Improving health and economic security by reducing work schedule uncertainty

Kristen Harknett\textsuperscript{a,1}, Daniel Schneider\textsuperscript{b,2}, and Véronique Irwin\textsuperscript{c}

\textsuperscript{a}Department of Social and Behavioral Sciences, University of California, San Francisco, CA 94143; \textsuperscript{b}Kennedy School of Government, Harvard University, Cambridge, MA 02138; and \textsuperscript{c}Department of Sociology, University of California, Berkeley, CA 94720-1980

Edited by Douglas S. Massey, Princeton University, Princeton, NJ, and approved September 2, 2021 (received for review April 25, 2021)

Work schedules in the service sector are routinely unstable and unpredictable, and this unpredictability may have harmful effects on health and economic insecurity. However, because schedule unpredictability often coincides with low wages and other dimensions of poor job quality, the causal effects of unpredictable work schedules are uncertain. Seattle’s Secure Scheduling ordinance, enacted in 2017, mandated greater schedule predictability, providing an opportunity to examine the causal relationship between work scheduling and worker health and economic security. We draw on pre- and postintervention survey data from workers in Seattle and comparison cities to estimate the impacts of this law using a difference-in-differences approach. We find that the law had positive impacts on workers’ schedule predictability and stability and led to increases in workers’ subjective well-being, sleep quality, and economic security. Using the Seattle law as an instrumental variable, we also estimate causal effects of schedule predictability on well-being outcomes. We show that uncertainty about work time has a substantial effect on workers’ well-being, particularly their sleep quality and economic security.

Significance

Alongside wages, work schedules are a fundamental component of job quality, yet work schedules are largely unregulated in the US labor market. In 2017, Seattle became the second large US city to pass fair workweek legislation. Seattle’s Secure Scheduling ordinance aims to increase schedule predictability by requiring employers to provide 2 wk notice of work schedules, among other provisions. Our paper shows that Seattle’s law not only increased schedule predictability but also improved subjective well-being, sleep quality, and economic security. The law had no effect on reports of psychological distress. Using the natural experiment afforded by Seattle’s fair workweek law, we provide causal evidence that uncertainty about work time has harmful effects on worker happiness, sleep quality, and material hardship.

Author contributions: K.H. and D.S. designed research; K.H., D.S., and V.I. performed research; K.H. and V.I. analyzed data; and K.H., D.S., and V.I. wrote the paper.

The authors declare no competing interest.

This article is a PNAS Direct Submission.

This open access article is distributed under Creative Commons Attribution-NonCommercial-NoDerivatives License 4.0 (CC BY-NC-ND).

1To whom correspondence may be addressed. Email: kristen.harknett@ucsf.edu.

This article contains supporting information online at http://www.pnas.org/lookup/suppl/doi:10.1073/pnas.2107828118

Published October 7, 2021.
employed by large retail and food service industries, defined as employers with at least 500 employees worldwide (33).

Although Seattle and several other localities have passed fair workweek laws between 2015 and 2019, the research to date on these laws is quite limited. In 2018, Oregon became the first US state to implement a secure scheduling law. In an in-depth interview study of 75 hourly workers in Oregon conducted after the law went into effect, workers reported that employers were offering more advanced notice of schedules and allowing more time to rest between consecutive closing and opening shifts but that schedules still changed on short notice without compensation (34). In Seattle, a short-term impact study and a manager study found that the law had some of its intended effects on scheduling, but the study did not provide information about downstream effects on worker well-being (35).

In the absence of evidence on the effects of fair workweek legislation, an employer-based intervention provides the best evidence to date that intervening to stabilize work schedules improves worker well-being. In a study of The Gap, an apparel retailer, researchers randomly assigned some stores to an intervention that increased schedule predictability and stability. The Gap study found that employees experienced greater consistency, predictability, and control of their schedules as well as improved sleep quality (26). These results align with findings from observational studies showing that retail and food service workers exposed to unstable and unpredictable schedules, including short advance notice and on-call shifts, reported lower overall sleep quality (16, 25).

Overall, the evidence base is quite limited on how legislative interventions affect the predictability of work schedules and whether interventions improve the lives of workers. This question is of great policy importance, as a growing number of states and localities consider fair workweek legislation, often in the face of resistance from the business community (6), and as the Federal Schedules that Work Act proposes a similar set of scheduling regulations nationally (36). Our research fills this gap in data and estimation by providing evaluation results from one of the first governmental efforts to regulate these unstable and unpredictable scheduling practices. We estimate the effects of Seattle’s Secure Scheduling ordinance on scheduling outcomes, and use the local fair workweek policy change to estimate causal effects of schedules on health and well-being outcomes.

