

# Wage-Setting Policies, Employment, and Food Insecurity: A Multilevel Analysis of 492 078 People in 139 Countries

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**Objectives.** To examine the association between wage-setting policy and food insecurity.

**Methods.** We estimated multilevel regression models, using data from the Gallup World Poll (2014–2017) and UCLA's World Policy Analysis Center, to examine the association between wage setting policy and food insecurity across 139 countries (n = 492 078).

**Results.** Compared with countries with little or no minimum wage, the probability of being food insecure was 0.10 lower (95% confidence interval = 0.02, 0.18) in countries with collective bargaining. However, these associations varied across employment status. More generous wage-setting policies (e.g., collective bargaining or high minimum wages) were associated with lower food insecurity among full-time workers (and, to some extent, part-time workers) but not those who were unemployed.

**Conclusions.** In countries with generous wage-setting policies, employed adults had a lower risk of food insecurity, but the risk of food insecurity for the unemployed was unchanged. Wage-setting policies may be an important intervention for addressing risks of food insecurity among low-income workers. (*Am J Public Health*. 2021;111:718–725. <https://doi.org/10.2105/AJPH.2020.306096>)

Food insecurity—"the uncertainty and insufficiency of food availability and access that are limited by resource constraints, and the worry or anxiety and hunger that may result from it"<sup>1(p49)</sup>—is a global problem, affecting the health of millions. Food-insecure adults have higher risk of depression, diabetes, and cardiovascular disease,<sup>2,3</sup> and children that have grown up in food-insecure homes have poorer health and education outcomes.<sup>4,5</sup> Food insecurity can even lead to stunting and wasting,<sup>6</sup> both of which increase the risk of mortality.<sup>7</sup> Although the last 100 years brought significant reductions in chronic food deprivation,<sup>8</sup>

improvements in these trends have now stalled,<sup>9</sup> with COVID-19 threatening to increase food insecurity globally. In this context, developing policies to address food insecurity is a key priority because "ensur[ing] healthy lives and promot[ing] well-being for all" (United Nation's Sustainable Development Goal 3) is not possible without achieving food security.<sup>10</sup>

Food insecurity is largely rooted in socioeconomic inequalities, which undermine access to food.<sup>11</sup> A recent global analysis of 134 countries illuminated this point: food insecurity was more likely in households with low incomes and where 1 household member

was unemployed.<sup>12</sup> This finding has been replicated in country-specific studies in high-income countries.<sup>13,14</sup> Importantly, however, food insecurity is also a problem among the employed. Indeed, in a global data set, over 50% of people who were food insecure were engaged in paid employment (authors' calculations using Food and Agriculture Organization data).<sup>15</sup> Workers in more precarious positions in the labor market (e.g., part-time employment) were also at heightened risk.<sup>16</sup> Employment status, length of contract, and wages may all affect food insecurity risk. It follows, then, that policies that increase wages may influence the risk of food insecurity.<sup>17,18</sup>

Wage-setting policies often include rules that govern contract negotiations between employers and employees. Wage bargaining, for example, can occur (1) directly between an employer and an employee, (2) in the context of a minimum wage, which restricts the lowest amount someone can be paid for their labor, or (3) through collective bargaining arrangements, where wages are set by unions and firms together.<sup>19</sup> Countries with collective bargaining or even high minimum wages may have lower food insecurity because these wage-setting policies tend to increase earnings compared with countries that have less generous minimum wages or that do not regulate earnings at all.<sup>20</sup> Collective bargaining arrangements could also reduce food insecurity through provision of nonincome benefits, such as employer-paid health insurance, as health care costs increase the risk of food insecurity.<sup>21</sup>

Research into the impacts of wage-setting activities on food insecurity has been scarce. Some simulation studies suggest that increasing the minimum wage would reduce food insecurity,<sup>22</sup> but there are significant gaps in our understanding of whether and how wage-setting policies affect food insecurity. It is currently unclear, for example, whether the possible benefits of wage-setting policies are concentrated among full-time workers.<sup>23</sup> Part-time workers may not fully benefit because they work fewer hours and therefore benefit less from minimum wages. People who are unemployed or who are in informal employment may not benefit at all, as they are not directly affected by wage-setting policies.<sup>22</sup>

The net effect of wage-setting policies on food insecurity may also depend on whether such policies create

unemployment or lead to more part-time working, which, in turn, may increase food insecurity. Whether minimum wages create unemployment remains a contested issue,<sup>24</sup> but it is possible that some people may lose their jobs and that some firms may increase the number of part-time workers to reduce costs.<sup>25</sup> Thus, even if increasing the minimum wage improves earnings for some, others may lose out. This could mean that food insecurity rises if the unemployed are not protected from experiencing food insecurity by other policies, such as unemployment insurance.

