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Assessing associations between insecure income and US workers' health: An IPUMS-MEPS analysis

Robert D. Thomas [a,b,*], John W. Davis [c], Paula M. Cuccaro [b], Gretchen L. Gemeinhardt [b]

[a] Immediate past Commissioner, Texas Workforce Commission
[b] The University of Texas Health Science Center Houston School of Public Health, United States
[c] The University of Texas Medical Branch at Galveston, Population Health Sciences Department, United States

A B S T R A C T

Gig economy compensation policy initiatives, such as California Prop 22, are increasing the number of US workers receiving piece rate pay (PRP) and other forms of insecure income. However, there is limited evidence about how this trend affects people's health. Using data from the 2008-19 IPUMS Medical Expenditure Panel Survey (MEPS), we examined associations between insecure compensation and US adults' self-reported overall health as well as psychological distress. We report significant associations with three types of insecure income — PRP, hourly, and daily pay — on overall health and psychological distress. These effects were robust to adjustment for suspected confounders, but point estimates suggested that the effect of each type of non-salary compensation differed by sex, level of education, income level, and health insurance coverage. These findings warrant policy makers' consideration as they balance the purported benefits of gig economy non-salary compensated work with implications for workers' health.

1. Introduction

In 1776, economist Adam Smith wrote that workers "when they are liberally paid by the piece, are very apt to overwork themselves, and to ruin their health and constitution in a few years." (Bender et al., 2012; Smith, 1776) From the mid-18th century through the mid-20th century, performance-based piece rate compensation, i.e., per unit of production-based pay, regardless of the time required, was the primary form of worker pay. After World War II, US policy makers sought to promote economic stability and growth, in part by protecting collective bargaining rights. In turn, unions gained substantial increases in the numbers of workers with salary-based traditional employment, that is the "stable, open-ended and direct arrangement between a dependent, full-time employee and their unitary employer." (Schoukens and Barrio, 2017) The normalization of secure, salary-based income and traditional employment is credited with fostering the growth of the middle class, a growing tax base, national prosperity (Bengtsson and Prado, 2020), and improved workers' health (Benach et al., 2016).

However, beginning in the 1970s, financial crises, globalized competition, and neoliberal policies regressed traditional salary-based employment towards more precarious, alternative and contingent work models, which are largely characterized by more insecure forms of income (Benach et al., 2014; Kalleberg, 2009; Kim et al., 2008). Traditionally associated with developing countries, contingent work and less secure performance-based pay models were likewise resurgent in the US and other developed industrialized countries (Hadden et al., 2007). Notably, performance-based pay, and PRP in particular, was increasingly being utilized in developed countries to incentivize worker productivity and efficiency, ostensibly to help companies compete in the global marketplace (Artz and Heywood, 2015; Bender et al., 2012; Davis, 2016; Lazear, 2000; MacDonald and Marx, 1998).

The early 2000s witnessed the resurgence of gig work through the rapid development of technology-driven freelance digital applications, allowing individual workers to more easily access contingent and alternate work (Ashford et al., 2007; Sutherland et al., 2020). The US Bureau of Labor Statistics (BLS) described the gig economy and gig work as any alternative, contingent and non-traditional work (Gallup Organization, 2018; Hadden et al., 2007). PRP is the core worker compensation model of the industry-agnostic modern gig economy (Friedman, 2014). It was the 2008 Great Recession financial and economic crises, which are widely recognized as the genesis of the current app-based gig economy era, prompting workers' increased reliance on precarious work, PRP, and other forms of insecure income, to meet their financial obligations (Betti, 2017; Bobek et al., 2018; Spreitzer et al., 2017).

With the advent of the current gig economy, the working age population must now compete for jobs and economic security in a globalized

* Corresponding author.
E-mail addresses: rthomas@austin.rr.com (R.D. Thomas), jowdavis@utmb.edu (J.W. Davis), Paula.M.Cuccaro@uth.tmc.edu (P.M. Cuccaro), Gretchen.L.Gemeinhardt@uth.tmc.edu (G.L. Gemeinhardt).

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marketplace that is no longer characterized by stable, long-term employment (Betti, 2017; Kalleberg and Vallas, 2017). Instead, the working age population often compete with local, remote and international workers for work (Abraham et al., 2018; Tompa et al., 2007; Tran and Sokas, 2017), increasingly finding available work opportunities predominately compensated with insecure pay structures. Once traditionally secure jobs in typically secure industries, such as manufacturing and education, are giving way to precarious work arrangements characterized by income insecurity (International Labor Organization, 2011). Regardless of industry, modern gig economy workers trade employment security for purported flexibility (Betti, 2017; Bobek et al., 2018). By 2018, an estimated 29% of US workers had an alternative work arrangement as their primary job, up from 11% in 2005 (Gallup Organization, 2018). Industry's advocacy for new gig work-friendly labor regulations, legislation and policy initiatives have material implications for millions of US workers, and is fostering the expansion of companies offering alternative work arrangements, PRP, and other insecure worker compensation models (Browning, 2022).

Industry's methodical and systematic efforts to erode traditional employment protections in favor of alternate work arrangements is particularly notable in Texas, California, New York, Washington, and now in Massachusetts (Browning, 2022). In Texas, industry successfully lobbied the state agency responsible for labor rules and unemployment claims to create a gig economy worker classification evaluation rubric that favors the determination of workers as independent contractors, and not as employees. In California, a consortium of app-based gig economy companies, including Uber, Lyft, and DoorDash, spent over $200 million to successfully pass California Proposition 22 (Prop 22). Passed in November 2020, Prop 22 overturned state employment security legislation that classified specific categories of gig economy workers as traditional employees, with all the attendant protections and benefits of traditional salary-based employment (Sammon, 2021). Based on their California success, gig economy companies unsuccessfully pursued a similar 2021 Massachusetts ballot proposition campaign to classify workers as independent contractors instead of employees (Browning, 2022). As app-based gig companies continue to seek the codification of industry-favorable labor laws and regulations securing precarious work status and insecure income payment models for gig workers throughout in the United States, it is necessary to assess of how such policies might impact workers' health.

The pathways and relationships between precarious work and poor health outcomes are complex, with numerous factors serving as potentially significant triggering mechanisms. Benach et al. found that "[c]ritical to the experience of employment precariousness and its adverse consequences for health and well-being are the (possibly cumulative) duration and intensity of exposure, as well as the number of dimensions to which one is exposed." (Benach et al., 2014) The Benach researchers categorized precarious work-associated health outcomes findings into three main groupings, including physical health, mental health (including depression, psychological and emotional distress), and health-related outcomes (Benach et al., 2014).