Work scheduling conditions are not measured in standard social science data sets such as the Current Population Survey or in administrative data. To fill this gap, we use a survey approach that allows us to target workers at the large retail firms covered by the ordinance in Seattle and at the same firms in comparison cities around the country, collected before and after the implementation of the ordinance. We use a difference-in-differences research design to estimate the effects of the law on work schedules and well-being outcomes. We find that the law led to significant improvements not only in stabilizing work schedules but also on multiple dimensions of workers’ well-being. We also leverage the law as an instrumental variable to estimate causal effects of schedule predictability on health and economic security outcomes. Here, we find that schedule predictability improves workers’ subjective well-being, sleep quality, and economic security.

Data and Methods
The Seattle ordinance covers hourly workers at large firms in the retail and food service subsectors employed within Seattle city limits. To evaluate the effects of the Secure Scheduling ordinance on workers’ schedules, our research team compiled a list of employers that would be covered by the ordinance, then harnessed the advertising infrastructure of Facebook and Instagram to deliver targeted advertisements to workers employed by the particular retail, food service, or casual dining establishments covered by the ordinance. These advertisements invited workers to our online survey, which was designed to capture key scheduling outcomes. Details on the Facebook-targeted advertising platform and data collection process are explained in the SI Appendix, and further details on data collection and validation are published separately (37). The research was approved by UC Berkeley’s (IRB#2015-10-8014) and Harvard’s (IRB#20-0877) Institutional Review Boards, and digital informed consent was obtained from all survey respondents. An anonymized data file and the analysis code to replicate our results are available from Harvard’s Dataverse repository.

We focus our data collection and limit our sample to workers paid by the hour and to workers employed by a large retail or food service establishment that falls under the coverage of the Secure Scheduling ordinance. Our survey instrument asked workers to self-report whether their workplace was within Seattle city limits. We determine whether an employer is covered by the ordinance by cross-referencing the named employer against a list of covered employers assembled from City Business Records, Hoovers data, and data from the Reference USA Database.

Treatment Group. Those who reported working in Seattle and whose employers were of the size and type that would be covered by the Secure Scheduling ordinance constitute the “Seattle treatment group.” Our sample includes 754 covered workers in Seattle at baseline, 747 Seattle workers surveyed in the first year of implementation, and 441 Seattle workers surveyed in the second year after the law took effect. Because turnover in the service sector is very high (6), we sought to reinterview baseline respondents but also replenished the sample at each subsequent wave. The workers in the first- and second-year surveys included a new cross section of workers employed by covered retail and food service employers and some workers who responded to a previous survey. All of our analyses adjust SEs to account for the nonindependence of observations for those surveyed more than once.

Comparison Group. The comparison group consists of workers employed by the exact same set of companies, all large multi-state employers, that were covered by the Seattle law but were employed in other large US cities. We restricted comparison cities to those that have a minimum wage that is higher than the federal minimum wage to align with Seattle’s progressive labor policy environment. We only include metropolitan areas with at least 1 million people so as to compare Seattle workers to those in other large urban areas. The comparison group consists of a pooled sample of workers in the 24 metropolitan areas that met those criteria: Baltimore, Boston, Buffalo, Chicago, Cleveland, Columbus, Denver, Detroit, Hartford, Jacksonville, Las Vegas, Los Angeles, Miami, Minneapolis–St. Paul, Orlando, Phoenix, Providence, Riverside, Rochester, Sacramento, San Diego, St. Louis, Tampa, and Washington, DC. The comparison sample includes 5,394 workers at baseline, 7,734 workers in the first year of follow-up, and 2,619 workers in the second year of follow-up.

Table 1 shows that the Seattle and comparison workers are similar in their work schedule attributes at baseline. Seattle workers and those in comparison cities averaged around 2.8 out of 6 possible types of schedule unpredictability. Workers in comparison cities were more likely than Seattle workers to report working back-to-back closing then opening (cloiopen) shifts. Seattle workers and those in comparison cities were well matched at baseline on well-being indicators. Our difference-in-differences research design addresses baseline differences...
between Seattle and comparison group workers by design, given that we are comparing changes over time for Seattle workers to changes over time for workers in comparison cities.

The Seattle and comparison samples are also closely aligned on their demographic characteristics at baseline (SI Appendix, Table S2). All of our model estimates control for individual-level demographic, socioeconomic, and job characteristics. As a robustness check, we also estimate a separate set of difference-in-difference models using samples of Seattle workers and workers in comparison cities who are matched on educational attainment, school enrollment, job tenure, industry subsector, age, race, gender, parental status, and marital status using propensity score matching (for further details, see the SI Appendix).

