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Work Schedule Unpredictability: Daily Occurrence and Effects on Working Parents' Well-Being

Objective: *To investigate the pervasiveness and frequency of work schedule unpredictability among workers in low-wage hourly jobs and the effects of work schedule unpredictability on worker and family well-being.*
Background: *Family science has long considered the ways in which parents' experiences in the workplace can affect families. Although unpredictability in work schedules has increased over time, especially for low-wage workers, the effects of schedule unpredictability on worker and family well-being have been understudied.*
Method: *Ninety-two workers with children aged 2–7, recruited using a new venue-time sampling technique, were asked to complete once-a-day surveys for 30 consecutive days (*N = *2,221 person-days for analysis). Descriptive analyses and regression models with family fixed effects were utilized.*
Results: *Work schedule unpredictability was common in the context of families' lives: over the 30 days, parents experienced an unanticipated work schedule change on 13.3% of days, and 87% of parents experienced at least one unanticipated work schedule change. Within families, unpredictable work schedule changes on a given day were associated with worse outcomes that day for parents, including increased negative mood and decreased perceived sleep quality.*
Conclusion: *Work schedule unpredictability is ubiquitous in the lives of low-wage hourly workers and is negatively related to working parents' well-being.*
Implications: *These results provide evidence that unscheduled and canceled shifts typical of low-wage service jobs may harm parents' well-being, which could ultimately affect their children's development and well-being.*

Developmental and family science has long considered the ways in which parents' experiences in the workplace can affect families' functioning and children's development (Bronfenbrenner & Crouter, 1982; Greenberger & Goldberg, 1989; Lambert, 1990). Research on the spillover of parents' work experiences to family outcomes, however, has yet to consider the shifting landscape and context of work in the United States, which has changed dramatically in the last half century. Since the 1970s, earnings volatility has increased across socio-economic levels, with volatility most pronounced among people with lower incomes (Dynan, Elmendorf, & Sichel, 2012; Gottschalk & Moffitt, 2009; Morduch & Schneider, 2017). Pressures of globalization and trade, as well as automation, have led to the destruction of jobs in many industries, particularly those such as manufacturing that in the past were a path to stability for low-skilled workers. In their place has come service work,

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which is characterized by both lower wages and much more unstable employment and hours (Autor, Dorn, & Hanson, 2013).

Not only has there been a shift toward service work for the low-skilled, but the nature of service work has also changed in ways that increase uncertainty and instability for workers, with important potential consequences for family functioning. While it has long been the case that service employment was less stable than manufacturing employment, today's service workers face additional forms of uncertainty even while stably employed. Managerial innovations have changed the day-to-day operations of retail and food service establishments such that service workers experience great daily uncertainty in both pay and hours. For example, the managerial tactic of "on-call scheduling," in which employers facing variable customer demand minimize labor costs by requiring workers to be available for work but not compensating them for their availability if they are not needed, introduces significant unpredictability into workers' days. All of these changes have led to increased work schedule precarity, which includes instability in work hours, fluctuations in work hours, and unpredictability in work hours (Lambert, Henly, & Kim, 2019). By increasing uncertainty in workers' lives, precarious work schedules have the potential to increase the difficulties that parents face in balancing work and family demands.

Recent surveys of U.S. workers underscore how common different aspects of schedule precarity, including schedule instability and unpredictability, are among low-wage workers. For example, using the National Longitudinal Survey of Youth, researchers found that 41% of workers receive notice of their schedules only 1 week ahead of time or less (Lambert, Fugiel, & Henly, 2014). Fluctuations in work hours are also substantial, with almost 75% reporting fluctuations in the number of hours they worked per week over the last month. Similarly, a survey of hourly workers in large retailers found that 60% of workers have variable hours and that 60% of workers have less than 2 weeks' notice of their work schedules (Schneider & Harknett, 2016).

Prior research has also established that schedule unpredictability is associated with worse worker and family well-being. Surveys of low-wage workers at a single point in time have shown that those with more unstable schedules report more psychological distress, worse sleep quality, and more parenting stress (Schneider & Harknett, 2016). Unstable work schedules are also correlated with lower-quality parent–child interactions (Henly, Shaefer, & Waxman, 2006), and estimates suggest that about one in six hourly workers has a young child (Schwartz, Wasser, Gillard, & Paarlberg, 2015). If the schedule unpredictability endemic to current low-wage service work has negative effects on families and children, then the increasing concentration of low-skilled workers in such jobs may portend poorly for both current population health and the next generation's healthy development.

While a body of correlational evidence on unstable scheduling is emerging, there remain important unknowns in the literature. First, although schedule unpredictability correlates to worse outcomes for workers, nothing in the extant literature has been able to test whether schedule unpredictability is causally related to worse outcomes or whether the associations simply reflect differences between workers in other characteristics that are related both to schedule unpredictability and to worker well-being. For example, workers with mental health challenges may have difficulty obtaining desirable jobs with stable work schedules, in which case poor worker health causes poor job quality rather than the other way around. Second, because there has been no straightforward sampling frame available of hourly workers with young children from which to generate representative samples, it is unclear whether the documented correlations are representative of any well-defined group of families. Finally, because the point-in-time survey instruments typically used to gather information from working parents cannot capture day-to-day variation in work hours and family processes, no researchers have been able to identify the mechanisms by which schedule unpredictability may disrupt health and family processes. To fully understand the causal effects of work schedule unpredictability on family outcomes, instruments that repeatedly gather daily information on a representative sample are needed.