Researchers have confirmed an association between precarious work and poorer health outcomes (Bender and Theodossiou, 2018; Cheng et al., 2005; Kim et al., 2008; Marmot et al., 1991). Based on their findings, Cheng et al. theorized that precarious work is an important source of stress, which is associated with poor health (Cheng et al., 2005). Chronic stress results in the sustained production of hormones such as cortisol, which can lead to poor health outcomes (Berkman et al., 2015; Salleh, 2008; Freni-Sterrantino and Salerno, 2021) through numerous biological mechanisms (i.e. chronic inflammation, immunosuppression, increased adiposity). It may also increase the probability of poor lifestyle choices (i.e. smoking, alcohol and/or drug consumption) (Muenster et al., 2011; Rumball-Smith et al., 2014). Both pathways are hypothesized to worsen cardiovascular disease risk factors, including increased blood pressure and heart rate, vascular constriction, blood flow changes, plaque formation (Eshak et al., 2017; Steptoe and Kivimäki, 2012; Virtanen et al., 2013), depression (Bender and Theodossiou, 2018; Vives et al., 2013) and psychological distress. (Barry et al., 2020; Prochaska et al., 2012).

One 2009 US study, at the height of the Great Recession, found that precarious employment was correlated with negative self-reported health (including mental health), and that the negative self-reported health status continued for over a decade (Burgard et al., 2009). Vives et al. found that workers' health outcomes are impacted by the type and duration of the employment precariousness, low wages creating possible economic deprivation, and limited to no ability of workers to effect positive change in work environments to offset the negative conditions (Vives et al., 2013). These same researchers found a direct correlation between precarious employment and decreased mental health, which "increased along a gradient of employment precariousness in a dose-response pattern." (Vives et al., 2013) Peckham et al. found that the quality of precarious work arrangements was correlated with self-reported health, mental health and work-related injuries (Peckham et al., 2019). Other studies have shown that obesity, which can lead to greater negative health risks, was positively correlated with working more than 40 hours per week in precarious work arrangements, even after controlling for important covariates such as education, age, gender, family, BMI category, leisure time and occupational physical activity, weight control habits, smoking habit and use of drugs (Barbadoro et al., 2016).

Income insecurity, a component of precarious work, has been found to be associated with workers' physical, emotional, and psychological health, including self-reported poor health (SRH), depression, anxiety, hypertension, weight-gain and weight-gain related illnesses (Davis, 2016; Davis and Hoyt, 2020; Kalleberg and Vallas, 2018; Souza et al., 2005). Another study found that consistent and prolonged exposure to insecurity can be as harmful to health outcomes as unemployment. (Kim and von dem Knesebeck, 2015) Bender and Theodossiou (Bender and Theodossiou, 2018) assessed the association of performance pay and detrimental health outcomes, referencing both Artz and Heywood (Artz and Heywood, 2015) and they found a "strongly robust relationship between workers with piece rates experience and higher probabilities of workplace injury …." (Bender and Theodossiou, 2013) Bender and Theodossiou found that workers who received performance-based pay were more likely to report poor SRH and poor physical health, and working performance pay increased the hazard of five measures of stress (Bender and Theodossiou, 2013). And finally, looking at longitudinal data, Kim et al. found that precarious workers self-reported poor health at greater rates in subsequent rounds, assessing that precarious work tended "to be chosen involuntarily and clear [ly] have disadvantages in terms of wage and benefits" (Kim et al., 2008).

Numerous factors have been suggested as moderators of PRP's effect on overall health and psychological distress. Some cohort studies indicate that insecure income's effect on health and mental wellbeing may be exacerbated by lower levels of educational attainment (Raghupathi and Raghupathi, 2020), low income (Marmot, 2017; McClurkin et al., 2015; Duncan, 1996; Marmot, 2002), and lack of health insurance (McClurkin et al., 2015; Pickett and Wilkinson, 2015).

Medical Expenditure Panel Survey (MEPS), a sub-component of the National Health Interview Survey (NHIS), longitudinally surveys a nationally-representative cohort of workers on their health, wellness, and work-related details. MEPS 2008 through 2019 contains over 1M subject responses, including information on sociodemographic factors known to confound health-related measures (i.e., race/ethnicity, income). Thus, the MEPS dataset presents an opportunity for more precise estimation of precarious employment's effect on health than many other surveys.

The purpose of this study was to examine associations between three specific forms of insecure income – PRP, hourly pay, and daily pay– on overall health and psychological distress. We measured health associations with these three distinct insecure income methods from the beginning of the Great Recession-driven gig economy (2008) through

the most recently available data (2019). More specifically, this research addressed the gap in the literature assessing current gig economy (2008 onward) forms of insecure income — particularly PRP, the focus of current state-level labor policy debates — and the association with two research validated health outcome variables (self-reported health and psychological distress) in US workers using data current through 2019.

2. Methods

2.1. Data source

Our data source was the 2008-2019 IPUMS(Blewett et al., 2021) curated MEPS (IPUMS-MEPS), a nationally-representative work and health survey, which includes the time period from the start of the modern gig economy through the most recent data. Detailed survey methodology for IPUMS-MEPS has been previously described (Agency for Healthcare Research and Quality, 2018; Blewett et al., 2021). Participants, non-institutionalized adults aged 18+ years old, generally reported sociodemographic information for themselves and for other family members. However, specific health-related questions, including self-rated health (SRH) and psychological distress, were individually answered by each unique person on the Self-Administered Questionnaire (SAQ). There are approximately 30,000 participants per round, with five survey administrations per round. Through a sequential panel design, participants of two different panels were interviewed for IPUMS-MEPS in each year.

2.2. Measures

The first outcome measure was SRH, which serves both as a proxy for true overall health and mortality risk (Davis, 2016; László et al., 2010). SAQ response options for self-reported health are on a Likert scale, ranging from 1 (excellent) to 5 (poor) health. We dichotomized responses into good to excellent health (1-3) versus fair or poor health (4-5). The next outcome measure was the Kessler Psychological Distress Scale (K6SUM) (Benach et al., 2014; Blustein et al., 2016; Davis, 2016). The K6SUM is a highly sensitive psychological distress screening tool (Prochaska et al., 2012). SAQ K6SUM response options allow for how often an individual experiences six different feelings. Response options were on a Likert scale ranging from 0 (none of the time) to 4 (all of the time), with a summary score maximum of 24. After reviewing the univariate and bivariate frequencies of K6SUM scores by type of compensation, we dichotomized the K6SUM variable at the cutoff of 5 points or more to capture the existence of moderate, yet clinically relevant, mental distress, which maximizes sensitivity while mitigating differential misclassification of non-distressed persons. This cut-point is consistent with previous methods (Prochaska et al., 2012).

The key independent variable, compensation type, was based on a survey question asking participants how they were paid for their work, with response options for PRP, hourly pay, daily pay, or annual salary. Annual salary was used as the referent group, while the other three categories were treated as three nominal categories. Because our hypothesis was that each form of insecure income may differ in its association with health measures when compared to annual salary, these compensation groups were treated as separate categories. We also examined the potential moderating effects of biological sex (based on previous evidence that employment environments meaningfully differed by gender) (Kim et al., 2008), limited formal education (less than a four-year college degree) (Raghupathi and Raghupathi, 2020), living at or near the poverty level (Davis and Hoyt, 2020; Marmot, 2017) (operationalized as <145% FPL (Davis and Hoyt, 2020)), and not having health insurance (Pickett and Wilkinson, 2015). Covariates included to control for potentially confounding effects included age, survey year, race (self-identification as white, black, Asian, American Indian/Pacific Islander, Multiple, or Other), ethnicity (Hispanic vs not Hispanic), immigration status (US-born vs. not US-born), depression (for models predicting overall health only) and marital status. These covariates have been previously demonstrated to have effects on self-reported health and psychological distress, mediated through numerous socioeconomic pathways (Davis and Hoyt, 2020).