Finally, when considering the impacts of wage-setting policies, it is necessary to take into account the size of the informal economy<sup>26</sup>—that is, the share of the population working outside the reach of labor market regulations. Higher minimum wages, for example, may reduce the risk of food insecurity, but these reductions could be diminished if labor market informality is high because more people are not regulated by these policies.

This article makes a significant contribution to understanding the relationship between wage-setting policies and food insecurity by addressing 2 main questions. First, are wage-setting policies correlated with risk of food insecurity (research question [RQ] 1)? In particular, we tested the hypothesis that food insecurity will be lower in countries with collective bargaining and higher minimum wage policies compared with countries with little or no minimum wage policies. Second, do associations between wage-setting policies and food insecurity differ between full-time employed, part-time employed, and unemployed (RQ2)? We also explored whether associations between wage-setting policies and food insecurity were

moderated by the size of the informal economy (RQ3).

## METHODS

To answer these questions, we brought together data from multiple sources, including nationally representative individual-level surveys and cross-national indicators of wage setting policies.

## Data

We used cross-sectional data from the 2014–2017 Gallup World Poll (GWP), collected in 147 countries. In these years, the GWP included the Food and Agriculture Organization's survey instrument for measuring food insecurity, the Food Insecurity Experience Scale (FIES),<sup>15</sup> providing an experience-based measure of food insecurity. The 2014–2017 GWP was conducted by telephone in countries where telephone coverage included at least 80% of the population, and face-to-face questionnaires were used in contexts where this was not the case. The survey aims to be nationally representative at the country level of the adult population (aged 15 years and older). The FIES is used to produce a global measure of food insecurity as well as comparable country-level estimates of food insecurity around the world.<sup>12</sup> The FIES comprises 8 “yes or no” questions designed to elicit whether respondents faced difficulty or uncertainty in accessing sufficient food over the past 12 months.<sup>15</sup> We summed responses across the 8 questions (1 = yes, 0 = no) and converted the total score into 3 binary categories of food insecurity<sup>27</sup>: any indication of food insecurity ( $\geq 1$  “yes” responses), “moderate or severe” food insecurity ( $\geq 4$  “yes” responses), and “severe only” food insecurity ( $\geq 7$  “yes” responses). We examined each of these

categories separately because the influence of wage setting policies may differ in magnitude and strength of association across these indicators.<sup>13</sup>

The GWP also contains a measure of employment status, which we recoded as (1) employed full-time (reference = 0), (2) employed part-time (coded as 1), or (3) not employed (coded as 2). The data set does contain a measure of self-employment; however, it is self-reported, so it could vary in meaning across different contexts. Whether wage-setting policies affect people in self-employment may also differ by country context. These ambiguities introduce significant uncertainties in the analysis and interpretation of findings related to self-employment status, so although we include self-employment as a category of employment in our regression models, we do not discuss it in the analysis. The GWP data set also provided data on respondent age, gender, marital status, social capital, social networks, and urban versus rural location, which are all included in our models as covariates.

We merged the GWP data with country-level measures of wage-setting policy taken from UCLA's World Policy Analysis Center,<sup>28</sup> which produces a policy database constructed from the constitutional and legal provisions for workers in 193 countries. These data were collected in 2014, although policy change in this area is very stable and so very few countries would have changed between 2014 and 2017. For our analysis, we combined 2 variables contained in their database—the legislative context for wage-setting policies and the value of the minimum wage required by law—to create a new variable that had 4 nonoverlapping categories. To increase comparability across countries, we expressed the minimum wage levels as Purchasing Power Parity Dollars (PPP\$),

a currency conversion that adjusts for prices and therefore compares purchasing power. We defined the 4 categories as (1) low (< PPP\$2 per day) or no minimum wage (19 countries; examples include Singapore and Bangladesh); (2) moderate minimum wage set by law between PPP\$2 and PPP\$10 per day (58 countries; examples include Mexico and Ghana); (3) high minimum wage set by law above PPP\$10 per day (50 countries; examples include Morocco and the United States); and (4) collective bargaining, where a minimum wage is not set by law but where wage negotiations are collectively organized (12 countries; examples include Bosnia and Herzegovina and Sweden).