This study begins to fill those gaps in the literature with two innovations: (a) using a venue-time sampling approach to recruit a representative sample of workers with young children within a city; and (b) applying a daily diary methodology, in which we gather survey reports of work schedules and schedule unpredictability as well as worker well-being every day over a

1-month period. To do so, we designed a new survey tool that uses basic SMS text messages to gather daily reports about low-wage workers' schedules, including unanticipated changes in hours and shifts, and well-being. Our data collection method allows us to obtain detailed daily information on workers' schedules and avoids recall bias. In addition, our research design enables us to examine how parents' work schedule unpredictability is associated with well-being, providing the first evidence on the effects of work schedule disruptions on parents that are not biased by between-person differences.

Theoretical Linkages between Parents' Work Schedule Unpredictability and Parent Well-Being

Theories of the work–family interface suggest one way that parents' work environments can affect themselves and their family members (Greenhaus & Beutell, 1985). These theories propose that people's work and family roles are interdependent, and they highlight the concept of spillover, in which circumstances or experiences in one role affect the circumstances of the other (Edwards & Rothbard, 2000; Grzywacz & Marks, 2000). Spillover can be in the negative or positive direction and encompasses different constructs, including spillover of mood and behaviors.

This theoretical perspective suggests that parental well-being will be affected by parents' experience of particular workplace stressors, and that this will manifest, in part, in daily work–family spillover of mood. In low-income families, last-minute changes to parents' work schedules may be particularly likely to interplay with interactions within the family to influence parent well-being. Last-minute schedule changes require parents of young children to alter daily routines and change child care arrangements, thereby leading to increased stress and worry. Understanding work–family spillover effects on parental well-being is important because parental well-being is strongly linked to parenting behavior (Lovejoy, Graczyk, O'Hare, & Neuman, 2000) and, ultimately, child development (Amato & Fowler, 2002; Bornstein, 2006; Cabrera, Fagan, Wight, & Schadler, 2011).

Effects of Parents' Work Schedule Unpredictability on Family Well-Being

Prior research on work schedule unpredictability and worker and family well-being have typically used single point-in-time surveys, and featured varying operationalizations of schedule unpredictability. Across definitions, however, previous findings have consistently shown work schedule unpredictability to be related to worse outcomes for workers and families. Compared to workers with predictable work schedules, those with unpredictable work schedules report more psychological distress, worse sleep quality, and worse physical health (Schneider & Harknett, 2019; Scholarios, Hesselgreaves, & Pratt, 2017). Unpredictable work schedules also correlate with important family functioning outcomes, including higher parenting stress and lower-quality parent–child interactions (Henly et al., 2006; Schneider & Harknett, 2016). Similarly, compared to those with regular work shifts, workers with irregular shifts report more stress (Golden & Kim, 2017). Irregular work shifts also predict difficulties with balancing work and family roles, including work–family conflict and work-to-family interference, especially for women (Beutell & O'Hare, 2018; Golden & Kim, 2017). Finally, unpredictable work schedules are linked to unstable child care arrangements (Carrillo, Harknett, Logan, Luhr, & Schneider, 2017).

Emerging evidence has also shown that schedule unpredictability, operationalized in various ways, was related to more child behavior problems. When low-income parents worked a combination of nonstandard and variable shifts, their children had more externalizing behavior problems and less school engagement (Hsueh & Yoshikawa, 2007). Low-income parents' erratic and fluctuating work schedules were also related to increased internalizing and externalizing behavior problems (Dunifon, Kalil, & Bajracharya, 2005; Johnson, Kalil, & Dunifon, 2012). Parental well-being is a key mechanism likely linking schedule unpredictability with child behavior problems.

Daily Diary Studies

The studies reviewed above examined associations between parents' recent or typical work schedule unpredictability and worker and family functioning at a single point in time. Rather

than comparing those who typically have unpredictable schedules to those who do not, a novel approach is to examine day-to-day variability in schedule unpredictability, in order to match the time scale of family life and capture daily variation in context and behavior (Bolger, Davis, & Rafaeli, 2003). A focus on parents' daily experiences and well-being, holding constant aspects of families that do not vary from day to day, allows for an examination of the dynamic interplay of work schedules with daily well-being. Understanding families' daily lives can facilitate culturally grounded inquiries about family life in diverse families (Weisner, 2002).

Using daily surveys has other methodological strengths. First, using daily surveys reduces recall bias. Survey questions that ask people to recall the number of instances of unpredictable work schedule changes over a fixed period of time may underreport the extent of work schedule unpredictability, as accurately recalling past events is cognitively challenging (Bound, Brown, & Mathiowetz, 2001). There is substantial evidence, for example, that even spells of unemployment, which are highly salient at the time that they occur, are not accurately captured retrospectively (Akerlof & Yellen, 1985; Jürges, 2007; Levine, 1993). Second, daily surveys reduce the need for individuals to mentally aggregate across instances in order to report about experiences in general. When individuals are asked to aggregate across instances in order to report about a general experience, underreporting can occur (Mathiowetz, Brown, & Bound, 2002; Winter, 2004). For example, asking people to report about their income in general results in lower reported levels than when people are asked to provide information about income from specific sources (Mathiowetz et al., 2002).

Thus far, however, research following this type of daily diary design has not been used to examine low-wage workers' schedule unpredictability or the daily consequences of that unpredictability. Research on related topics that does use this method, however, has shown that increased nighttime work causes increases in workers' daily negative mood (Gassman-Pines, 2011), as does being "on-call" for work hours (Bamberg, Dettmers, Funck, Krähe, & Vahle-Hinz, 2012; Dettmers, Vahle-Hinz, Bamberg, Friedrich, & Keller, 2016). Both nighttime work hours and being "on-call" also lead to worse daily sleep quality (Härmä et al., 2018; Sprajcer et al., 2018). Working back-to-back shifts has also been found to worsen daily perceived sleep quality (Vedaa et al., 2017).