2.3. Statistical analysis

Univariate and bivariate frequencies were assessed for all covariates, independent, and outcome variables. Baseline characteristics of the cohort (responses from the first relative year in the study) were analyzed by type of income to assess for potential confounding or moderation. Conservatively, Phi statistics (categorical association measure) of greater than 0.1 were considered possibly meaningful, whereas an association greater than 0.2 was considered a possible moderator. We compared crude odds of distress with the primary cut-point (5+) with a higher cut-point (13+) to assess whether further sensitivity analysis was warranted (Appendix Table A) since higher scores were rare but more likely to represent true distress.

Several generalized estimating equation (GEE) models were constructed to assess the odds of poor health and psychological distress given one's type of compensation. All GEEs were constructed with a log-odds exchangeable correlation structure (Touloumis et al., 2013) to account for idiosyncrasy of responses (i.e., an individual predisposition to answer negatively about their health). The first model (Model A) constructed was unadjusted to assess the crude association size. Second, an "empty" model (Model B) including all possible confounders was fit to assess the adjusted effects of the covariates on each outcome. Third, a "time-invariant"-adjusted model (Model C) — including race, ethnicity, sex, and immigration status — was constructed. Finally, a fourth model (Model D) including all suspected confounders and moderators was constructed to assess the effect.

Two sensitivity analyses and one sub-analysis were conducted for each outcome. The first sensitivity analysis (Model E) was to assess whether occupation class and/or other contingent types of work (temporary or seasonal work) might bias effect estimates. Occupation class was assessed as "White-Collar" (Occupation Classes 1-5) versus Blue-Collar, which is similar or identical to previous studies' approaches (Artz and Heywood, 2015; Gallo et al., 2000; Krokoff et al., 1988). Temporary and seasonal work were collapsed into a single index to account for small cell sizes. The second sensitivity analysis (Model F) was a quasi-mediation analysis meant to estimate to what extent the hourly pay ***rate*** (dollars per hour) differences across compensation types might explain associations. Thus, Model F indirectly tests Adam Smith's hypothesis that workers liberally paid PRP (i.e. insecure income) likely experience poorer health. A relative reduction in independent variable effect estimates of greater than 20% was considered a possibly meaningful mediation. Finally, a sub-analysis (Appendix Table B) assessing all forms of insecure income in persons who reported currently smoking — known to be a proxy for employment risk tolerance (Jung et al., 2013), a possible self-selection bias — was conducted. Parameter estimates were compared across main and sub-analyses to assess robustness and possible strength of influence.

Descriptive statistics were calculated in R, version 4.0.3. All further statistical analyses were performed using SAS, version 9.4. The study design was deemed IRB-exempt by the University of Texas Health Science Center at Houston Committee for the Protection of Human Subjects.

3. Results

There were 1,229,412 total responses from 228,679 individuals between 2008 and 2019. Because only the annual questionnaire included queries on the exposure, outcomes, and key confounders, these responses alone were included. Excluding non-informative responses, there were 132,185 responses from 83,503 unique persons reporting hourly, daily, piece rate, or annual salary pay that were available for

analysis. The overall number of annual responses decreased from 2008 (n = 11204) to 2019 (n = 8815). The proportion of persons reporting each form of insecure income did not fluctuate meaningfully throughout the study period (Appendix Figure A).

Table 1 demonstrates the descriptive statistics for this sample. Persons reporting a non-salary compensation method, on average, were more likely to have less than a college degree (Phi = 0.27), report <145% of the Federal Poverty Line for their total family income (Phi = 0.23), and to report not having health insurance (Phi = 0.18). Workers reporting annual salary, as expected, were more likely to report a "White-Collar" occupation (Phi = 0.24) and reported much higher hourly pay ***rates*** than those receiving PRP, hourly, or daily pay (Phi = 0.52).

Covariate Analysis. In Table 2, Model B, we display the adjusted effects of suspected confounders on SRH. As expected, odds of poor SRH increased the most for those workers with less than a four-year college degree (OR = 1.50, 95% CI: 1.39, 1.62), reporting income levels <145% FPL for the family (OR = 1.49, 95% CI: 1.41, 1.58), or identifying as Black (OR = 1.42, 95% CI: 1.33, 1.52) or Hispanic (OR = 1.84, 95% CI: 1.84, 95% CI: 1.73, 1.97). Because odds of reporting fair/poor SRH was strongly confounded by reporting psychological distress (OR = 3.21, 95% CI: 3.06, 3.38) or depression (OR = 2.29, 95% CI: 2.14, 2.45), these covariates were carried for all SRH models to better isolate the possible effects on overall health — while adjusting for mental health — by type of compensation.

Overall Health: There were 11.02% (5285) of hourly pay workers, 12.01% (74) daily pay workers, 11.30% (147) PRP workers, and 5.70% (1042) salaried workers who reported fair or poor health at baseline (Table 1). In Table 2, Model A, the crude effects of these forms of insecure income on all SRH responses are displayed. When compared to those working annual salary positions, daily pay (OR = 2.33, 95% CI: 1.96, 2.78), hourly pay (OR = 1.96, 95% CI: 1.85, 2.08), and PRP (OR = 1.92, 95% CI: 1.67, 2.17) were all significantly associated with higher odds of reporting fair or poor SRH. When adjusting for time-invariant covariates (Table 2, Model C), effect estimates for each type of compensation stayed approximately constant. Adjusting for all confounders (Table 2, Model D), including mental health measures, led to some attenuation of each estimate (daily aOR = 1.54; 1.29–1.84; hourly aOR = 1.56; 1.47–1.65; PRP aOR = 1.44; 1.25–1.66).

The first sensitivity analysis (Table 2, Model E) assessed whether

Table 1
Descriptive statistics by compensation type.