The data for this study are from a nonprobability sample and as such may differ from the broader population of workers in Seattle and comparison cities. When we compare our sample characteristics to workers in the American Community Survey, we see that our sample resembles the broader population of service sector workers in terms of age and educational attainment but that our sample is disproportionately female and White, non-Hispanic. To align our sample with the broader population of workers, we construct and apply survey weights, drawing on data from the American Community Survey. We describe the construction of these weights in the SI Appendix along with our multiple imputation approach for addressing missing values due to item nonresponse.

**Schedule Unpredictability Measures.** The Seattle law contained a complex set of scheduling provisions designed to regulate aspects of job quality that are not reported on by workers in any existing large-scale data set (such as the Current Population Survey or American Community Survey) or in administrative data. A key innovation of our approach is to field a survey questionnaire that was tailored to align with the provisions of the Secure Scheduling ordinance. We focus here on six work schedule measures that were regulated by the Secure Scheduling ordinance, given our aim of estimating causal effects of schedule unpredictability. Then, we estimate the effect of this unpredictability on well-being outcomes by using the Secure Scheduling Ordinance as an instrumental variable that parcels out endogeneity in a two-stage least squares analysis.

**Well-Being Measures.** We also examine four self-reported measures of worker well-being: happiness (very or pretty happy), sleep quality (good or very good), psychological distress (frequently feeling sad, restless, nervous, hopeless, that everything was an effort, and worthless), and experience of one or more material hardships from among six types of hardship related to hunger or food insecurity, housing instability, difficulty paying bills, and deferring needed medical care.

**Difference-in-Differences Analytic Approach.** The survey data, collected from workers before and after the ordinance took effect in Seattle and in comparison cities, allow us to estimate the ordinance’s effects using a difference-in-differences approach. We compare changes over time for workers at the large companies covered by law in Seattle with the changes for workers at the same companies that are not affected because they work in other cities without fair workweek laws in place. In particular, we estimate the change in outcomes between baseline and follow-up for Seattle workers (the first difference) after parceling out any change in outcomes over the same period for workers in comparison cities (the second difference). The estimation approach is displayed in Eq. 1.

\[ Y_{it} = \alpha + \beta X_{it} + \gamma \text{Seattle}_{it} + \delta \text{YearOne}_{it} + \mu \text{YearOne}_{it} + \pi \text{YearTwo}_{it} + \rho \text{Seattle}_{it} \text{YearTwo}_{it} + \epsilon_{it} \]  

where \( Y \) is an outcome of interest for individual \( i \) at time \( t \) (where time \( t \) is either baseline, year 1, or year 2); \( X \) represents a vector of individual-level control variables; Seattle is a dummy variable that is 1 for “Seattle treatment group” and 0 for “Comparison group” workers; YearOne is 1 for the year one follow-up period and 0 otherwise; YearTwo is 1 for the year two follow-up period and 0 otherwise; Seattle*YearOne and Seattle*YearTwo are interaction terms that are 1 for treatment group members when the ordinance was in effect in year 1 and year 2, respectively, and 0 otherwise. The terms of interest are the \( \mu \) and \( \rho \) coefficients, which represent the effect of the fair workweek law on outcome \( Y \) after 1 and 2 years following implementation.

The difference-in-differences models assume the trends in outcomes are parallel in the treatment and comparison groups prior to the intervention and would continue on a parallel trend were it not for the intervention. Because schedule unpredictability data are not available in historic survey or administrative data, we do not have pretrend data available. However, the large national sample from the Shift Project demonstrates that, in the absence of a legislative change regulating work schedules, workers in the retail and food service sectors reported a high and steady level of schedule unpredictability from Spring 2017 through Spring 2019. Examining survey reports from service sector workers in localities without scheduling legislation, we find that levels of schedule unpredictability remain uniform over time in the absence of a legislative intervention. In particular, SI Appendix, Fig. S2 shows that on the summative scale of schedule unpredictability ranging from 0 to 6, the average worker reports about 2.8 types of schedule unpredictability and that level remains stable across three points in time: spring of