Finally, we merged these data with GDP per capita, adjusted for purchasing power and inflation, which we obtained from the World Bank. We also merged data on informal employment, also from the World Bank. These data provide an estimate of the proportion of the non-agricultural labor force engaged in informal employment (all jobs in unregistered or unincorporated enterprises). These data were not available for 67 countries (48%) included in our merged GWP–UCLA data set. After we merged these data sets and excluded cases with missing individual-level and country-level data, our final analytic sample comprised 492 078 individuals spanning up to 139 countries for the years 2014 to 2017 for our main analyses and 72 countries and 257 032 individuals for RQ3 (a full list of countries is included in Appendix A, available as a supplement to the online version of this article at <http://www.ajph.org>).

## Statistical Models

To evaluate the impact of wage-setting policy on food insecurity, we estimated

separate multilevel logistic regression models (with random intercepts), with standard errors clustered at the country level to account for correlations between individuals living within the same country. The outcome variables across all models were the 3 measures of food insecurity described in the Data section. The main predictor variable was the measure of wage-setting policy. The analysis proceeded in 2 steps. First, we estimated whether food insecurity was, on average, lower in countries that had implemented specific wage-setting policies (RQ1). Second, we tested for possible heterogeneity in the association between wage-setting policy and food insecurity according to employment status (RQ2). To do this, we estimated a cross-level interaction term between employment status and the type of wage-setting policy in place in that country. For each of these models, we estimated the predicted probability of being food insecure and then calculated the marginal effect of the policies (predicted at the means)—that is, the average difference in the predicted probability of being food insecure between countries that have different types of wage-setting policies.

We adjusted models for possible confounders. These included age, because earnings are correlated with age and with food insecurity (we also added an age-squared term to account for any nonlinearities). We also controlled for gender because women tend to face higher risk of food insecurity but may also be underrepresented in the labor market and therefore less affected by labor market policies.<sup>12</sup> Marital status may also be a confounder because single parents may face a higher risk of food insecurity and may also be less able to work.<sup>12</sup> People in rural areas face an elevated risk of food insecurity but may

also be less likely to work for an employer.<sup>12</sup> We also included measures of social networks (respondents' satisfaction with their opportunities to make friends) and social capital (respondents have people in their life they can count on) because earlier work suggests that these are correlated with both food insecurity and employment opportunities.<sup>12</sup> Finally, our models controlled for GDP per capita because richer countries, on average, will have less food insecurity than poorer countries and GDP may also correlate with wage-setting policies.<sup>17,18</sup> More details on all variables are provided in Appendix B (available as a supplement to the online version of this article at <http://www.ajph.org>).

We also conducted an additional analysis that add an interaction term between the proportion of people employed informally in the labor market and our measure of wage setting policy (RQ3). We did not include countries with collective bargaining in these models because none of these countries had data on labor market informality.

We explored the robustness of our findings by conducting sensitivity tests (1) excluding low-income countries (because very few low-income countries had high minimum wages or collective bargaining), retaining middle-income countries only, and then retaining high-income countries only; (2) controlling for other policies that might be correlated with food insecurity (such as family, pension, and maternity- and paternity-leave policies, as defined by the World Policy Analysis Center); and (3) conducting a matching analysis at the country level—matching on economic development, population size, the degree of democracy, and their geographical location (continent)—and thereby focusing on those parts of the

distribution where there was common support.<sup>29</sup>

## RESULTS

We begin by exploring the association between wage-setting policies and food insecurity and then turn to the question of which groups benefit most from these policies.

### Wage-Setting Policies and Food Insecurity

More generous wage-setting policies were negatively associated with the predicted probability of food insecurity across all measures (any indication, moderate or severe, and severe), even after we accounted for GDP and other control variables. In countries where there was no minimum wage or a low minimum wage, the probability of being moderately or severely food insecure was 0.31 (95% confidence interval [CI] = 0.25, 0.36; [Table 1](#)). Moderate or severe food insecurity was only slightly lower in countries with moderate minimum wage policies (0.29; 95% CI = 0.25, 0.33). The probability of moderate or severe food insecurity was 0.25 (95% CI = 0.21, 0.30) in countries with high minimum wages. Lastly, the probability of food insecurity was lower still at 0.21 (95% CI = 0.15, 0.26) in countries with collective bargaining arrangements.