	Hourly Wage	Daily Pay	Piece Rate	Annual Salary	Overall	Phi/Eta
	(N = 47946)	(N = 616)	(N = 1301)	(N = 18269)	(N = 68132)	
Subject Age						
Mean (SD)	38.35 (±13.97)	42.31 (±15.90)	41.59 (±14.19)	42.70 (±11.96)	39.61 (±13.62)	
Missing	1 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.0%)	2 (0.0%)	0.14
Sex						
Female	53.63% (25715)	57.95% (357)	34.13% (444)	48.89% (8932)	52.03% (35448)	0.07
Family Size						
Mean (SD)	3.13 (±1.69)	3.06 (±1.85)	3.19 (±1.79)	2.86 (±1.46)	3.06 (±1.64)	0.07
Race						
White (referent)	71.33% (34198)	76.95% (474)	74.79% (973)	74.29% (13572)	72.24% (49217)	
Black/African-American	19.92% (9552)	17.53% (108)	13.91% (181)	12.38% (2261)	17.76% (12102)	
American Indian/Alaska Native	1.04% (499)	0.65% (4)	0.85% (11)	0.57% (105)	0.91% (619)	
Asian	5.12% (2453)	3.57% (22)	8.30% (108)	10.73% (1961)	6.67% (4544)	
Other/Multiple Races	2.59% (1244)	1.30% (8)	2.15% (28)	2.03% (370)	2.42% (1650)	0.13
Hispanic Ethnicity						
Hispanic	30.91% (14822)	39.12% (241)	35.59% (463)	16.61% (3034)	27.24% (18560)	0.15
US Born						
Not US-born	24.73% (11855)	37.34% (230)	35.97% (468)	20.84% (3808)	24.01% (16361)	0.06
Educational Attainment						
Less than 4 Year Degree	89.87% (43090)	82.79% (510)	84.78% (1103)	67.12% (12263)	83.61% (56966)	0.27
Income Level						
<145% FPL	27.08% (12984)	36.85% (227)	28.52% (371)	5.97% (1091)	21.54% (14673)	0.23
Health Insurance						
Uninsured	20.72% (9933)	35.88% (221)	31.36% (408)	6.58% (1203)	17.27% (11765)	0.18
Marital Status						
Unmarried	57.34% (27491)	54.22% (334)	47.19% (614)	36.16% (6606)	51.44% (35045)	0.19
Smoking Status (Current)						
Current Smoker	19.71% (9452)	16.56% (102)	18.83% (245)	9.84% (1797)	17.02% (11596)	
Missing	3385 (7.1%)	37 (6.0%)	103 (7.9%)	1440 (7.9%)	4965 (7.3%)	0.12
Job Classification (Occupational Codes)						
"White-Collar" (Class Code 1-5)	29.10% (27161)	32.96% (409)	49.92% (1269)	7.32% (2568)	23.76% (31407)	0.24
Seasonal Work						
Seasonal	7.11% (3410)	25.32% (156)	12.38% (161)	3.23% (591)	6.34% (4318)	
Missing	120 (0.3%)	3 (0.5%)	6 (0.5%)	4 (0.0%)	133 (0.2%)	0.11
Temporary Work						
Temporary	10.47% (5020)	30.03% (185)	14.83% (193)	3.13% (571)	8.76% (5969)	
Missing	162 (0.3%)	5 (0.8%)	10 (0.8%)	11 (0.1%)	188 (0.3%)	0.14
Second Job						
Yes	8.39% (7827)	10.72% (133)	9.40% (239)	8.07% (2829)	8.34% (11028)	
Missing	0.05% (45)	0.08% (1)	0.20% (5)	0.01% (3)	0.04% (54)	0.02
Hourly Pay Rate						
Mean (SD)	14.39 (±8.89)	14.16 (±10.78)	16.29 (±15.28)	30.86 (±17.78)	18.81 (±14.08)	
Missing	3385 (7.1%)	37 (6.0%)	103 (7.9%)	1440 (7.9%)	4965 (7.3%)	0.52
Self-Rated Health						
Poor Health	11.02% (5285)	12.01% (74)	11.30% (147)	5.70% (1042)	9.61% (6548)	0.08
Psychological Distress (K6SUM Score)						
Possibly distressed	24.68% (11831)	23.70% (146)	22.98% (299)	18.31% (3345)	22.93% (15621)	0.07
Depression (PHQ-2 Score)						
Possibly depressed	7.30% (3501)	5.19% (32)	5.38% (70)	3.86% (706)	6.32% (4309)	0.06

Table 2
Insecure income and SRH.

	Variable	N	Model A: Unadjusted	Model B: Empty Model (Covariates Only)	Model C: Insecure Income with Time-Invariant Covariates**	Model D: Insecure Income with All Suspected Confounders	Model E: Insecure Income with Occupation, Temporary/Seasonal Work Adjustment	Model F: Insecure Income through Hourly Pay Rate (Mediation)
Main Exposure	**Salary (ref)**	35070	1	1	1	1	1	1
	Daily	1241	2.33 (1.96, 2.78)		2.07 (1.74, 2.47)	1.54 (1.29, 1.84)	1.47 (1.23, 1.76)	1.26 (1.05, 1.51)
	Hourly	93332	1.96 (1.85, 2.08)		1.95 (1.84, 2.06)	1.56 (1.47, 1.65)	1.52 (1.43, 1.61)	1.30 (1.22, 1.38)
	Piece Rate	2542	1.92 (1.67, 2.17)		1.82 (1.59, 2.09)	1.44 (1.25, 1.66)	1.39 (1.20, 1.60)	1.22 (1.06, 1.42)
Simple Adjustments	**Survey Year**	NA		1.00 (0.99, 1.01)	0.98 (0.97, 0.98)	100 (0.99, 1.00)	1.00 (0.99, 1.01)	1.00 (1.00, 1.01)
	Subject Age	NA		1.03 (1.03, 1.04)	1.03 (1.03, 1.03)	1.03 (1.03, 1.04)	1.03 (1.03, 1.04)	1.04 (1.03, 1.04)
Potential Moderators	**Female Sex**	68917		1.12 (1.07, 1.17)	1.22 (1.16, 1.28)	1.10 (1.05, 1.16)	1.15 (1.09, 1.21)	1.06 (1.01, 1.12)
	< College Degree	111067		1.50 (1.39, 1.62)		1.36 (1.26, 1.47)	1.34 (1.24, 1.45)	1.23 (1.14, 1.34)
	<145% FPL	27923		1.49 (1.41, 1.58)		1.43 (1.36, 1.51)	1.43 (1.35, 1.51)	1.37 (1.29, 1.45)
	Uninsured	22463		1.31 (1.23, 1.40)		1.28 (1.21, 1.36)	1.28 (1.21, 1.36)	1.22 (1.15, 1.30)
Potential Confounders	**Black Race**	23843		1.42 (1.33, 1.52)	1.42 (1.34, 1.51)	1.38 (1.29, 1.47)	1.38 (1.30, 1.48)	1.32 (1.24, 1.42)
	American Indian/ Alaskan Native	1190		1.30 (1.04, 1.62)	1.42 (1.15, 1.76)	1.28 (1.02, 1.60)	1.28 (1.02, 1.60)	1.27 (1.01, 1.60)
	Asian Race	8822		1.07 (0.96, 1.20)	1.01 (0.90, 1.13)	1.11 (0.99, 1.24)	1.13 (1.01, 1.26)	1.14 (1.01, 1.28)
	Multiple/Other	3216		1.38 (1.19, 1.60)	1.44 (1.24, 1.66)	1.36 (1.17, 1.58)	1.37 (1.18, 1.59)	1.39 (1.19, 1.62)
	White Race (ref)	95114		1	1	1	1	1
	Hispanic	35950		1.84 (1.73, 1.97)	1.79 (1.68, 1.91)	1.80 (1.68, 1.92)	1.79 (1.67, 1.91)	1.72 (1.61, 1.84)
	Unmarried	68159		1.07 (1.02, 1.13)		1.04 (0.99, 1.10)	1.05 (1.00, 1.10)	1.02 (0.97, 1.07)
	US-Born*	100693		0.96 (0.90, 1.03)	0.94 (0.89, 1.00)	0.97 (0.91, 1.04)	0.99 (0.92, 1.05)	0.98 (0.91, 1.05)
	Psych. Distress	28957		3.21 (3.06, 3.38)		3.18 (3.03, 3.35)	3.19 (3.03, 3.35)	3.14 (2.98, 3.31)
	Depressed	7853		2.29 (2.14, 2.45)		2.27 (2.12, 2.43)	2.28 (2.13, 2.44)	2.30 (2.14, 2.46)
Important Sub-Groups	**White-Collar**	100778					0.88 (0.84, 0.93)	
	Temp/Seasonal	15314					1.00 (0.95, 1.06)	
Possible Mediator	**Hourly Pay Rate**	–						0.98 (0.98, 0.99)