**Table 1. Baseline work schedule and well-being outcomes for workers in Seattle and comparison cities**

|                         | Seattle (%) or mean | Comparison cities (%) or mean |
|-------------------------|---------------------|-------------------------------|
| **Work schedules**      |                     |                               |
| Unpred. scale (0 to 6)  | 2.79                | 2.85                          |
| Less than 2 wks' notice | 57                  | 55                            |
| Last-minute change      | 76                  | 74                            |
| Change without pay      | 70                  | 68                            |
| Clopening               | 37                  | 44**                          |
| On-call                 | 26                  | 27                            |
| Cancel without pay      | 14                  | 16                            |
| **Well-being indicators** |                     |                               |
| Happiness               | 76                  | 75                            |
| Psychological distress  | 30                  | 31                            |
| Good sleep              | 30                  | 32                            |
| Any material hardship   | 60                  | 58                            |

N 754 5,394

Mean values and percentages are regression-adjusted to control for demographics (age, race/ethnicity, sex, educational attainment, school enrollment, marital status, and parental status) and work characteristics (managerial status, job tenure, and industry subsector). Statistically significant differences between groups are indicated by **P < 0.01.
In all, a key strength of our approach is that we ensure significant homogeneity in the comparison and treatment samples by design (38). By focusing on large multi-state employers who have substantial homogeneity in their scheduling practices across geography absent regulation, we impose substantial constraints on the possibility of unobserved heterogeneity. In contrast, prior literature on minimum wage effects (39, 40) or on paid sick leave (41) lack firm-identified information and so must pool across many very different employers by geography. Notably, our design is most similar to the canonical minimum wage study by Card and Krueger (42) that similarly constrained the comparison and treatment samples to the same employers.

Using the difference-in-differences approach, we assess whether the “treated” group—workers in Seattle covered by the Secure Scheduling legislation—experienced significantly greater changes in outcomes between baseline and follow-up compared with comparison nontreated groups. We estimate these difference-in-differences models using linear probability models for dichotomous outcomes. Linear probability models were chosen for their ease of interpretation and have been found to generate results that closely align with marginal effects from probit and tobit models (43).

We control for a set of demographic characteristics including age, race/ethnicity, sex, educational attainment, school enrollment, marital status, and presence of children in the household. We also control for job tenure, managerial status, and industry subsector (retail apparel, cafe, casual dining, department or big box store, fast food, grocery, hardware, health and beauty, and miscellaneous retail). We adjust SEs to account for repeat observations of respondents.

Instrumental Variables Analytic Approach. The Seattle policy change represented an exogenous shock to work schedules that we exploit to examine the causal effects of schedules on well-being outcomes in an instrumental variables framework. We combine the bundle of scheduling conditions that were affected by the Secure Scheduling ordinance into a “schedule unpredictability scale” that ranges from 0 to 6 types of unpredictability. In the first stage, we treat working in Seattle after the fair workweek law went into effect as the exogenous treatment, which we use to predict the endogenous schedule unpredictability scale (Eq. 2). In the second stage, we use the predicted value for the schedule unpredictability scale, now purged of endogeneity, to predict well-being outcomes (Eq. 3).

\[
Sched_t = \alpha + \beta X_t + \gamma Seattle_t + \delta YearOne + \mu Seattle_t \cdot YearOne + \pi YearTwo + \rho Seattle_t \cdot YearTwo + \epsilon_{it}
\]  

[2]

\[
Y_t = \alpha + \beta X_t + \gamma Seattle_t + \delta YearOne + \pi YearTwo + \rho Sched_t + \epsilon_{it}
\]  

[3]

The first stage estimation uses ordinary least squares (OLS) regression, and the second stage estimates a probit model for the schedule unpredictability scale. The Secure Scheduling legislation stipulated that workers should receive at least 2 wk notice of their schedule. The ordinance increased the share of workers who received at least 2 wk notice of their work schedules by 11 percentage points. Before the law went into effect, 57% of Seattle workers received less than 2 wk schedule notice (Table 1) and that share had declined by 11 percentage points by Year 2 (Fig. 1B). Meanwhile, in comparison cities, the share who received less than 2 wk notice was 55% at baseline (Table 1) and remained the same in Year 2 (Fig. 1B). The difference between the change for Seattle workers (11 percentage points) and the change for workers in other cities (0 percentage points) is the 11 percentage-point impact estimate.

The ordinance generated a large impact on last-minute shift changes without pay. This practice decreased by 19 percentage points for Seattle workers in 2019 compared with the period in 2017 before the law went into effect. Over that same time period, this practice decreased by 6 percentage points for workers in other cities. Thus, we estimate that the net impact of the law was 13 percentage points (19 percentage points minus 6 percentage points).

The Secure Scheduling ordinance was associated with modest declines in on-call shifts (7 p.p., \(P = 0.07\), back-to-back closing then opening (clopening) shifts (6 p.p., \(P = 0.09\), and in cancelled shifts without pay (3 p.p., \(P = 0.23\)). Seattle workers experienced slight reductions in each of these work conditions, whereas workers in comparison cities reported a slight increase in these conditions.

