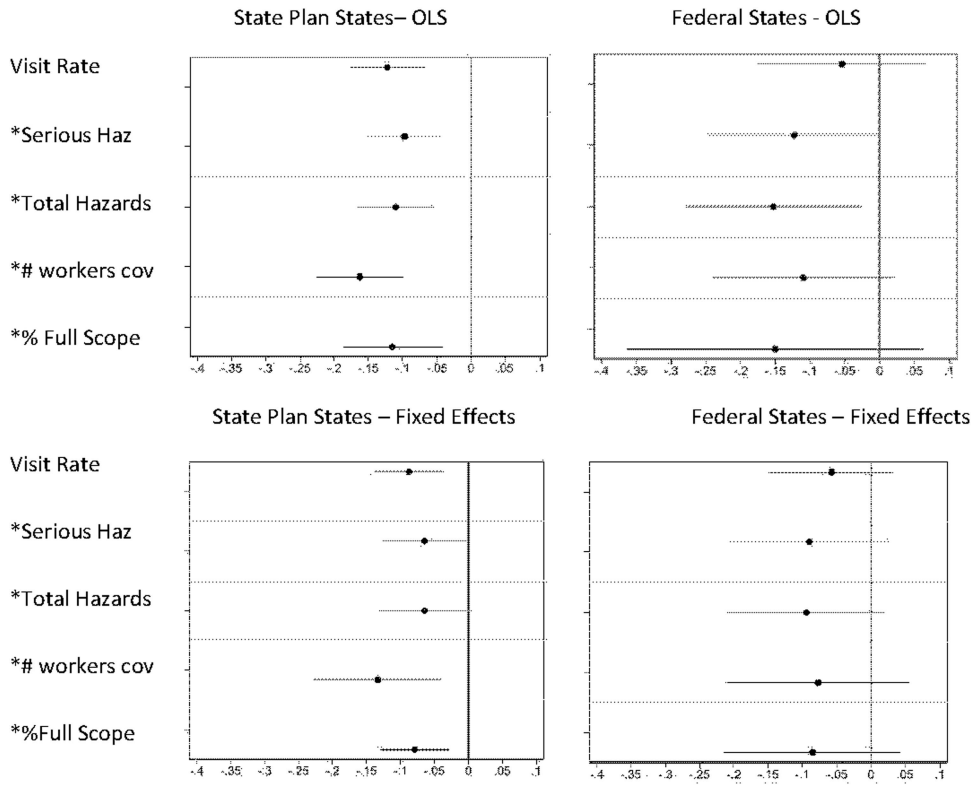

FIGURE 2 | Estimated impacts of visit rate interactions on fatality rates based on regression coefficients in Tables A2–A5 (50 states, 1992–2016). These graphs show the estimated impact of a one-standard-deviation change in the X variable along with its 95% confidence interval. Standard deviations for each X variable are based on the numbers in Table A1; coefficients are based on the regressions shown in Tables A2–A5. 5 variables = visit rate, visits*serious hazards, visits*total hazards, visits*#workers covered, visits*%full.

part of firms, even though the expected reductions in penalties would be greater in Federal states? One potential explanation is the offsetting effect of greater financial support in SP states. Better-funded consultation programs may have more resources to devote to outreach efforts, which could generate more requests. Finally, the significantly lower penalties levied by OSHA enforcement programs in SP states could create a less adversarial relationship that spills over into a greater willingness by firms to engage with the consultation program. Here again, additional research will be needed to develop and test a model of a firm's willingness to request a consultation visit.

In addition to visit frequency, we examined several measures of the average consultation characteristics in each state that might be connected to their effectiveness in reducing workplace hazards. Some of these characteristics differ substantially between SP and Federal states, while others are more idiosyncratic across states. SP states are less likely than Federal states to do multiple visits for a single request, which means SP states are visiting more worksites for the same overall visit rate. Of course, multiple visits to a single construction site could occur at different stages of construction, which will often confront different sets of subcontractors and hazards. Can multiple visits at the same site represent a productive use of consultation resources? Multiple visits over time could address different issues; treating each subcontractor as a separate visit could focus more attention on their individual hazards. However, if a single visit can address the most serious issues at a worksite, doing single visits at more worksites could be a better strategy.

SP states tend to do more "full" scope visits, while Federal states do more visits that are "limited" in scope. These differences could be explained by the greater funding available in SP states. We did not see substantial differences in the average number of hazards reported per visit for SP and Federal states. This may reflect less willingness in SP states for their visits to impose costs on firms, which would be consistent with the lower average enforcement penalties observed in SP states.

Our regression results build on the earlier analysis of Gray and Mendeloff [1]. We again find that higher rates of construction consultations in a state are significantly associated with lower construction fatality rates. In regressions run separately for SP and Federal states the negative connection between consultation visit frequency rates and construction workplace fatalities is only statistically significant for the SP states. The smaller coefficient for the visit rate in Federal states could be explained by our earlier observations that visits in Federal states are less likely to cover the whole worksite. The nonsignificant coefficients for Federal states may be tied to their smaller coefficients, but may also be tied to the limited amount of variation in visit rates within the Federal sample as compared to the SP sample. When a regression has less variation in an explanatory variable, the estimated coefficients tend to have larger standard errors and wider confidence intervals, as we see in Figure 2.

When we interact the consultation visit frequency with measures of these average visit characteristics in the state, the coefficients on the interaction terms are similar in magnitude and even a bit larger for the Federal states than the SP states.

This suggests that the differences in the original visit frequency coefficients may be explained by those differences across states in their visit characteristics. The nonsignificance of the interaction coefficients for Federal states may be tied again to their having less variation in visit rates, seen in their wider confidence intervals in Figure 2 for Federal states relative to SP states.