*Note that approximately 50% of persons who identified as not US-born also identified as Hispanic.
** Also adjusted for age and year.

effect estimates were stable even when controlling for 1) type of occupation (White Collar vs. Blue Collar) and 2) whether the person reporting worked either seasonal or temporary work (as a single index variable, due to small cells). While the estimated effect of each type of income insecurity on SRH slightly decreased when adjusting for these factors, none were meaningfully different than previous estimates. The second sensitivity analysis (Table 2, Model F) assessed whether the effect of these forms of income insecurity was partially or entirely explained by hourly pay rate — the actual dollars per hour earned regardless of compensation type. While daily (OR = 1.26; 1.05–1.51), hourly (OR = 1.30; 1.22–1.38) and PRP (OR = 1.22; 1.06–1.42) relative effect estimates dropped by approximately 50% compared to the effect size estimated in Table 2, Model D, each effect remained significant at 95% confidence. Thus, this sensitivity analysis suggests that hourly pay rate may partially mediate the association.

We next assessed stratified analyses by four key, suspected moderators: sex, education level, income level, and health insurance. These estimates are demonstrated in Table 3, and as a Forest Plot in Fig. 1. We present adjusted income insecurity estimates without and with (Table 3, Models A1 and A2, respectively) the moderators included as confounders, demonstrating the main effects of income insecurity for comparison. There was evidence for significant moderation of the effect of receiving hourly compensation by income level ($p < 0.01$; 56% increase vs. 21% increase in odds of fair/poor SRH in those with greater vs. lower incomes, respectively) and those who did not have health insurance ($p < 0.001$). Receiving hourly pay was associated with a 57% increase in odds of fair/poor SRH (OR = 1.57; 1.48–1.68) in those with health insurance, whereas the effect was smaller (OR = 1.24; 1.08–1.43) in those without health insurance. Likewise, there was significant moderation of PRP's effect on SRH by sex ($p < 0.01$) and education ($p < 0.05$). Having less than a four-year degree in PRP workers was associated with a 51% increase in odds of fair/poor SRH (OR = 1.51; 1.30–1.75) while having a four-year degree or more for PRP appeared ***protective*** (OR = 0.87; 0.53–1.42). The interaction between PRP and education was borderline ($p = 0.04$).

Table 3
Insecure income and SRH: Stratified analyses.

	Stratified Variable[a]	Salary (n = 35070)	Daily (n = 1241)	Hourly (n = 93332)	Piece Rate (n = 2542)
Model A1	**Main Effects (Other Confounders Only)**	**1**	**1.83 (1.53, 2.18)**	**1.76 (1.66, 1.86)**	**1.65 (1.43, 1.90)**
Model A2	**Adj. Effects (Table 2, Model D)**	**1**	**1.54 (1.29, 1.84)**	**1.56 (1.47, 1.65)**	**1.44 (1.25, 1.66)**
Model B	**Female Sex**	1	1.64 (1.31, 2.07)	1.61 (1.49, 1.75)	1.09 (0.85, 1.40)[c]
	Male Sex	1	1.49 (1.13, 1.97)	1.51 (1.38, 1.64)	1.64 (1.37, 1.96)[c]
Model C	**< College Degree**	1	1.49 (1.22, 1.81)	1.54 (1.44, 1.64)	1.51 (1.30, 1.75)[b]
	≥ College Degree	1	1.74 (1.15, 2.64)	1.56 (1.36, 1.79)	0.87 (0.53, 1.42)[a]
Model D	**< 145% FPL**	1	1.27 (0.97, 1.66)	1.21 (1.06, 1.39)[c]	1.11 (0.87, 1.41)
	≥ 145% FPL	1	1.52 (1.21, 1.91)	1.56 (1.46, 1.66)[c]	1.47 (1.24, 1.74)
Model E	**No Health Insurance**	1	1.38 (1.02, 1.85)	1.24 (1.08, 1.43)[d]	1.27 (1.00, 1.61)
	Health Insurance	1	1.56 (1.25, 1.94)	1.57 (1.48, 1.68)[d]	1.34 (1.11, 1.60)

[a] Adjusted for all factors in Table 2, Model D (except Unadjusted Analysis).
[b] Significant at $p < 0.05$.
[c] Significant at $p < 0.01$.
[d] Significant at $p < 0.001$.

Psychological Distress: At baseline, there were 24.68% (11831) hourly workers, 23.70% (146) daily workers, and 22.98% (299) PRP workers who reported psychological distress, compared to 18.31% (3345) annual salary workers (Table 1). The distribution of workers reporting psychological distress did not differ at a cut-point of 5 versus 13 (Phi = 0.05 vs. 0.06, respectively), suggesting that alternative cut-points were unlikely to change associations (see Appendix Table A). Crude odds of psychological distress (Table 4, Model A) increased with daily pay (OR = 1.38; 1.22–1.57), hourly pay (OR = 1.38; 1.33–1.42), and PRP (OR = 1.30; 1.18–1.43) compared to annual salary. Importantly, some key confounders, such as Black race (OR = 0.75; 0.72–0.79) and Hispanic ethnicity (OR = 0.80; 0.76–0.84) were associated with ***lower*** rates of reporting psychological distress. The time-invariant model (Table 4, Model C) suggested the effects of income insecurity largely did not differ when controlling for time-invariant factors. The fully-adjusted model (Table 4, Model D) suggested some attenuation of the effects of income insecurity when controlling for all key confounders and proposed moderators (daily OR = 1.24; 1.09–1.41; hourly OR = 1.25; 1.20–1.29; PRP OR = 1.24; 1.13–1.37), and that effects were nearly identical across types of compensation.

Repeating both sensitivity analyses for the psychological distress outcome (Table 4, Model E) did not suggest that the effects were meaningfully different when adjusting for either occupation class or temporary/seasonal work. Adjusting for hourly pay rate (Table 4, Model F), however, appeared to meaningfully mediate the relationship between type of compensation and psychological distress. The effects of daily (OR = 1.12; 0.98–1.27) and PRP (OR = 1.10; 0.99–1.21) were reduced by approximately 50% in magnitude and became non-significant, whereas the effect of hourly pay reduced by more than 50% (OR = 1.11; 1.07–1.16) but remained significant.