Our estimates treat the passage and implementation of the Secure Scheduling ordinance as exogenous. However, the factors that shape city selection into legislative action could confound the effects we estimate. We propose a strategy to test this potential source of bias. We re-estimate our models,
comparing Seattle workers to their counterparts in cities or states that had considered scheduling legislation but had not yet enacted it. As shown in the SI Appendix, Table S3, we find very similar results with this alternative estimation.

We also compare Seattle workers to their counterparts who worked just outside of Seattle city limits. Here, we find somewhat smaller impacts on schedule unpredictability. One reason for this attenuation could be that the effects of Seattle’s ordinance spilled over to affect workers in the surrounding area.

The SI Appendix, Table S3 contains the difference-in-differences estimates (the coefficients on the interaction of Seattle

Fig. 1. (A) Impacts of Seattle’s Secure Scheduling ordinance on work schedule unpredictability scale (0 to 6). (B) Impacts of Seattle’s Secure Scheduling ordinance on work schedules. For Figs. 1 A and B and 2, baseline values are set at zero. Y1 and Y2 values are the difference-in-differences estimates, which represent changes relative to baseline for Seattle and comparison workers. Estimates are regression-adjusted to control for demographics (age, race/ethnicity, sex, educational attainment, school enrollment, marital status, parental status) and work characteristics (managerial status, job tenure and industry subsector). The 95% confidence intervals are indicated by green shading for Seattle workers and gray shading for comparison workers. Dashed vertical line indicates when the Secure Scheduling ordinance went into effect.
worker \times \text{postordinance period}) for each scheduling dependent variable for each of the four comparison groups. This appendix table also contains results from a fifth comparison group derived using propensity score matching to closely align background characteristics between Seattle and the matched comparison group without applying survey weights. The impact estimates on scheduling outcomes derived from each of the five comparison groups are similar (SI Appendix, Table S3).

Although the central aims of the Secure Scheduling ordinance were related to work scheduling practices, by increasing schedule predictability the ordinance also had positive effects on workers’ well-being.

Fig. 2 shows the trends in levels of happiness for Seattle workers and workers in comparison cities. Reported happiness was similar for workers in Seattle and in comparison cities before the ordinance went into effect (Table 1). Happiness levels slightly improved for Seattle workers after the law took effect and declined for workers in comparison cities. On net, the law was associated with a 7 percentage point increase in happiness for Seattle workers relative to their counterparts (Fig. 2 and SI Appendix, Table S4). The ordinance did not have a statistically significant effect on Seattle workers’ reports of psychological distress.

The ordinance also led to improvements in sleep quality for Seattle workers. The impact estimate was an 11 percentage point increase in “good” or “very good” sleep quality as opposed to “fair” or “poor” sleep quality. This positive impact came about largely because reported sleep quality improved over time for Seattle workers while it stayed the same over time for workers in comparison cities.

The Secure Scheduling ordinance led to a 10 percentage-point decrease in reports of at least one of the material hardships described previously, such as food or housing insecurity. This improvement was driven by a reduction in hardships for Seattle workers and stability in hardships over time for workers in comparison cities.

In the SI Appendix, Table S4, we show that these results were consistent across most alternative comparison groups but somewhat weaker for the comparison group comprised of workers employed near Seattle but outside of city limits, which, as discussed previously, could reflect spillover effects of the ordinance.

### Causal Estimates of the Effects of Schedule Predictability on Well-Being Outcomes

The legislative change in Seattle provides an opportunity to estimate the causal effects of precarious work schedules on well-being outcomes using an instrumental variables approach. We generate causal estimates of the relationship between schedule unpredictability and well-being outcomes, using the Seattle Secure Scheduling ordinance as an instrumental variable. Table 2 contains probit coefficients from the second stage of the two-stage least squares modeling. The Table 2 estimates imply that increases in the number of types of schedule unpredictability cause statistically significant reductions in sleep quality and improvements in happiness and good sleep quality. The F-statistic for the first stage indicates that the exogenous variable (working in Seattle after the Secure Scheduling ordinance took effect) is a strong predictor of the endogenous variable (schedule unpredictability). The second stage coefficient estimates for happiness and psychological distress are negative and statistically significant, indicating a decrease in both outcomes with increased schedule unpredictability. The coefficient for good sleep is negative and statistically significant, indicating a decrease in good sleep quality with increased schedule unpredictability. The coefficient for any material hardship is positive and statistically significant, indicating an increase in hardship with increased schedule unpredictability.