The limited related literature in this area has also shown that parents' work schedules also affect family well-being. More nighttime work hours leads to less daily parent time spent together with adolescent children, and harsher interactions between parents and children in early childhood (Gassman-Pines, 2011; Lee et al., 2017). Increased parental nighttime work also leads to less positive daily child behavior among preschool-aged children (Gassman-Pines, 2011).

These findings suggest that daily schedule unpredictability may affect the well-being of both workers and their children. Moreover, these related prior studies suggest that measuring typical schedule unpredictability at a single point in time may fail to capture important variation in experiences from one day to the next, and miss opportunities for improving causal inference.

Current Study

This study collected daily reports from a sample of low-wage service workers with young children and sought to answer two research questions:

1. How common is schedule unpredictability in families of low-wage service workers with young children? Have point-in-time global measures underestimated its pervasiveness?
2. How is daily schedule unpredictability related to daily well-being of workers with young children?

By answering these questions, this study aimed to fill several gaps in the literature on low-income families in the United States. First, focusing on schedule unpredictability, which is currently very common in low-wage workplaces, is crucial for understanding experiences of working parents of young children. Second, the use of daily diary methodology allows for a focus on within-family variability, enabling a richer understanding of parents' day-to-day experiences without recall bias and allowing for comparisons of outcomes on days when workers experienced last-minute work schedule changes and days when they did not. Finally, we employ a venue-time sampling method to create, to our knowledge, the first representative sample of

service workers with young children used in this literature.

Method

Sample Recruitment

Individuals were eligible if they worked in an hourly service-industry position in Emeryville, CA, had a child between ages 2 and 7, and had a mobile phone that could send and receive basic SMS text messages. Emeryville has several characteristics that made it an excellent demonstration site: it is a compact, walkable town with a very high density of retail and food service establishments and it employs workers who reside throughout the San Francisco Bay Area. Recruitment occurred in May 2017 and used a venue-based sampling approach. Venue-based sampling is a commonly used technique for sampling hard-to-reach, unrostered populations that results in generalizable samples (Semaan, 2010). The key to successfully using such a technique is generating a complete list of venues, which in this case were businesses. We secured from the City of Emeryville a complete list of businesses in the city. We then constructed a sampling frame of venue (business) day-time units (VDTs), randomly selected VDTs, and systematically identified and recruited eligible individuals in those VDTs (Muhib et al., 2001).

In a venue-based sampling approach, research staff aim to identify all eligible individuals in a given VDT (Muhib et al., 2001). In this particular study, therefore, at the time that study staff visited each business, they aimed to identify all workers who met our sampling criteria who were at work at that time. To do so, they approached workers at each business and determined their eligibility. They also asked those workers to direct them to any other employee with a young child who was currently at the venue at that time. This strategy differs from snowball sampling in that study staff only followed up with potentially eligible workers who were in that business at that time, but did not follow up with any other individuals who were likely eligible, even when nominated or mentioned by participants.

Study staff saturated the area, talking with over 600 workers, including at least one from each retail or food establishment in the city. We estimated, based on recent nationally representative surveys of hourly retail and food service workers (Schwartz et al., 2015), that about 15% of the 3,743 Emeryville hourly retail and food service workers had a young child, suggesting an eligible population of 561 workers. Of these, we contacted 170 during our randomly sampled VDTs, an estimated 30% of eligible workers. We successfully recruited 96, or 56%, of the eligible workers we contacted. Our refusal rate of 44% compares favorably with studies of similar populations that are commonly viewed as having produced representative samples. For example, the 2011 ECLS-K had a 50% refusal rate for its parent interview component (Burns, Wang, & Henning, 2011). Our sample, although small in absolute size, reflects a substantial 1-in-6 sample of the universe of Emeryville retail and food workers with a young child (96 recruited of 561 total projected eligible), and reflects the voices of a majority of the people we randomly contacted. Our analysis sample was limited to parents who completed at least one daily survey ($N = 92$).

Sample Characteristics

The characteristics of the sample are summarized in Table 1. Parents were, on average, 30 years old, had 12 years of education, and were 86% female. The sample was diverse in race and ethnicity, with 44% of the sample Black non-Hispanic and 31% of the sample Hispanic. In terms of living arrangements, 29% of the parents were married, 48% were unmarried and living with a partner, and 21% were living with at least one of their own parents (the child's grandparents). The focal children were 3.6 years old, on average.

Assessing representativeness of the sample is difficult because there is no available data on all individuals working in Emeryville regardless of their place of residence. To begin to understand the representativeness of our sample, therefore, we used the American Community Survey (ACS) to construct a comparison sample. Detailed information about this analysis is available in the Appendix; we discuss the results briefly below.

Our representativeness analysis revealed that our Emeryville sample was nearly identical to the comparison sample along several dimensions. In particular, our sample had the same share African-American, white, and other/multi-racial, as well as the same average years of education and average age as the comparison sample. In contrast, however, although