How large are the estimated impacts of state consultation programs? Focusing on the fixed-effect regression results in the SP states for the basic model, we roughly calculate the predicted relationship between visit frequency and fatality rates. The calculation starts with the coefficient of −6 in model 2 from Table 6. Using our OSHA data from 2016, the average visit rate among SP states is 0.025. Multiplying the two gives −0.15, suggesting that this level of consultation visits is associated with a 15% lower fatality rate.

For the 19 SP states for which we have spending data, there was a total of $32.3 million in state and federal spending on their consultation programs. Those 19 states had a total of 260 workplace fatalities in construction in 2016. Reducing that figure by 15% would amount to about 39 fewer fatalities. Recent benefit-cost calculations by OSHA [10] assigned a value of a statistical life of $10.6 million in 2016 dollars, yielding a benefit-cost ratio over 10.[4] Of course, this calculation doesn't include the cost to firms of reducing workplace hazards or the benefits to workers of having fewer non-fatal injuries.

4.1 | Limitations

Our analysis uses states as the unit of analysis so it cannot test whether consultation visits at particular worksites reduced fatalities at those worksites. That linkage is not possible here because we lacked access to the names of firms and worksites. Our OSHA data with details about consultation visit characteristics covers the 2016–2022 period while the regression analysis covers 1992-2016, so we cannot examine the impact of changes within states in their consultation characteristics over time. We do include controls for state-level fixed effects, reducing potential problems from fixed unmeasured differences across states, but there could still be time-varying factors not captured by the control variables in our regressions.

5 | Conclusion

We have examined differences across states in their OSHA consultation programs, identifying clear differences in program activity between SP states and Federal states. That distinction is based on decisions by states in the 1970s about whether they were willing to pay more for the privilege of running their own OSHA enforcement program or would prefer to let federal OSHA do (and pay for) the enforcement. Despite the lack of an obvious connection to the consultation program, we see substantially higher rates of consultation visits in construction for SP states compared to Federal states. We also see differences in some visit characteristics between these groups, such as SP states doing more “full” visits covering the entire worksite and Federal states doing more “limited” visits.

Our regression results show the same significant relationship that was found in earlier research between more frequent consultation visits and lower fatality rates in construction. The significance of this relationship is concentrated within the set of SP states, although the lack of significance of the relationship for Federal states may be explained in part by their smaller variation in visit rates compared to SP states. The estimated impact for SP states is somewhat smaller but continues to be significant when state fixed-effects are included in the model, thus controlling for possible concerns about omitted variable bias in earlier research. Interaction of the visit rate with the state average for other visit characteristics eliminates the difference in coefficient magnitudes between SP and Federal states, although the Federal coefficients are nonsignificant. This suggests that controlling for visit characteristics as well as their frequency can be important in measuring their impact on workplace hazards.

The benefit-cost calculation presented earlier shows that state consultation program activity could generate considerable benefits, substantially exceeding the costs to the government of running the program. This points toward the importance of future research on the relationship between state consultation programs and workplace hazards in construction. Better data and more advanced models could allow a more nuanced exploration of the relationship. Having firm-level data connecting consultation visits with specific outcomes could provide better evidence regarding the causal connection between consultation visits and workplace hazards, essential for any policy application of these results.

Author Contributions

Both authors contributed to the planning of the project, analysis of the data, and writing the manuscript.

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Consent

The interviews with state consultation program managers conducted in this project were approved by Clark University's IRB and there was written informed consent.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Most of the data used in this paper was obtained from publicly available sources, but the consultation data was provided by OSHA's Directorate

of Cooperative and State Programs, who must be aksed for permission before sharing the full data set.

Endnotes

[1]We focus in this current article on fatalities because an earlier study [11] found that state fatality rates in construction were strongly and negatively correlated with non-fatal injury rates, apparently because poor safety management is related to poor safety recordkeeping.

[2]"Each month, F.W. Dodge provides CIRPC with the names of projects that have entered the start stage (about 18,300 projects per month), based upon the date of the award of a general contract or the date when project decision makers state that work is to start on a particular date." [4] These project numbers exclude single-family homes, which are much less often the object of OSHA attention. Only 4.4% of the consultation visits in our data were in NAICS industry 236115, new single-family housing construction.

[3]There could be concerns about applying the 2016–2022 averages to regressions covering 1992–2016, but these average consultation characteristics are very stable over time, at least for the 2016–2022 period for which we have data. Regressing the annual values on state dummies gave R^2 values of 0.62 for serious hazards and 0.75 for %Full while a similar regression on year dummies gave R^2 values of only 0.04 and 0.01, respectively

[4]In discussing monetizing the benefits from the rule, "the analysis would use the Department of Transportation (DOT) 2023 value-of-a-statistical-life (VSL) estimate of $13.2 million per avoided fatality." [10] That translates into $10.6 million in 2016 dollars using the GDP deflator.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.
Appendix Table A1: Summary Statistics for Regression Analysis (1,250 state-year observations; 50 states, 1992-2016). **Appendix Table A2:** Determinants of Workplace Fatality Rates in Construction Interacting Consultation Rate with Visit Characteristics (State Plan states, OLS, 1992-2016). **Appendix Table A3:** Determinants of Workplace Fatality Rates in Construction Interacting Consultation Rate with Visit Characteristics (State Plan states, Fixed-Effects Models, 1992-2016). **Appendix Table A4:** Determinants of Workplace Fatality Rates in Construction Interacting Consultation Rate with Visit Characteristics (Federal states, OLS, 1992-2016). **Appendix Table A5:** Determinants of Workplace Fatality Rates in Construction Interacting Consultation Rate with Visit Characteristics (Federal states, Fixed-Effects Models, 1992-2016).