#### Table 2. Two-stage least squares estimates of causal effects of schedule unpredictability scale on well-being outcomes (n = 17,689)

| Second stage outcomes | Happiness | Psychological distress | Good sleep | Any material hardship |
|-----------------------|-----------|------------------------|------------|-----------------------|
| Unpred. coef.         | −0.33+    | 0.14                   | −0.46**    | 0.44**                |
| Unpred. std. error    | (0.19)    | (0.22)                 | (0.15)     | (0.14)                |

First stage estimates imply that increases in the number of types of schedule unpredictability cause statistically significant reductions in sleep quality and improvements in happiness and good sleep quality. The F-statistic for the first stage indicates that the exogenous variable (working in Seattle after the Secure Scheduling ordinance took effect) is a strong predictor of the endogenous variable (schedule unpredictability). The second stage coefficient estimates for happiness and psychological distress are negative and statistically significant, indicating a decrease in both outcomes with increased schedule unpredictability. The coefficient for good sleep is negative and statistically significant, indicating a decrease in good sleep quality with increased schedule unpredictability. The coefficient for any material hardship is positive and statistically significant, indicating an increase in hardship with increased schedule unpredictability.

#### Table 2. Two-stage least squares estimates of causal effects of schedule unpredictability scale on well-being outcomes (n = 17,689)

| First stage estimates | F-statistic | 17.1 | 17.1 | 17.1 | 17.1 |
|-----------------------|-------------|------|------|------|------|

Probit coefficients from the second stage of Two-Stage Least Squares Models and (SEs) shown. Models include controls for age, race/ethnicity, sex, education, school enrollment, marital status, parental status, manager status, job tenure, and industry subsector. Working in Seattle after the Secure Scheduling ordinance took effect is the instrumental variable, and the schedule unpredictability scale is the endogenous predictor.

\[ +P < 0.10; **P < 0.01. \]
quality and increase the share of workers experiencing at least one material hardship. Schedule unpredictability was associated with a reduction in happiness, but this relationship fell short of statistical significance ($P = 0.08$). Schedule unpredictability does not appear to increase psychological distress.

Table 3 draws on the two-stage least squares estimates and generates predicted values for the well-being outcomes for workers with an average level of schedule unpredictability and then simulates the expected level of well-being outcomes if schedule unpredictability were eliminated. The Table 3 estimates suggest that eliminating schedule unpredictability would improve happiness by 24 percentage points (from 68% to 92%), although this result should be interpreted with caution given that the IV estimate fell short of statistical significance ($P = 0.08$). The models also estimate large effects on sleep quality and material hardship. Eliminating all forms of schedule unpredictability would increase the share of workers reporting good or very good sleep quality by 49 percentage points (from 31% to 80%). The models also predict large reductions in the experience of at least one material hardship. Eliminating schedule unpredictability would reduce the share of workers experiencing at least one material hardship by 45 percentage points (from 64% to 19%).

### Discussion

In 2017, Seattle became the second large US city to pass legislation aimed at increasing the predictability of work schedules for hourly workers employed in the retail and food service sectors and the first to include a rigorous evaluation of the effects of the legislation on workers’ schedule experiences and well-being outcomes. We find that the Seattle ordinance worked as intended to increase work schedule predictability and induced positive downstream improvements in workers’ subjective well-being, sleep, and economic security. These findings are significant, given that fair workweek laws have not been rigorously evaluated previously. We provide evidence that these laws can have a positive effect for workers, not only in terms of work schedule conditions but also in their quality of life.

However, while the Secure Scheduling ordinance provided workers with greater schedule stability and predictability, we also find that compliance with the provisions of the ordinance was far from universal. For instance, while the ordinance caused significant increases in the share of workers getting at least 2 wk notice of their work schedules (an 11-percentage-point increase), that still left over 40% of covered workers reporting less than 2 wk notice 2 y after the law took effect. Seattle’s Office of Labor Standards has led the way in developing an innovative model of enforcement (46), but there is still substantial work needed to ensure full compliance with the ordinance.

In addition to providing estimates of the efficacy of a fair work week law, we also make a contribution to the literature on the effects of precarious working conditions generally, and of unstable and unpredictable scheduling conditions more specifically, on workers’ health and well-being. While prior research has used observational designs to estimate the association between work scheduling and well-being (16, 17), we provide quasieperimental estimates of the effects of unstable and unpredictable work schedules on workers’ well-being, finding that reducing such practices significantly increases workers’ sleep quality and economic security and may also positively affect happiness.