Stratified analyses for the effect of type of compensation on psychological distress are displayed numerically in Table 5 and graphically in Fig. 2. As previously, we present adjusted income insecurity estimates without and with (Table 5, Models A1 and A2, respectively) the moderators included as confounders, demonstrating the main effects of income insecurity for comparison. There was only one meaningful moderation detected among the four proposed moderators. Biological sex significantly moderated the effect between hourly pay and psychological distress ($p < 0.0001$). Women working hourly pay, on average, were more likely to report psychological distress (OR = 1.32; 1.25–1.38) than men working for hourly pay (OR = 1.17; 1.11–1.23).

It was a concern that some workers who reported fair/poor SRH and/or psychological distress may be self-selecting into jobs associated with their preferred level of risk tolerance. Based on previous evidence (Artz and Heywood, 2015; Davis and Hoyt, 2020; Jung et al., 2013) suggesting that smoking is a proxy for work-related risk preferences, we performed a sub-analysis of workers who reported currently smoking, and repeated effect estimates for SRH and psychological distress. In Appendix Table B, we show that the effects of compensation type on SRH did not meaningfully differ among current smokers versus those in the total sample. However, psychological distress effects were reduced (daily OR = 1.11; 0.85–1.44; hourly OR = 1.18; 1.09–1.27; PRP OR = 1.14; 0.93–1.38) among current smokers as compared to overall estimates (Table 4, Model D).

4. Discussion

To our knowledge, this is the first broad assessment of the effect of different forms of insecure income — in a large United States sample of workers (IPUMS-MEPS) — from the inception of the modern gig economy (2008) through the pre-pandemic era (2019). When compared to

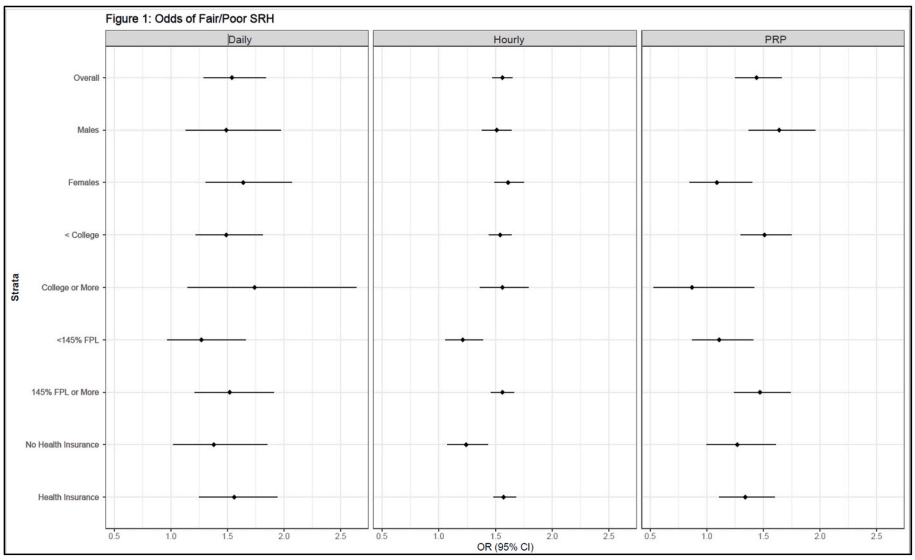

Fig. 1. Forest plot, stratified analysis of SRH by insecure income category.

those receiving annual salary, we found significant associations with poorer overall health with all three pre-specified forms of insecure income: PRP, hourly pay, and daily pay. While the effect sizes were moderated by several key factors (sex, education, family income level, and health insurance), the association remained significant when we stratified the estimates.

While the actual proportions of respondents reporting insecure forms of compensation did not meaningfully change over time (Appendix Fig. 1), these findings may not be representative of national trends towards insecure forms of income. While Katz & Krueger reported that 'alternative work arrangements' rose from 10.1% to 15.8% from 2005 to 2015 (Katz and Krueger, 2019), it is difficult to compare whether our rate of change — which is relative to persons, not nationally representative, and used different queries about employment — is similar.

Consistent with previous work, we found US workers who reported piece rate compensation had greater odds of reporting poorer overall heath and psychological distress relative to those who earned a salary (Matilla-Santander et al., 2020; Merolli, 2012; Nishikitani et al., 2012). For overall health, this association was strong for PRP in persons without a college degree, but was estimated to be protective in those with a college degree. This suggests that the nature of PRP is not homogenous, and that those with higher educational backgrounds may benefit from the flexibility of PRP while those without may be distressed and in poorer overall health. Hourly pay and daily pay, likewise, were associated with poorer overall health and psychological distress, with stratified estimates suggesting that women, those with health insurance, and those with higher incomes have *higher* odds of having negative outcomes. The 'material deprivation' pathway (Peckham et al., 2019) may explain these results in that those who are already materially deprived are at a higher, baseline level of psychological distress and poorer health and are less likely to experience *additional,* negative health ramifications from receiving insecure income.

There are numerous reasons for analyzing responses in clusters rather than treating them as independent. Independence model correlation structures, by definition, assume all observations are non-dependent on other responses. This will create biased standard error estimates that increase the probability of failing to detect real associations (Touloumis et al., 2013). While there are weights available for generating nationally representative estimates for IPUMS-MEPS, these can only be utilized with independence models. In this study, we only utilize health responses from the annual questionnaire to increase certainty that respondents' health responses are directly tied to their current compensation type. Thus, not only would weighting responses questionably yield representative results, but it would also decrease our ability to detect real associations. While the correlated structure results are not necessarily representative of the national population, they still provide strong evidence that insecure compensation models are associated with poorer mental and overall health.

Income insecurity's effect on overall health and psychological distress was partially explained by one's hourly pay rate (Tables 2 and 4, Model F). Approximately 50% of the effect of each form of insecure income assessed in our analyses could be explained by the hourly pay rate. There are numerous plausible explanations for the hourly rate effect. Because we control for total family income, this phenomenon might be explained by increases in the total number of hours worked weekly. Persons who work longer hours are known to be at higher risk of developing acute and chronic illnesses or work-related injuries (Barbadoro et al., 2016; Goh et al., 2015; Macassa et al., 2017). Further, it may support Adam Smith's proposition that certain compensation methods incentivize *workers to work themselves into poor health.* More exploration is needed to illuminate the pathways, and potential interventions, through which insecure forms of compensation affect health, though the associative trend is made clear with this analysis.