Table 1. *Sample Characteristics*

	Mean	*SD*
Parent demographics		
Race (%)		
Hispanic	31.4	
African-American (non-Hispanic)	44.2	
Caucasian (non-Hispanic)	8.1	
Asian (non-Hispanic)	8.1	
Native American (non-Hispanic)	1.2	
Multi-racial (non-Hispanic)	7.0	
Age	29.8	6.12
% Female	86.4	
Education (in years)	11.7	4.38
% 12 or more years of education	73.8	
# Of children	1.8	0.9
Age at first child	23.6	5.0
% Live with a parent	21.2	
% Married at some point in time	29.1	
% Currently married or living w/partner	54.3	
Child demographics		
Age	3.6	2.4
% female	54.4	
% in head start	35.4	
% in daycare	50.0	
Hours at daycare per week	14.5	16.7
% in afterschool	17.9	
Hours at afterschool per week	1.9	5.6
% with other parent	46.8	
Hours with other parent per week	13.6	25.2
% with relative	40.0	
Hours with relative per week	9.2	16.7
Total hours of non-respondent care per week	38.1	35.5
Parent workforce demographics		
# of jobs held by parent	1.2	0.41
% unable to accept job due to lack of child care (in last year)	38.0	
% lost job due to lack of child care (in last year)	20.8	
% unable to work hours due to lack of child care (in last year)	59.5	
% lost a promotion due to lack of child care (in last year)	30.8	
Parent financial status		
Monthly income (family) ($)	2,795	1,880
% with just enough money to make ends meet	55.3	
% with not enough money to make ends meet	22.4	
% not confident in ability to pay for a $1,000 emergency	63.6	
% postponed medical care (in last year)	30.3	
% borrowed money from relatives or friends	61.8	
% applied for government assistance	37.3	
% obtained loan to pay off debt	21.1	
% creditor demanded payment	32.0	
% moved to cheaper housing	24.0	
Parent behavioral health (within the last week)		
% often/always felt had nothing to look forward to	2.7	

Table 1. *Continued*

	Mean	*SD*
% often/always found it difficult to relax	26.3	
% often/always felt down-hearted or blue	10.5	
% often/always felt close to panic	6.6	
% often/always felt unable to become enthusiastic	5.3	
% often/always felt wasn't worth much as a person	6.6	
% often/always felt life was meaningless	0.0	
Child behavioral health (within the last 6 months)		
% some/very well-behaved	98.7	
% often some/very worried	21.5	
% often some/very unhappy, depressed, or tearful	10.1	
% gets along some/much better with adults than children	43.6	
% has somewhat/very good attention span	88.5	

Note. Of 96 participants 89 completed the background survey.

both our comparison sample and our Emeryville sample were both majority female, our sample had an even larger share female than the comparison sample. Our sample also had smaller shares of Asian and Hispanic workers. The potential reasons for these differences are discussed in more detail in the Appendix. Overall, we conclude that our sample selection technique, which was designed to recruit a representative sample, is valid and effective relative to other available estimation approaches.

Procedure

At recruitment, respondents were asked their hourly wage, whether they received tips (either formally, as in a sit-down restaurant, or informally, as in counter service), and the age of their child; recruiters also made note of their perception of the respondent's gender. Thus, these variables are non-missing for all participants. Respondents then reported on each day's work experiences and their own well-being via SMS text message for 30 consecutive days. In addition, at the beginning of the study, respondents were asked to provide, either during recruitment, by web survey, or in a phone interview, additional information about their demographics and characteristics of their jobs that do not vary from day to day, such as their overall assessment of how often their boss changes their work schedule (specific measure described in more detail below); we have complete background surveys for 84% of respondents. All survey materials used for this study were available in both English and Spanish ($N = 11$, 12% of the analysis sample, participated in Spanish).

The daily text surveys were programmed and automated by a third-party vendor. On the day of enrollment in the study, each participant received a text welcoming them to the study. The following day, the 30-day data collection period began. During that period, the first survey question was sent out each evening at 7:00 PM. As soon as respondents sent back their answer to the first survey question, the second question was sent. This sequence was repeated until all questions and answers had been sent and received. A thank-you text was sent at the end of the sequence letting individuals know they had completed all survey questions that day. If a respondent failed to reply to the first survey question, a reminder text was sent out at 8:00 PM, encouraging the person to complete the survey. Additionally, if an individual started the survey but did not complete all questions, a reminder text was sent after 2 hours of inactivity (with the question where the individual left off re-sent as part of the reminder) and then again after 14 hours of inactivity.

The number of questions asked each day and, therefore, the amount of time the daily survey required was variable for two reasons. First, as described in more detail below, the survey was structured to ask about schedule unpredictability in up to three jobs; individuals working in two or three jobs were, therefore, asked more questions each day than individuals working in one job. Second, follow-up questions were asked on days for which respondents reported some kind of schedule unpredictability (more

details in the Measures section). Therefore, on days without schedule unpredictability, participants were asked fewer questions than on days with schedule unpredictability. Because the survey was responsive both to participants' number of jobs and to the day's work schedule events, and because respondents could respond at their own pace, taking breaks of their own volition, the amount of time that it took participants to complete the survey varied from day to day. The minimum number of minutes to completion was 1 minute; the typical amount of active time was less than 10 minutes.

This method of data collection has several benefits that facilitate within-family analysis, which requires high levels of daily participation. First, the ubiquity of mobile phones with text-messaging capability has increased greatly among low-income individuals in the last several years, with 92% of low-income individuals now reporting owning a cell phone (Pew Research Center, 2017). Indeed, of eligible participants our research team talked to in Emeryville, no one who was interested in participating did not enroll because of a problem with texting. Second, participants can take their time and answer survey questions when it works for them. On some days, some participants took several hours over the course of the evening to answer all of the survey questions. Allowing people to balance work and family while participating in this intensive research study was a key innovation of our design. It also facilitated our high enrollment rate among recruited eligibles. Finally, all text messages are date-time-stamped, allowing the research team to know for certain that questions were answered on a given day. This is an important issue in this of type of data collection and analysis (Bolger et al., 2003).

Daily survey completion rates among participants were very high: 61% of participants completed 100% of the daily surveys; 13% completed 90–99% of the daily surveys; 5% completed 75–89% of the daily surveys; and 8% completed 50–74% of the daily surveys. Participants completed 98% of all daily surveys that they began.