These evaluation results are based on positive changes for Seattle workers that were observed as of the spring of 2019. Since that time, the retail and food service sectors have experienced an enormous shock as the coronavirus outbreak upended life and commerce in Seattle and across the United States. Business and working conditions have changed fundamentally since 2019. Some restaurants and retail businesses closed temporarily or permanently, and many workers have experienced layoffs. For those workers who have managed to remain employed during the pandemic, work schedule stability and predictability take on heightened importance as other aspects of home life have become more complex, for instance, because of closures of many in-person schools and care settings. The stress that comes along with schedule unpredictability may be exacerbated in the context of day-to-day uncertainty and stress related to the pandemic and the economy.

Although the coronavirus outbreak has taken a heavy toll on workers in the retail and food service sector, it has also prompted a growing appreciation that service sector work is essential for meeting our basic needs. As many workplaces were required to close down for safety reasons and only essential businesses could remain open, grocery store workers and those employed in pharmacy and delivery sectors took their place alongside health care workers as part of the essential workforce. With this heightened appreciation may come a reassessment of job conditions in the service sector, for which the evaluation of the Secure Scheduling ordinance in Seattle can be instructive. Fair workweek legislation like the Secure Scheduling ordinance can be effective in increasing schedule predictability and improving worker well-being.

### Data Availability

Anonymized data and code have been deposited in Harvard’s Dataverse (https://doi.org/10.7910/DVN/LMAZ2N).

### ACKNOWLEDGMENTS

We gratefully acknowledge grant support from the city of Seattle (OCA-2017-2019-XX), the US Department of Labor (EO-30277-17-61-5-6), the Robert Wood Johnson Foundation (Award 74528), the National Institutes of Child Health and Human Development (R21HD091578), the William T. Grant Foundation, and the Washington Center for Equitable Growth (Award 39092). We are also grateful for excellent research assistance provided by Rebecca Wolfe, Connor Williams, Megan Collins, Annette Gailliot, and Evelyn Bellew. We thank Claudia Gross-Schader, Anna Haley, Shannon Harper, David Jones, and Susan Lambert for thoughtful input.

Harknett et al.

Improving health and economic security by reducing work schedule uncertainty

1. P. Braeman, S. Egerter, D. R. Williams, The social determinants of health: Coming of age. Annu. Rev. Public Health. 32, 381–398 (2011).

2. M. Marmot, Social determinants of health inequalities. Lancet 365, 1099–1104 (2005).

3. O. Solar, A. Irwin, A conceptual framework for action on the social determinants of health. Social Determinants of Health Discussion Paper 2 (Policy and Practice). (World Health Organization, 2010).

4. J. Benach, et al., Precarious employment: Understanding an emerging social determinate of health. Annu. Rev. Public Health. 35, 229–253 (2014).

5. A. L. Kalleberg, Good Jobs, Bad Jobs: The Rise of Polarized and Precarious Employment Systems in the United States (Russell Sage Foundation, 2011).

