

Original Contribution

The Great Recession and the Health of Young Children: A Fixed-Effects Analysis in Ireland

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Economic recessions have been linked to adult health, but few studies have examined how recessions influence the health of young children. This study examined the impact of life transitions linked to the recent financial crisis on the health of young children in Ireland. Data came from the Growing Up in Ireland Infant Cohort Study ($n = 11,134$), which assessed children before (2008), during (2011), and after (2013) the Great Recession that followed the financial crisis of 2008 and incorporated questions on the impacts of the financial crisis on families. Using fixed-effects models to control for confounding, we found that a reduction in welfare benefits during the recession was associated with a significant increase in the risks of asthma ($\beta = 0.014$, 95% confidence interval (95% CI): 0.004, 0.023) and atopy ($\beta = 0.014$, 95% CI: 0.001, 0.027). While parental job loss was not associated with child health, a reduction in working hours was associated with increased reports of child health problems ($\beta = 0.024$, 95% CI: 0.004, 0.043), as were difficulties affording basic necessities ($\beta = 0.019$, 95% CI: 0.001, 0.038). Results suggest that failing to protect vulnerable families and children during economic recessions may have long-lasting implications for child health.

child development; child health; economic recessions; Ireland; social welfare

Abbreviations: CI, confidence interval; GUI, Growing Up in Ireland Infant Cohort Study.

Growing evidence suggests that a child's environment during the early years of life is a critical determinant of future health and developmental outcomes (1, 2). The first 5 years of life represent a particularly sensitive period, where dramatic changes in the family situation may have long-lasting consequences for health (3–5). Poor health during early childhood is strongly associated with lifelong health, education, and socioeconomic trajectories (6), and it has been linked to the origin of health inequalities in later life (7).

While much research has examined the impact of economic downturns on adults (8, 9), few studies have assessed how recessions influence the health of young children. The 2008 financial crisis had a dramatic impact on Irish families (10); the unemployment rate nearly doubled from 2008 to 2009, peaking at 15% in 2011 (11, 12). The recession led to large reductions in wages and employment, and in 2010 and 2011, it resulted in substantial cuts in welfare payments for families (13). Economic downturns have previously been linked to negative changes in the home environment, such as increases in family stress (14), which may have implications for child health. For example, exposure to stress during

sensitive periods of development may program the immune cells responsible for inflammation responses through multiple mechanisms, including epigenetic markings, posttranslational modifications, and tissue remodeling (5, 15). This biological embedding of stress may induce a chronic proinflammatory state—which, along with physical exposures such as exposure to allergens, can lead to negative child health outcomes such as asthma and atopy, which are generally viewed as inflammatory conditions (5, 16, 17).

Most studies on the impact of the Great Recession on child health have been based on repeated cross-sectional analyses or aggregate statistics (18). In this study, we used longitudinal data from a cohort study that collected detailed information on how the recession impacted families. We examined whether different household-level transitions in employment, income, welfare benefits, and material circumstances due to the recession had potentially different effects on asthma, atopy symptoms, and parents' reports of children's general health status, as well as on maternal health behaviors that are potentially associated with child health. We hypothesized that the recession may have affected general health status, asthma, and atopy in children due to the

sensitivity of these conditions to stress and poor living environments (16, 19–21).

METHODS

Study sample

We used data from 3 waves of the Growing Up in Ireland Infant Cohort Study (GUI). The cohort is comprised of 11,134 children born between December 2007 and June 2008 who were randomly selected from Ireland's Child Benefit Register (22). The infant cohort represented 14.8% of all births that occurred in Ireland in 2008, and it was close to a pure equal-probability-of-selection method sample (22). Baseline assessments and interviews with mothers were conducted in 2008–2009 when infants were 9 months of age. The second wave of data was collected in 2011, and the third wave was collected in 2013, which provided us with 1 assessment prior to the onset of the recession in Ireland and 2 assessments after the recession's onset (Figure 1).

Figure 2 outlines the selection of the study sample and exclusions. The analytical sample included households that participated in all 3 waves of GUI and always had the mother as the main respondent. We excluded households in which the main respondent changed, in order to avoid bias in reporting of children's and mothers' outcomes. This yielded a sample of 8,468 children and their mothers who were followed from wave 1 to wave 3.