Measures

Daily schedule unpredictability was characterized along a number of dimensions, described in detail below. To generate these measures, we asked a series of questions about up to three jobs per respondent, based on the number of jobs reported at the time of enrollment. For each job, respondents were asked whether they worked that day, and if so: when they started and stopped working and whether their hours worked were their originally scheduled hours. If not, they provided their originally scheduled hours. Further, if respondents did not work at a given job on a given day, they were asked if they were originally scheduled to work at that job that day. We used the answers to those questions to create the following variables:

Change in work hours was an indicator variable that equaled one when the parent indicated that she worked at a job that day and that the hours she worked were not the originally scheduled hours, and equaled zero in all other circumstances.

Canceled shift was an indicator variable that equaled one when the parent indicated that she did not work at a job that day and that she had originally been scheduled to work at that job that day, and equaled zero in all other circumstances.

Any schedule change was an indicator variable that equaled one if the parent was coded as having had either a change in work hours or a canceled shift at that job on any given day, and equaled zero otherwise.

For both change in work hours and canceled shifts, respondents were asked when they found out about the change: *less than 1 hour before the shift start time; more than 1 hour before the shift start time, on the day of the shift; the night before*; or *earlier*. *Last-minute schedule change* was an indicator variable that equaled one when parents provided a response to that question other than *earlier*, and equaled zero in all other circumstances.

Responses for all jobs were aggregated within day and indicators for each day were created representing whether the respondent had experienced each type of schedule unpredictability that day at any of their jobs: change in work hours; canceled shift; any work schedule unpredictability; and last-minute schedule change.

Daily parental well-being outcomes were measured as follows: *Daily parental mood* was measured with a single item that asked respondents how much of the time they felt fretful, angry, irritable, anxious, or depressed on a three-point scale from *all of the time* to *none of the time*. We dichotomized responses to indicate having those negative feelings *some* or *all of the time*. *Daily perceived sleep quality*

was measured with a single item that asked parents to rate the quality of their sleep last night on a 10-point scale from *slept really badly* to *slept really well*. We treat self-reports of sleep quality as a measure of daily well-being, as prior research has shown that perceived sleep quality is associated with daily affect (Bower, Bylsma, Morris, & Rottenberg, 2010). These measures are self-reported, not clinical, measures of well-being. The measures, or very similar measures, have been used and validated in prior studies (Almeida, 2005; Gassman-Pines & Schenck-Fontaine, 2019). The sleep quality measures were reverse coded so that higher numbers indicated worse perceived sleep quality. For analysis, the measures were then standardized so that sleep quality scores are presented in *SD* units.

Single point-in-time global measures of schedule unpredictability: At the beginning of the study, participants completed a survey that asked standard questions about the characteristics of their jobs. For up to three jobs, they were asked two questions about schedule unpredictability. First, they were asked: Do you work the same days and hours each week or do your work days and hours vary from week to week? A dichotomous indicator variable was created, indicating whether hours at that job varied from week to week. Second, they were asked: How frequently does your employer change your work schedule after you have been notified of your shifts? Respondents were given a categorical response scale ranging from 1 (*never*) to 5 (*always*). Responses were dichotomized to create an indicator variable indicating whether that job's employer changed the work schedule *sometimes*, *often*, or *always*, as opposed to *rarely* or *never*.

Analytic Strategy

To answer our first research question, we first conducted descriptive analyses across people and days. Next, to compare our novel measure of daily unpredictability to previous global, point-in-time measures, we conducted descriptive analyses across people, jobs, and days. We examined the distributions of each type of work schedule unpredictability over the month among respondents' jobs that were reported to have fixed schedules or for which the respondents stated that their boss rarely/never changed their schedule, and compared those to the distributions for respondents' jobs that were reported to have variable schedules or frequent boss-initiated changes.

To examine our second research question, we conducted regression analysis with family fixed effects and heteroscedasticity-robust *SE*s clustered at the family level in order to account for correlation of errors within family over time. Our basic equation is as follows:

$$PW_{it} = \beta SU_{it} + \gamma X_t + \alpha_i \quad (1)$$

where a given parental well-being outcome PW_{it} (mood, sleep quality) for family i on day t is modeled as a function of that parent's schedule unpredictability SU_{it} (e.g., any work schedule change, hours change, canceled shift, last-minute work schedule change) on day t; a vector X_t of time-varying covariates, such as whether day t was a weekend day; and a family fixed effect. Because the family fixed effects control for all stable within-family characteristics, whether measured or unmeasured, any associations we find between daily schedule unpredictability and family well-being outcomes cannot be due to any stable family characteristic, such as parental marital status, parental education, or parents' personality traits.

Results

Descriptive Results: Daily Schedule Unpredictability and Parental Well-Being

The descriptive results shown in Table 2 provide important information about the context of families' daily lives. On average, parents experienced some type of work schedule change on 13.3% of days. Nearly all of the variance in work schedule changes from day to day, just over 95%, occurred within respondents over time (as measured by the intraclass correlation (ICC); (Singer & Willett, 2003)). During the course of the month-long data collection, the vast majority of participants, 87%, experienced at least one work schedule change. That is, schedule unpredictability was endemic and widespread in our sample, rather than concentrated among specific individuals.

Schedule changes occurred in two ways: work hours varying from originally scheduled hours and shift cancellations. Parents regularly experienced both types of changes (Table 2). Across all days, 6.8% of days included a change to originally scheduled work hours. That proportion represented over nearly 11% of parents'

Table 2. *Key Measures of Schedule Unpredictability and Parent Well-Being Outcomes*

	Mean (*SD*)	Intraclass correlation
Schedule unpredictability		
% of days with any schedule change	13.3	0.043
% of days with last-minute schedule change	8.8	0.031
% of days with any change to work hours	6.8	0.039
% of days with shift cancellation	5.4	0.065
Daily outcomes		
% feeling negative mood some or all of the time	36.5	0.313
Sleep quality, 1 = very well; 10 = very badly	2.83(2.37)	0.469

Note. 92 participants; number of person-day observations = 2,221.

work days. When parents did experience a change in work hours, they reported two fewer hours, on average, when hours were lost and one more hour, on average, when hours were gained. Across all days, 5.4% included an expected work shift that was canceled completely. That represented over 12.5% of days on which parents did not work at all. The variance in canceled shifts was largely due to within-person variation during the month. During the course of the data collection month, 71% of parents had their hours changed at least once and 58% of parents had at least one shift canceled.