Statistical tests of the difference in the probability of food insecurity, using countries with collective bargaining as the reference category, are also reported in [Table 1](#). Countries with a moderate ( $P = .016$ ) or no or low minimum wage ( $P = .029$ ) had higher moderate or severe food insecurity. However, the null hypothesis could not be rejected when we compared countries with a high minimum wage to countries with collective bargaining ( $P = .053$ ). We observed similar

results for low, moderate, or severe and severe-only measures of food insecurity ([Table 1](#)). In sum, more generous minimum wages and collective bargaining arrangements were associated with less food insecurity.

### Variation Across Employment Status

Next, we explored whether these policies benefited full-time workers more than part-time workers and the unemployed. Wage-setting policies appeared beneficial for full-time workers but not the unemployed. The predicted probability of moderate or severe food insecurity among the unemployed remained high, irrespective of wage-setting policies (see [Figure 1](#) and Appendix C, available as a supplement to the online version of this article at <http://www.ajph.org>, for full models). By contrast, among those in full-time employment, the predicted probability of moderate or severe food insecurity was higher in countries without a minimum wage policy (0.31) than it was in countries with collective bargaining (0.17), a difference of 0.14 ([Figure 1](#)). Among part-time workers, the predicted probability of food insecurity was approximately 0.32 in countries without a minimum wage policy and approximately 0.22 in countries with collective bargaining, a difference of approximately 0.092. The risk of food insecurity was lower for both groups when they lived in collective bargaining countries compared with countries with little or no minimum wage, but the reduction was greater for full-time employees (0.14) than part-time employees (0.092), suggesting that the declines in food insecurity were concentrated among full-time employees (difference,  $0.14 - 0.092 = -0.047$ ;  $P = .026$ ).

**TABLE 1— Predicted Probability of Food Insecurity by Type of Wage-Setting Policy and Difference in Predicted Probability of Food Insecurity Between Countries With Collective Bargaining and Other Wage-Setting Policies: 2014–2017**

Wage-Setting Policy	Any Indication of Food Insecurity, PP (95% CI) or No.	Moderate or Severe Food Insecurity, PP (95% CI) or No.	Severe Food Insecurity, PP (95% CI) or No.
Collective bargaining (Ref)	0.394 (0.332, 0.457)	0.208 (0.153, 0.262)	0.094 (0.060, 0.127)
High minimum wage			
Overall	0.451 (0.413, 0.489)	0.255 (0.214, 0.295)	0.124 (0.092, 0.156)
Difference between high minimum wage and reference category	0.057 (-0.002, 0.116)	0.047 (-0.001, 0.095)	0.030 (0.001, 0.060)
Moderate minimum wage			
Overall	0.489 (0.444, 0.533)	0.293 (0.252, 0.334)	0.154 (0.126, 0.182)
Difference between moderate minimum wage and reference category	0.095 (0.006, 0.183)	0.085 (0.009, 0.162)	0.060 (0.012, 0.109)
Little or no wage-setting policy			
Overall	0.493 (0.432, 0.555)	0.307 (0.249, 0.365)	0.163 (0.120, 0.206)
Difference between little or no wage-setting policy and reference category	0.099 (0.004, 0.194)	0.099 (0.018, 0.181)	0.070 (0.017, 0.122)
Countries	139	139	139
Observations	492 078	492 078	492 078

Notes. CI = confidence interval; PP = predicted probability. The estimated differences reported in the table are absolute differences in the predicted probability of food insecurity (predicted at the means), on average, between countries with collective bargaining and countries with other types of wage-setting regime. Estimates come from a multilevel logistic regression model that controls for gender, age, age squared, marital status, whether respondents live in an urban or rural area, their employment status, whether there are children in the household aged < 15 years, whether respondents are satisfied with their opportunities to make friends, whether respondents have people in their life they can count on, and GDP per capita (adjusted for purchasing power and inflation, measured on a log scale). The categories of the wage-setting policy measure are defined as follows: little or no wage-setting policy: countries with either (a) no minimum wage or (b) a very low minimum wage (< PPP\$2/day); moderate minimum wage: countries with a minimum wage set by law between PPP\$2 and PPP\$10/day; high minimum wage: countries with a minimum wage set by law above PPP\$10/day; collective bargaining: countries without a minimum wage but where wage negotiations are collectively organized.