Measures of recession impact

The second and third waves of the GUI asked mothers to rate the extent to which the recession had had an impact on

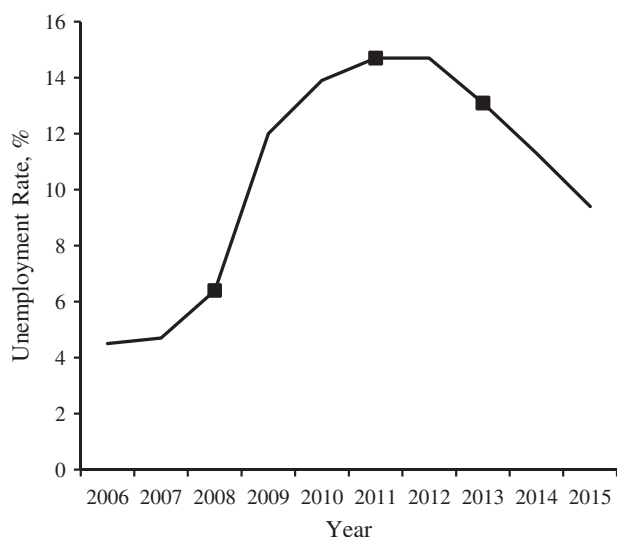


Figure 1. Annual unemployment rate among the active population during the Great Recession that followed the financial crisis of 2008, Ireland, 2006–2015. Black squares represent waves 1, 2, and 3 of data collection in the Growing Up in Ireland Infant Cohort Study (2008–2013), which fell prior to (2008), during (2011), and after (2013) the Great Recession. The large increase in the annual unemployment rate after 2008 serves as an indicator of the Great Recession in Ireland. Data were obtained from Eurostat in 2016 (50).

their household, on a 4-point scale (“no effect,” “small effect,” “significant effect,” or “very significant effect”). Mothers who reported at least a small effect were asked more detailed questions about how the recession had affected their household. Possible responses were 1) mother's job loss, 2) spouse/partner's job loss, 3) a reduction in working hours for either partner, 4) a reduction in wages for either partner, 5) a reduction in social welfare benefits, 6) the household falling behind on rent or mortgage payments, 7) the household falling behind on utility bills, and 8) the household being unable to afford or having to cut back on basic necessities, such as food and clothing. Responses were coded as binary variables that took the value 1 if the household reported experiencing the effect and 0 otherwise. We expected that experiencing any of these changes might be associated with both immediate and longer-term changes in child health. To account for this, if mothers reported an exposure to a recession impact (e.g., father's job loss) in the second wave of the study, the value of that exposure was carried forward to the third wave. Thus, the measures of recession impacts retained the values they held at the time at which they were first experienced for the remainder of the observation period. This is consistent with the approach used in previous studies of recession impacts on adults (23, 24). Models that updated information on recession exposure at every wave of the study yielded results similar to those of the main specification (see Web Table 1 (available at <https://academic.oup.com/aje>) for children and Web Table 2 for mothers).

Child health outcomes

Child health outcomes were based on mothers' reports of whether the child had asthma, atopy symptoms (asthma and/or eczema), or any health problems. These outcomes were chosen on the basis of data availability and their susceptibility to rapid changes in a child's environment (25, 26). For asthma and eczema, mothers were asked, “Has a medical professional ever told you that [*baby*] has any of the following conditions?” at baseline. In follow-up waves, mothers were first asked, “What long-standing illness, condition, or disability does [*child*] have?”, followed by “Has this illness, condition, or disability been diagnosed by a medical professional?” We relied on the mother's reports of child illness rather than the mother's reports of diagnoses for constructing the asthma and atopy indicators for waves 2 and 3 because information about diagnoses was not included in the publicly available wave 3 data set. However, most mothers who reported that a child had an illness at wave 2 also reported that the illness had been diagnosed by a medical professional (asthma: 92.2%; eczema: 93.2%). Additionally, due to differences in the wording of the questionnaire between baseline and subsequent waves, we did not include allergic rhinitis in the atopy indicator.

Based on the mother's response to the question “In general, how would you describe [*child's*] current health?”, we constructed an indicator of having any health problems that took the value 1 if the child was categorized as being “healthy but a few minor problems” or “sometimes or almost always unwell” and took the value 0 if the child was categorized as “very healthy, no problems.” Comparisons of health problems among the 3 original categories indicated that while children rated “sometimes/almost always unwell” were clearly in the poorest