The ICCs of our outcome measures reflected substantial within-family variance as well: on average, parents reported feeling negative mood some or all of the day on 37% of days, with over two-thirds of that variation occurring within person; 53% of the variation in reported perceived sleep quality was within-person.

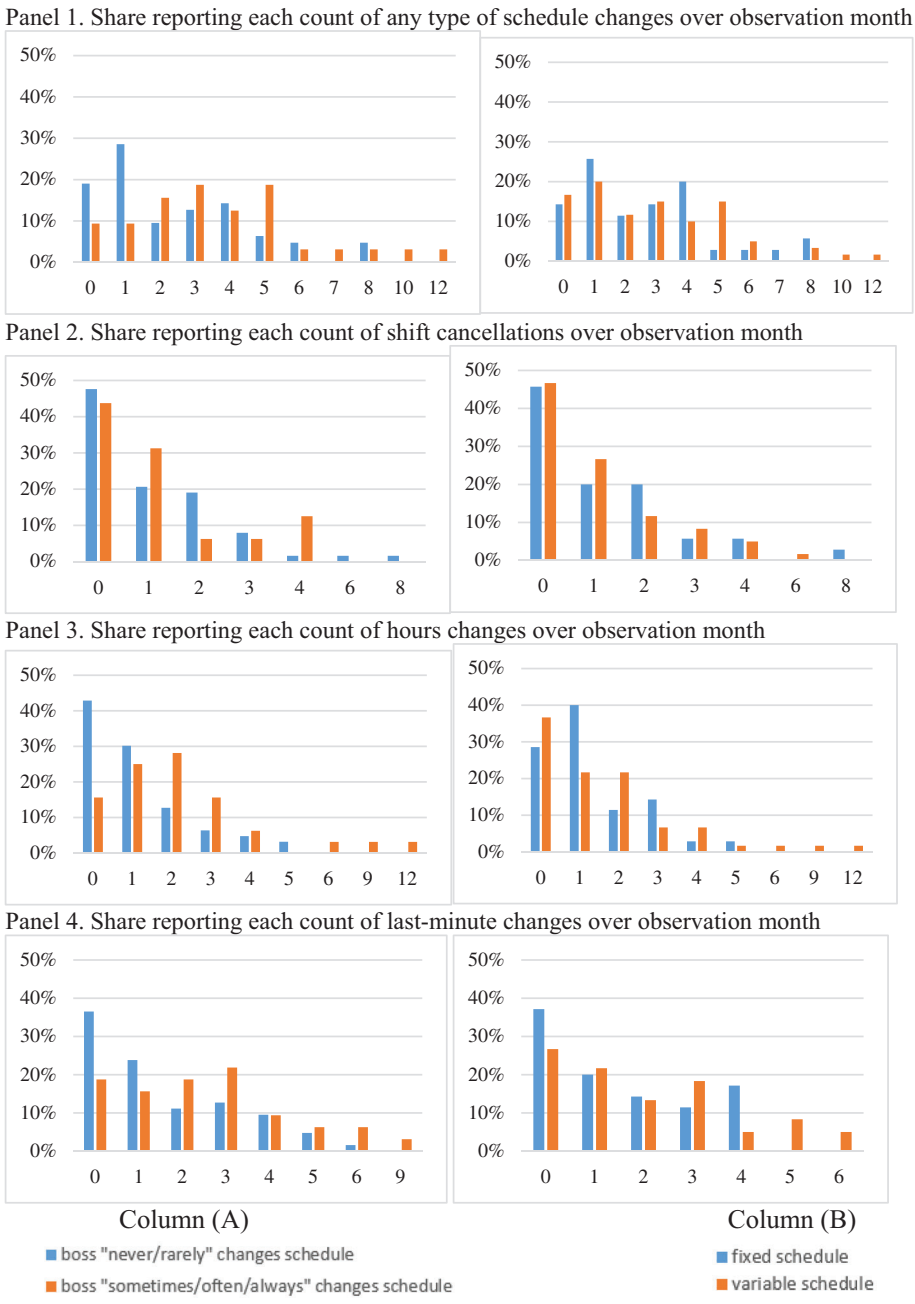
Finally, last-minute schedule changes were also very common in our sample. On average, parents experienced a last-minute work schedule change on 8.8% of days. Further, 74% of the sample had at least one last-minute work schedule change during the month of daily data collection.

Schedule disruptions were widespread and endemic, affecting all demographic groups. There were no significant differences between those who experienced and those who did not experience specific types of schedule changes. We ran 20 t tests checking for demographic balance between those who did and did not experience any schedule change: one test was significant at the 10% level and one other test was significant at the 5% level, exactly what would be expected by chance. However, the differences in point estimates by group that we observed were consistent with shift cancellations being concentrated among disadvantaged groups, particularly women, Hispanics, and African-Americans (the result for women is marginally significant at $p < .10$), which was consistent with other work in larger samples (Lambert et al., 2019; Storer, Schneider, & Harknett, 2019) finding that these groups experience schedule disruptions even more than the average.