Our findings contribute to the current legislative and policy discussions, such as California Prop 22, by raising for consideration the potential for negative health outcomes for gig workers. Poorer worker health and increased distress could meaningfully undermine industry's stated purported policy benefits of increasing economic competitiveness, expanding the worker pool, creating worker flexibility, and increasing income opportunities for workers. These findings also suggest that insecure income-based precarious work during the COVID-19 pandemic might also contribute to poor workers' health. During the COVID-19 era, Instacart, Amazon, and Uber Eats, among others, worked to incentivize both the retention and recruitment of workers willing to perform precarious work during the pandemic (Cameron et al., 2021; Spurk and Straub, 2020). As Spurk and Straub noted, the pandemic-driven demand for workers may have caused workers to transition from income insecurity fears to the fear of being unable to work at all if they suffered COVID-19 related morbidities, or obviously even mortality (Spurk and Straub, 2020). It is highly plausible that incenting gig economy workers with increased PRP to work in forward facing and community engaged roles during COVID-19 resulted in higher levels of poor SRH and higher rates of psychological distress. Additional research is necessary to assess gig worker health outcomes during the COVID-19 pandemic era. However, our findings that insecure income work increases workers' sense of poor health should cause policy

Table 4
Insecure income and psychological distress.

	Variable	N	Model A: Unadjusted	Model B: Empty Model (Covariates Only)	Model C: Insecure Income with Time-Invariant Covariates[b]	Model D: Insecure Income with All Suspected Confounders	Model E: Insecure Income with Occupation, Temporary/Seasonal Work Adjustment	Model F: Insecure Income through Hourly Pay Rate (Mediation)
Main Exposure	**Salary (ref)**	35070	1		1	1	1	1
	Daily	1241	1.38 (1.22, 1.57)		1.42 (1.25, 1.62)	1.27 (1.11, 1.44)	1.24 (1.09, 1.41)	1.12 (0.98, 1.27)
	Hourly	93332	1.38 (1.33, 1.42)		1.37 (1.32, 1.42)	1.25 (1.20, 1.29)	1.25 (1.20, 1.29)	1.11 (1.07, 1.16)
	Piece Rate	2542	1.30 (1.18, 1.43)		1.37 (1.24, 1.50)	1.24 (1.13, 1.37)	1.24 (1.13, 1.37)	1.10 (0.99, 1.21)
Simple Adjustments	**Survey Year**	NA		0.96 (0.95, 0.96)	0.96 (0.95, 0.96)	0.96 (0.95, 0.96)	0.96 (0.95, 0.96)	0.96 (0.96, 0.97)
	Age	NA		1.00 (1.00, 1.00)	0.99 (0.99, 0.99)	1.00 (1.00, 1.00)	1.00 (1.00, 1.00)	1.00 (1.00, 1.00)
Potential Moderators	**Female Sex**	68917		1.33 (1.29, 1.38)	1.36 (1.32, 1.41)	1.33 (1.28, 1.37)	1.32 (1.27, 1.36)	1.28 (1.24, 1.33)
	< College Degree	111067		1.13 (1.08, 1.18)		1.07 (1.02, 1.12)	1.07 (1.02, 1.12)	1.00 (0.96, 1.06)
	<145% FPL	27923		1.37 (1.31, 1.42)		1.34 (1.29, 1.39)	1.34 (1.29, 1.39)	1.31 (1.26, 1.37)
	Uninsured	22463		1.08 (1.03, 1.13)		1.06 (1.02, 1.11)	1.06 (1.01, 1.11)	1.04 (0.99, 1.09)
Potential Confounders	**Black Race**	23843		0.75 (0.72, 0.79)	0.82 (0.78, 0.85)	0.74 (0.71, 0.77)	0.74 (0.71, 0.77)	0.73 (0.69, 0.76)
	American Indian/ Alaskan Native	1190		1.20 (1.02, 1.42)	1.25 (1.06, 1.47)	1.19 (1.01, 1.41)	1.20 (1.02, 1.41)	1.20 (1.01, 1.42)
	Asian Race	8822		0.93 (0.87, 1.00)	0.93 (0.86, 1.00)	0.95 (0.88, 1.02)	0.94 (0.87, 1.02)	0.99 (0.92, 1.07)
	Multiple/Other	3216		1.23 (1.12, 1.36)	1.27 (1.15, 1.40)	1.22 (1.11, 1.35)	1.22 (1.11, 1.35)	1.17 (1.06, 1.30)
	White Race (ref)	95114		1	1	1	1	1
	Hispanic	35950		0.80 (0.76, 0.84)	0.84 (0.80, 0.88)	0.79 (0.75, 0.83)	0.79 (0.75, 0.83)	0.78 (0.74, 0.82)
	Unmarried	68159		1.33 (1.28, 1.37)		1.30 (1.26, 1.35)	1.30 (1.25, 1.35)	1.27 (1.23, 1.32)
	US-Born[a]	100693		1.05 (1.00, 1.11)	1.06 (1.01, 1.11)	1.06 (1.01, 1.11)	1.06 (1.01, 1.11)	1.07 (1.01, 1.12)
Important Sub-Groups	**White-Collar**	100778					1.02 (0.98, 1.06)	
	Temp/Seasonal	15314					1.05 (1.01, 1.09)	
Possible Mediator	**Hourly Pay Rate**	–						0.99 (0.99, 0.99)

[a] Note that approximately 50% of persons who identified as not US-born also identified as Hispanic.
[b] Also adjusted for age and year.

Table 5
Insecure income and psychological distress: Stratified analyses.

	Stratified Variable[a]	Salary (n = 35070)	Daily (n = 1241)	Hourly (n = 93332)	Piece Rate (n = 2542)
Model A1	**Main Effects (Other Confounders Only)**	**1**	**1.39 (1.22, 1.58)**	**1.33 (1.28, 1.38)**	**1.29 (1.17, 1.42)**
Model A2	**Adj. Model (Table 4, Model D)**	**1**	**1.27 (1.11, 1.44)**	**1.25 (1.20, 1.29)**	**1.24 (1.13, 1.37)**
Model B	**Female Sex**	1	1.36 (1.15, 1.60)	1.32 (1.25, 1.38)[b]	1.34 (1.16, 1.56)
	Male Sex	1	1.18 (0.96, 1.44)	1.17 (1.11, 1.23)[b]	1.15 (1.01, 1.31)
Model C	**< College Degree**	1	1.52 (1.13, 2.04)	1.26 (1.16, 1.36)	1.35 (1.07, 1.71)
	≥ College Degree	1	1.23 (1.07, 1.41)	1.24 (1.19, 1.29)	1.23 (1.10, 1.36)
Model D	**< 145% FPL**	1	1.20 (0.98, 1.48)	1.28 (1.16, 1.41)	1.23 (1.03, 1.47)
	≥ 145% FPL	1	1.35 (1.15, 1.58)	1.21 (1.17, 1.26)	1.22 (1.09, 1.37)
Model E	**No Health Insurance**	1	1.15 (0.92, 1.43)	1.19 (1.07, 1.32)	1.13 (0.94, 1.36)
	Health Insurance	1	1.33 (1.13, 1.55)	1.24 (1.19, 1.28)	1.28 (1.14, 1.43)

[a] Adjusted for all covariates displayed in Table 4, Model D.
[b] Significant at $p < 0.0001$.

makers to pause. Contrary to the argued gig work advantages, our findings show that even the perception of poor health may be enough to drive worker shortages, increase industry expenses, and increase healthcare utilization and the economic burden of chronic morbidity care in the United States.