If wage-setting policies do not reduce food insecurity among the unemployed, then any increase in unemployment attributable to the wage-setting policy would undermine the overall reduction in food insecurity brought about by the policy. Formally modeling this relationship would go beyond the scope of this article, but we have conducted a counterfactual analysis to estimate how large the rises in unemployment would need to be to offset the reductions in food insecurity achieved through increasing the minimum wage (see Appendix D, available as a supplement to the online version of this article at <http://www.ajph.org>, for more details). The models reported in Table 1 suggest that moving from a low to a high minimum wage would reduce moderate or severe food insecurity by

approximately 4 percentage points. To offset these gains, our counterfactual analysis suggests the increase in unemployment would need to be very large, more than 10 percentage points.

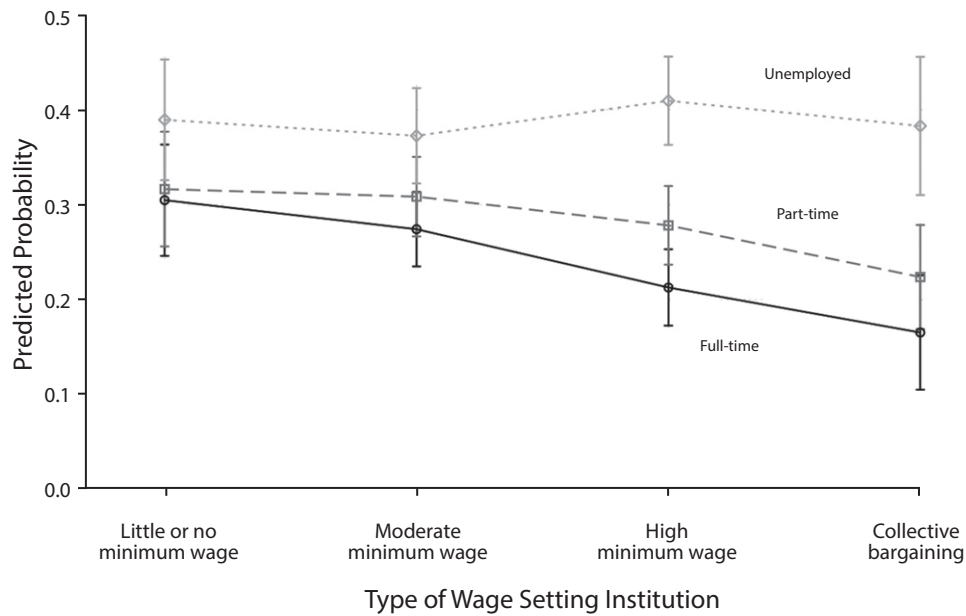
### Labor Market Informality and Food Insecurity

Finally, we explored whether the size of the informal economy moderated the impact of wage-setting policy on food insecurity. The direct association between informal labor markets and food insecurity was positive: on average, countries with larger informal economies had higher levels of food insecurity (Figure 2 and Appendix E, available as a supplement to the online version of this article at <http://www.ajph.org>). However,

as shown in Figure 2, the association between the size of the informal economy and food insecurity appeared to vary according to the kind of wage-setting policies implemented. Among countries with a high or moderate minimum wage, an increase in the proportion of informal workers was clearly associated with higher levels of food insecurity (Figure 2 and Appendix D). In countries with little or no minimum wage, the impact of the size of the informal economy on food insecurity was less clear. The association was still positive, but there was far more variation in countries' experiences.

### Sensitivity Tests

We conducted a series of sensitivity analyses. First, the findings remained



**FIGURE 1— Predicted Probability of Moderate or Severe Food Insecurity Wage-Setting Regime, by Employment Status: 2014–2017**

Note. Results reported in this figure are taken from column 2 of Appendix C, available as a supplement to the online version of this article at <http://www.ajph.org>.

consistent when we reestimated the models excluding low-income countries, including middle-income countries only, and including high-income countries only (Appendix F, available as a supplement to the online version of this article at <http://www.ajph.org>). Second, the results were unchanged after we controlled for 3 other policies that could be associated with wage-setting policies (Appendix G, available as a supplement to the online version of this article at <http://www.ajph.org>). Third, the results from the matching analysis were consistent with the findings reported in Table 1 (Appendix H, available as a supplement to the online version of this article at <http://www.ajph.org>).