Comparing these measures to global reports provided by respondents about each of their jobs at baseline, we found that the global reports did not adequately capture this day-to-day variation. As shown on the right side of Figure 1 Panel 1, in 86% of jobs described as having a fixed work schedule, parents experienced at least one work schedule change during the month of daily data collection. That differed little from the jobs described as having variable schedules: in 83% of such jobs, parents experienced at least one work schedule change. Notably, that difference was in the unexpected direction. As shown in the left side of Figure 1 Panel 1, a similar pattern could be seen for jobs in which parents stated that their boss rarely or never changes their schedule (in 81% of jobs parents had a work schedule change) and jobs in which parents stated that their boss sometimes, often or always changes their schedule (in 91% of jobs parents had a work schedule change).

Although those who described their job's work schedule as variable at baseline had a higher average number of hours changes over the month than did those who described their schedules as fixed, both groups averaged a substantial number of changes (right side of Figure 1 Panel 3). Those who described their jobs as having fixed hours experienced an average of 1.3 changes in hours ($SD = 1.3$); those

FIGURE 1. FREQUENCY OF DAILY WORK SCHEDULE UNPREDICTABILITY OVER OBSERVATION MONTH BY BASELINE JOB DESCRIPTIONS. PANEL 1. SHARE REPORTING EACH COUNT OF ANY TYPE OF SCHEDULE CHANGES OVER OBSERVATION MONTH. PANEL 2. SHARE REPORTING EACH COUNT OF SHIFT CANCELLATIONS OVER OBSERVATION MONTH. PANEL 3. SHARE REPORTING EACH COUNT OF HOURS CHANGES OVER OBSERVATION MONTH. PANEL 4. SHARE REPORTING EACH COUNT OF LAST-MINUTE CHANGES OVER OBSERVATION MONTH.



who described their jobs as having variable hours experienced an average of 1.7 changes in hours ($SD = 2.2$). Similarly, although those who reported that their boss sometimes, often or always changed their schedule experienced a higher average number of hours changes than those who report that their boss rarely or never did, changes were common among both groups (mean = 2.4 [$SD = 2.5$] and 1.1 [$SD = 1.3$] per month, respectively) (left side of Figure 1 Panel 3). Moreover, there was significant overlap between the distribution of hours changes experienced by parents who described their jobs differently: 31% of those who described their schedule as fixed experienced two or more hours changes, compared to 42% of those who described their schedule as variable.

The single point-in-time questions were particularly insensitive for picking up the likelihood of shift cancellations. Those who reported fixed schedules actually had a slightly higher average number of canceled shifts over the month, at 1.2 ($SD = 1.7$), than did those who reported variable schedules, at 1.1 ($SD = 1.3$). And those who reported that their boss rarely or never changed their schedule reported the same number of canceled shifts on average (1.1, $SD = 1.5$) as did those who reported their boss changed their schedule more often (1.1, $SD = 1.4$). A majority of jobs in all categories—54% of those with a fixed schedule, 53% of those with a variable schedule, 52% of those whose boss rarely or never changes their schedule, and 56% of those whose boss sometimes, often or always changes their schedule—included at least one shift cancellation over the observation month (Figure 1 Panel 2).

How Is Daily Schedule Unpredictability Related to Parental Well-Being?

Results showed that experiencing at least one kind of unpredictable work schedule change on a given day was related to worse parental well-being that day (Table 3). Having any type of work schedule change led to a marginally statistically significant 6.4 percentage point increase in the probability of negative mood that day, which represented a substantial 17% increase over days without schedule changes ($p < .10$). A work schedule change was also related to a marginally significant reduction in perceived sleep quality of 0.11 *SD*s ($p < .10$).

Table 3 also shows how the two different types of schedule unpredictability were related to well-being. In particular, having a scheduled shift canceled strongly predicted well-being, with a large and statistically significant increase in negative mood. Compared to days on which parents did not have a shift canceled, on days when parents experienced a work shift cancellation they reported a nearly 17 percentage point increase in negative mood ($p < .01$). This difference was substantial in size, representing an increase of over 40% from baseline.

Finally, Table 3 also shows that last-minute work schedule changes were detrimental for parental well-being. Compared to days without a last-minute schedule change, on days when parents experienced a last-minute schedule change they reported increased negative mood ($p < .10$). This difference was also substantial in size, with negative mood increasing by 22%.

Specification Tests

We also ran a variety of different specifications that tested the strength and validity of our results (all results available from authors). First, we ran our regression models with alternate specifications, including without individual fixed effects but including demographic controls, and without daily covariates. Our results were robust to model specification, though, as expected, the size of the coefficients was larger in the models that excluded individual fixed effects. Second, because the majority of our sample members were women, we re-ran our main model for the women in the sample only. The results were substantively the same as those found for the whole sample.

Discussion

Using a novel recruitment strategy, venue-time based sampling, and a novel data collection tool, daily text message surveys, we establish several new facts about the lives of parents of young children who work in low-wage, service jobs. First, we find that schedule disruptions are much more common than previous survey approaches had been able to document. Using baseline questions similar to previous surveys, we find, in line with previous estimates (Lambert et al., 2014; Schneider & Harknett, 2016), that nearly two thirds of hourly retail and food service workers report variable schedules, and just over one

Table 3. *Effect of Daily Schedule Unpredictability on Parental Well-Being*

	b	*SE*
Any schedule change (hours changed or canceled shift)		
% feeling negative mood some or all of the time	6.44†	3.51
Sleep quality, in *SD*s of score	0.11†	0.06
Any change in hours		
% feeling negative mood some or all of the time	−0.13	4.70
Sleep quality, in *SD*s of score	0.12	0.08
Canceled Shift		
% feeling negative mood some or all of the time	16.76**	5.56
Sleep quality, in *SD*s of score	0.06	0.10
Last-minute change in schedule		
% feeling negative mood some or all of the time	7.91†	4.09
Sleep quality, in *SD*s of score	0.08	0.07

Note. $N = 2{,}221$ person-days from 92 parents. Each cell reports the estimate from a separate regression of the coefficient on a dichotomous measure of schedule unpredictability that day. All regressions include respondent fixed effects and control for weekend day, scheduled day off, and the number of days participated. *SE*s are robust clustered by person. †$p < .10$. *$p < .05$. **$p < .01$.

third report that their boss changes their schedule frequently. Yet, these statistics understate the ubiquity of disruptions in the lives of families with young children: nearly nine in 10 workers reported at least one change in work hours or canceled shift over the month of daily data collection. We find that schedule unpredictability is not just common, as previously reported, but virtually unavoidable for parents of young children working in these industries.