6. F. Carre, C. Tilly, Where Bad Jobs Are Better: Retail Jobs Across Countries and Companies (Russell Sage Foundation, 2012).
7. A. Dube, A. Lindner, City limits: What do local-area minimum wages do? J. Econ. Perspect. 35, 27–50 (2021).
8. C. Fuchs Epstein, A. L. Kalleberg, Time and the sociology of work: Issues and implications. Work. Occup. 28, 5–16 (2001).
9. E. Zerubavel, Hidden Rhythms: Schedules and Calendars in Social Life (University of California Press, 1985).
10. J. C. Williams, The Disrupted Workplace: Time and the Moral Order of Flexible Capitalism (Oxford University Press, 2016).
11. J. Wolfe, J. Jones, D. Cooper, ‘Fair workweek’ laws help more than 1.8 million workers. (Economy Policy Institute, 2018).
12. Bureau of Labor Statistics, Employment by Major Industry Sector (U.S. Bureau of Labor Statistics, 2020).
13. S. J. Lambert, P. J. Fugiel, J. R. Henly, Precarious work schedules among early-career employees in the US: A national snapshot (University of Chicago, 2014).
14. L. Golden, Flexible work schedules: What are we trading off to get them. Mon. Lab. Rev. 124, 50 (2001).
15. D. Clawson, N. Gerstel, Unequal Time: Gender, Class, and Family in Employment Schedules (Russell Sage Foundation, 2014).
16. D. Schneider, K. Harknett, Consequences of routine work-schedule instability for worker health and well-being. Am. Sociol. Rev. 84, 82–114 (2019).
17. E. O. Ananat, A. Gassman-Pines, Work schedule unpredictability: Daily occurrence and effects on working parents’ well-being. J. Marriage Fam. 83, 10–26 (2021).
18. S. N. Houseman, Why employers use flexible staffing arrangements: Evidence from an establishment survey. Ind. Labor Relat. Rev. 55, 149–170 (2001).
19. C. O’Neill, Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy (Simon & Schuster, 2016).
20. H. Boushey, Finding Time: The Economics of Work-Life Conflict (Harvard University Press, 2016).
21. S. J. Lambert, Passing the buck: Labor flexibility practices that transfer risk onto hourly workers. Hum. Relations 61, 1203–1227 (2008).
22. J. R. Henly, S. J. Lambert, Unpredictable work timing in retail jobs: Implications for insecurity and institutional distrust. J. Marriage Fam. 83, 10–26 (2021).
23. L. Ben-Ishaq, Volatile job schedules and access to public benefits (CLASP, 2015).
24. L. Morsy, R. Rothstein, Parents’ Non-Standard Work Schedules Make Adequate Child-Rearing Difficult: Reforming Labor Market Practices Can Improve Children’s Cognitive and Behavioral Outcomes (Economic Policy Institute, 2015).
25. K. Harknett, D. Schneider, K. Wolfe, Losing sleep over work scheduling? The relationship between work schedules and sleep quality for service sector workers. SSM Popul. Health 12, 100681 (2020).
26. J. C. Williams et al., Stable Scheduling Study: Health Outcomes Report. The Center for WorkLife Law at University of California, Hastings College of the Law, San Francisco, CA (2018).
27. S. J. Lambert, J. R. Henly, J. Kim, Precarious work schedules as a source of economic insecurity and institutional distrust. RSF 5, 218–257 (2019).
28. K. J. Edin, H. L. Shaefer, 2,000 a Day: Living on Almost Nothing in America (Houghton Mifflin Harcourt, Boston, MA, 2015).
29. L. Golden, “Irregular work scheduling and its consequences” (Briefing Paper #394, Economic Policy Institute, 2015).
30. I. Zeytinoglu, W. Lillevik, B. Seaton, J. Moruz, Part-time and casual work in retail trade: Stress and other factors affecting the workplace. Relations industrielles 59, 516–544 (2004).
31. J. Morduch, J. Siwicki, In and out of poverty: Episodic poverty and income volatility in the US financial diaries. Soc. Serv. Rev. 91, 390–421 (2017).
32. R. Finnigan, Varying weekly work hours and earnings instability in the Great Recession. Soc. Sci. Res. 74, 96–107 (2018).
33. S. M. Code, Chapter 14.22: Secure scheduling. Municipal code (Municode Library, Seattle, WA, 2017).
34. L. Golden, How state and local laws help more than 1.8 million work-at-home parents. (Economy Policy Institute, 2015).
35. K. Harknett, D. Schneider, V. Irwin, The evaluation of Seattle’s secure scheduling ordinance: Year 1 findings, A. Haley et al., Eds. (West Coast Poverty Center, University of Washington, Seattle, WA, 2019), pp. 13–31.
36. R. L. DeLauro, Text—H.R.5004-116th Congress (2019-2020): Schedules That Work Act (2019) Archive Location: 2019/2020.
37. D. Schneider, K. Harknett, What’s to like? Facebook as a tool for survey data collection. Sociol. Methods Res. 49, 1017–1046 (2021).
38. D. Card, A. B. Krueger, The effect of minimum wages on low-wage workers. Q. J. Econ. 134, 1405–1454 (2019).
39. K. Callison, M. F. Pesko, The effect of paid sick leave mandates on coverage, work absences, and presenteeism. J. Hum. Resour. 10.3368/jhr.57.4.1017-9124R2 (2020).
40. D. Card, A. B. Krueger, Myth and Measurement: The New Economics of the Minimum Wage—Twentieth-Anniversary Edition (Princeton University Press, Princeton, NJ, 2015).
41. J. D. Angrist, J. Pischke, Mostly Harmless Econometrics: An Empiricist’s Companion (Princeton University Press, Princeton, NJ, 2009).
42. C. Muller, C. Winship, S. L. Morgan, “Instrumental variables regression” in The SAGE Handbook of Regression Analysis and Causal Inference, H. Best, C. Wolf, Eds. (SAGE, 2013, pp. 277–299).
43. D. Stais, J. H. Stock, Instrumental variables regression with weak instruments. Econometrica 65, 557–586 (1997).
44. J. Fine, T. Bartley, Raising the floor: New directions in public and private enforcement of labor standards in the United States. J. Ind. Relations 61, 252–276 (2019).