## DISCUSSION

This article explored whether wage-setting policies were associated with lower risks of food insecurity. Generous minimum wages and collective

bargaining were associated with lower levels of food insecurity. To illustrate our

findings, consider Costa Rica and Panama. Both are Latin American countries



**FIGURE 2— Change in Predicted Probability of Moderate or Severe Food Insecurity Associated With 1 Percentage Point Increase in the Size of the Informal Labor Market, by Wage-Setting Policy: 2014–2017**

Note. Results come from the model estimated in Table 1, with 2 changes. First, we added a measure of the size of the informal labor market and, second, we added an interaction term between this measure of labor market informality and wage-setting policy. Data on labor market informality come from the World Bank.



with approximately the same GDP per capita and population size. Costa Rica, however, has a high minimum wage (over PPP\$10 per day, albeit with some exceptions) whereas Panama has only a moderate minimum wage (somewhere between PPP\$4.01 and PPP\$10.00 per day). Panama also has a much higher level of moderate and severe food insecurity (~30%) than Costa Rica (~18%), suggesting that if Panama increased its minimum wage, food insecurity might be reduced.

These findings add to the growing literature highlighting the health effects of minimum wages and other wage-setting policies,<sup>30</sup> but they also reinforce earlier work highlighting how adults in precarious work face greater risks of food insecurity.<sup>31</sup> Our results not only support these earlier findings, but they also suggest a policy remedy: when countries establish wage-setting policies that seek to ensure financial security for low-income households, the risk of food insecurity appears to be lower.

Importantly, however, our results also suggest that wage-setting policies do not benefit everyone to the same degree. The unemployed and those in the informal economy appear to benefit less from these policies. Part-time workers experienced lower risk of food insecurity, but full-time employees experienced even lower risks, most likely because they worked more hours. When viewed together, these differences between full-time and part-time workers reinforce other research revealing how labor market segmentation can have consequences for poverty and, by implication, health.<sup>23,32</sup>

Labor market segmentation between full-time workers, part-time workers, and the unemployed may be especially important in countries where there are fears that raising the minimum wage will increase unemployment or labor market informality. These risks must be put into

perspective, however. Our models suggested that any increase in unemployment attributable to a higher minimum wage would need to be very large to offset the reductions in food insecurity (Appendix D). Such large rises in unemployment are unlikely because the impact of minimum wages on unemployment are very often negligible,<sup>24</sup> even in developing countries.<sup>33</sup> Thus, although pursuing higher minimum wages could create winners and losers in some contexts, it is very likely to lead to a net reduction in food insecurity. Of course, even in these contexts, it would be important to complement policies that increase wages with greater financial protection for the unemployed, which can also lower the risks of food insecurity.<sup>11,34</sup>

## Limitations

There are a number of limitations to our analysis. First, although our data covered an unprecedentedly large number of countries, our measure of wage-setting policies did not vary over time, precluding any examination of how changes to wage-setting policy affect food insecurity. Although the matching analysis partially addressed this issue, in the absence of such changes, it is difficult to draw strong causal conclusions about the association between wage-setting policies and food insecurity. Second, the data did not follow the same individuals over time, so we were unable to test what happens to risk of food insecurity when people move into or out of employment under these different policy regimes. Future work will need to examine these issues in more detail.

## Public Health Implications

Food insecurity is a major health problem that affects educational outcomes,

depression, cardiovascular disease, and even mortality.<sup>4,5</sup> These findings are important because they suggest that food insecurity and, in turn, these health outcomes, may be reduced by the implementation of collective bargaining or high minimum wages. However, the reverse may also be true—namely, that moving away from collective bargaining and higher minimum wages may lead to increasing food insecurity. Indeed, a number of countries have seen major reconfigurations of their wage-setting policies in recent decades. There has been a steady erosion of coverage by collective bargaining in Germany, the United Kingdom, and the United States.<sup>19</sup> At the same time, minimum wages have frequently become less generous in real terms. This analysis suggests that public health actors have a role to play in working with other agencies (including government departments) involved in setting labor market protections and wage policies. The retrenchment of wage-setting policies not only exacerbates in-work poverty but, as this analysis suggests, may leave families facing insufficient food supplies and, in the worst cases, without enough to eat.<sup>35</sup> **AJPH**

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## CONTRIBUTORS

A. Reeves and R. Loopstra designed the analysis. A. Reeves conducted the analysis and wrote the first draft of the article. R. Loopstra and V. Tarasuk helped interpret the results and helped write the article.

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## CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

## HUMAN PARTICIPANT PROTECTION

Human participant protection was not required because this study used publicly available, de-identified data.

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