Our new approach to gathering information about parents' work schedule unpredictability offers several advantages for researchers studying the lives of low-wage workers and their families in the contemporary work context. First, it allows us to document variation in work hours that is underreported in point-in-time surveys. Our daily survey approach reduces recall bias and underreporting that might arise through the mental aggregation of events in responding to general survey questions. Our approach also allows us to identify shift cancellations, which have been unmeasured in most point-in-time surveys despite being both common and the most harmful form of unpredictability, according to our measures of parental well-being. These are important methodological innovations that enable us to capture unanticipated changes to work schedules, including shift cancellations, in real time. Such methodological innovations are crucial to family scientists who seek to design survey tools that facilitate capturing information about parental work in the current context.

That previous research using point-in-time measures of job characteristics and family functioning has suffered from *selection* bias is well known, and has left that research unable to provide causal evidence. We find, however, that research using point-in-time measures suffers from *attenuation* bias as well: because differences in reported job characteristics are very weak measures of actual day-to-day unpredictability, they likely understate the true correlations between unpredictability and parent well-being.

While there is some correlation between reported job characteristics and the frequency of changes in work hours, standard single point-in-time survey questions exhibit *no* correlation with shift cancellations. Yet, we find that shift cancellations, the type whose incidence therefore goes virtually unmeasured in standard surveys, are the type of schedule disruption that is most strongly related to parental well-being, and that the majority of parents experienced at least one cancellation per month. Daily work schedule changes and shift cancellations, in particular, were strongly related to parents' daily well-being. These negative associations with parental well-being are of concern because increased negative mood and decreased sleep quality are known to have harmful effects on individual health (Doi, Minowa, & Tango, 2003; Hale et al., 2013) and to parenting behavior and family well-being (Lovejoy et al., 2000).

Our substantive findings have important implications for work–family spillover theory. One type of spillover is mood spillover, where mood in the workplace spills over into mood within the family. The family science literature has generated substantial evidence of mood spillover on stressful work days, such as those with perceived discrimination (Gassman-Pines, 2015), high workload (Repetti, 1993), and other stressors (Grzywacz & Bass, 2003). Our results build on this prior work by demonstrating that non-work days can also have spillover: when a shift is canceled, mood is also affected. This suggest that spillover is not just from one setting to the next but also arises from changes to the schedule and timing of the work setting.

Finally, by allowing us to control for unmeasured characteristics of families that are stable over the month and to isolate the effects of unexpected changes to work schedules, this design allows addresses several challenges to causal inference that are present in studies using single point-in-time survey measures.

These results also leave open questions that should be explored in future research with larger sample sizes. First, there are theoretical reasons why the overall effects reported here might be moderated by important parent and family characteristics. Such analyses were not possible in the present study due to the small number of parents in the sample. For example, those with another co-parent in the home may be less strongly affected by unanticipated work schedules changes than those without another adult on whom they can rely, and those with different types of childcare arrangements may face different types of challenges. Second, both the U.S. population of retail and food service workers and the U.S. population with primary caregiving responsibility for a young child are majority female; small studies such as ours, which cannot tease out the ways that minority groups in a population have experiences that differ from the average, cannot speak to the specific experiences of fathers or other small populations. Third, our study cannot detect the duration of effects from schedule disruptions; while we focus on effects on worker well-being the day of the disruption, it is possible that such effects persist, and either fade out or compound over the course of days.

Limitations of this study should be mentioned. This study was conducted in a single setting, Emeryville, CA. Although the sample was recruited through a representative venue-based sampling approach, was diverse along a number of dimensions and was employed largely in major retail and food services businesses that exist around the United States, the effects may not generalize to other settings. Additional research using this type of rigorous daily data collection design in other sites and with larger populations is needed. Additionally, although we were able to use family fixed effects, which hold constant all stable differences between families, the possibility of time-varying omitted variables remains.

Despite these limitations, the results of this study provide strong evidence of negative effects of work schedule unpredictability on parental well-being, that are not due to differences between parents, such as level of education, marital status, or personality characteristics. Unanticipated work schedule changes in general, and shift cancellations, in particular, were associated with worse parent mood and sleep quality. The pervasive effects of parents' work schedule unpredictability on the well-being of those currently raising the next generation should be considered in research and practice.

Policymakers around the country are beginning to recognize the potential costs of allowing scheduling practices that harm worker well-being. So-called fair workweek legislation was implemented in Emeryville shortly after these data were collected, and has also been implemented in San Francisco, Seattle, Philadelphia, and Oregon, among others; a number of other states and localities are currently considering similar policies, which require employers to provide workers with their schedules in advance (typically at least 2 weeks) and to compensate workers for subsequent changes to those schedules. Future work should evaluate the effects of such policies to determine whether policies aimed toward reducing schedule disruptions do so effectively, and whether they have the effect our results would predict of improving worker well-being.

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Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Appendix Supporting Information.

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