4.1. Limitations

Though IPUMS-MEPS provides a large sample of US workers over time, this study was observational, did not provide causal inferences, and cannot reliably test for reverse causality. Thus, results may signify that those earning income-insecure compensation are more likely to develop poor health, or that those with poor health may self-select work in insecure income settings. However, it is far more plausible that insecure income affects health rather than health affecting likelihood of jobs that pay insecure income. PRP, for example, is frequently a physically and psychologically demanding form of labor that would more readily select for *healthier* workers than unhealthy ones.

We were also limited by the questions that are answered at the annual level in these analyses due to the structure of the survey, which may have limited generalizability. Further, the queries of respondents were somewhat limited for our purposes. For example, we could not assess different types of contract structures (e.g., dispatch work) on health reliably. Finally, while the single measures used for outcomes in this study – overall health and psychological distress – may be subject to instability, their repeated measure over time mitigates some of those concerns. The issue is further mitigated by collapse of outcomes into binary, reducing variability across respondents. More robust measures of health are needed to assess these trends in future studies. The analyses presented here were not necessarily nationally representative, and those reporting insecure types of compensation here may differ than the average worker in the United States. However, the methodology employed was robust and sufficient to justify investment in greater studies, such as a prospective cohort.

5. Conclusion

The finding that piece rate compensation, in addition to other forms of insecure income, is associated with worse overall health has serious public health and public policy implications. The Massachusetts, New York, Texas and California piece rate compensated worker classification policy battles continue to foreshadow policy disputes in the courts and legislatures at both state and federal levels. Similarly, the European Union is currently assessing new labor regulations to synthesize competing EU member gig company worker classification policies. If adopted, the new regulations would require gig economy companies in the EU to classify their workers as employees in order to provide workers' income security, minimum wages and benefits, insurance, and other traditional employment protections (Satariano and Peltier, 2021). An in-depth discussion and analysis of state, federal and international worker classification policy choices, direction and promulgation were outside the scope of this research. However, this research shows that worker classification policy analyses should equally consider workers' health implications, including healthcare utilization, costs, and outcomes. As more companies turn to alternate work and more insecure payment structures for workers, it is important for policy makers to

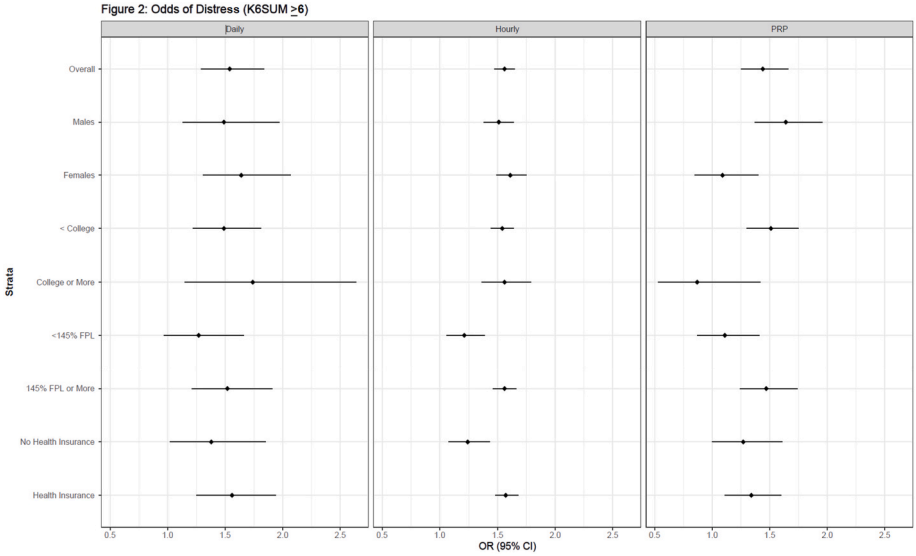

Fig. 2. Forest plot, stratified analysis of psychological distress by insecure income category.

balance appropriate safeguards to ensure that workers' health and mental well-being are protected. Our findings, therefore, may inform labor, economic, and market policies related to Proposition 22 and beyond.

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Credit authors' statement

Robert Thomas: Conceptualization, Methodology, Data Curation, Writing - Original Draft, Writing – Review & Editing, Project administration, Supervision.

John Davis: Methodology, Formula Analysis, Writing - Original Draft Assistance, Writing – Review & Editing.

Paula Cuccaro: Writing- Reviewing and Editing.

Gretchen Gemeinhardt: Conceptualization, Writing – Review & Editing.

Declaration of competing interest

Robert D. Thomas is the immediate past Commissioner of the Texas Workforce Commission where he participated in the development, promulgation, deliberations and votes on Texas state-wide economic development related workforce and labor policies, including relating to gig worker characterization. John W. Davis reports no conflicts of interest. Paula M. Cuccaro reports no conflicts of interest. Gretchen L. Gemeinhardt reports no conflicts of interest.

Data availability

IPUMS-MEPS is a publicly-available dataset, and requests for data can be made through that entity.

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Appendix

Table A
Sensitivity Analysis Examining Two Possible K6SUM Cut-Points.

	K6SUM (5+ vs. Less)				K6SUM (13+ vs. Less)			
N Col %	No Distress	Distress	Total	Phi	No Distress	Distress	Total	Phi
Hourly	71446	21886	93332	0.06	90029	3303	93332	0.05
	69.21%	75.58%			70.24%	82.51%		
Daily	949	292	1241		1200	41	1241	
	0.92%	1.01%			0.94%	1.02%		
Piece-Rate	1994	548	2542		2478	64	2542	
	1.93%	1.89%			1.93%	1.60%		
Salary	28839	6231	35070		34475	595	35070	
	27.94%	21.52%			26.90%	14.86%		
Total	103228	28957	132185		128182	4003	132185	

Table B
Sub-Analysis of Smoking on SRH and Psychological Distress

Wage Type	Model 1: Wage Type on Health in Smokers*	Model 2: Wage Type on Distress in Smokers*
Daily	1.36 (0.93–1.99)	1.11 (0.85–1.44)
Hourly	1.40 (1.24–1.58)	1.18 (1.09–1.29)
Piece-Rate	1.38 (1.07–1.79)	1.14 (0.93–1.38)
Salary	1	1

* Adjusted for factors in Tables 2 and 4, Model D.

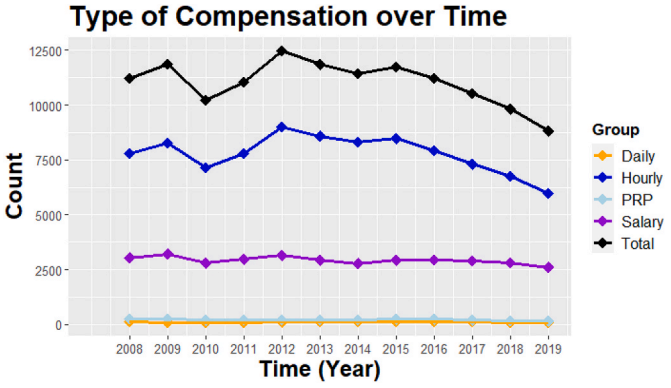

Fig. A. Insecure Income Levels over Time.

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