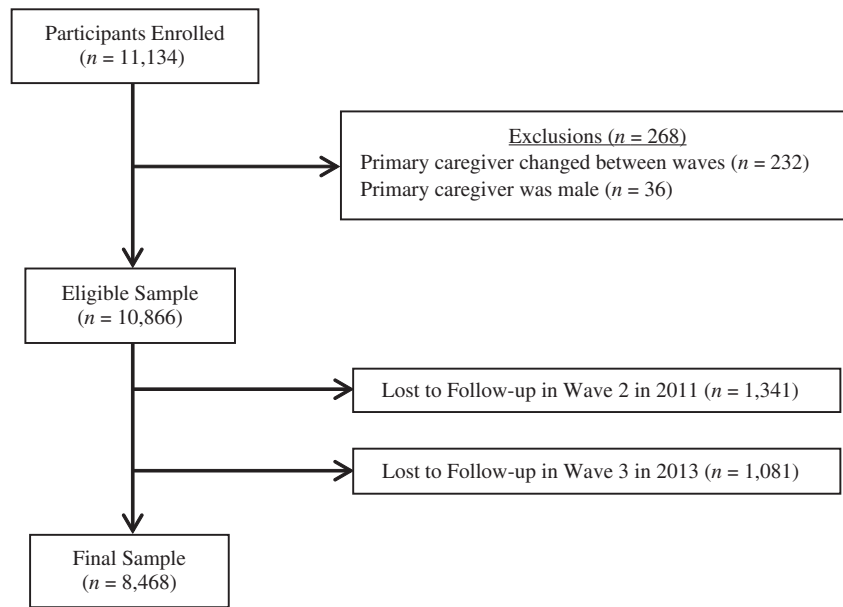


Figure 2. Follow-up from wave 1 (2008) through wave 3 (2013) of the Growing Up in Ireland Infant Cohort Study and exclusion criteria used to select the analytical sample, 2008–2013.

health, children who were categorized as “healthy but a few minor problems” also had much higher rates of health conditions, hospitalizations, and bouts of illness than those categorized as “very healthy, no problems” (Web Figure 1, Web Table 3). All outcomes were constructed as binary variables that took the value 1 if the child or mother had the outcome and 0 otherwise.

Maternal health outcomes

We assessed maternal health outcomes that may have reflected changes in the family environment and affected the health of their children. Health behaviors evaluated included mothers’ reports of current smoking (daily or occasional smoker) and alcohol consumption (≥ 5 units/week; 1 unit of alcohol = 1 pint of beer, 1 glass of wine, or 1 measure of spirits). Our alcohol drinking indicator was restricted to consumption of 5 or more units, as the publicly available data set did not provide raw data for alcohol units. The third outcome indicated whether the mother was overweight or obese based on World Health Organization cutpoints for body mass index (27), which was derived from GUI interviewer measurements of the mother’s height and weight (22).

Control variables

We controlled for the following time-varying characteristics: study wave, household region (urban/rural), maternal age (16–17, 18–29, 30–39, or ≥ 40 years), mother’s marital status (married and cohabiting; married but separated; divorced or widowed; never married), and each parent’s highest educational level (primary, secondary, postsecondary nontertiary, or tertiary). For mother’s health models, we controlled for the number of children under age 18 years living in the household (1 or ≥ 2). In separate analyses, we also controlled for equalized household

income (in quintiles) and each parent’s employment status (employed, unemployed, or out of the labor force). For both father’s highest educational level and employment status, there were 2 additional categories for denoting households without a secondary caregiver and households in which the secondary caregiver did not complete a survey. In random-effect models, we also controlled for mother’s ethnicity (Irish; other white; African or black; Chinese or Asian; other or mixed), household occupational class, classified according to the highest class of the coresident parents (professional and managerial; nonmanual and skilled manual; semiskilled and unskilled manual; other/unknown; no social class/never employed), child’s sex, whether the child had ever been breastfed, number of pregnancy complications the mother had experienced (0, 1, 2, 3, or ≥ 4), and whether the child had low birth weight (defined as $< 2,499$ g).

Statistical analysis

Hausman specification tests (28) rejected the null hypothesis that random-effect models were consistent, relative to fixed-effects models (see Web Tables 4 and 5 for children and Web Tables 6 and 7 for mothers). Therefore, we used linear probability fixed-effect regression models to examine whether changes in socioeconomic circumstances due to the recession were associated with changes in individual health outcomes (29, 30). Fixed-effects models control for time-invariant variables that may be correlated with both exposure and outcome. They effectively compare the same individual’s health before and after an exposure (i.e., exposure to the recession), thus using each individual as his or her own control. We used fixed-effect rather than first-difference models, as fixed-effect models are more efficient when there are more than 2 waves of data (31); however, first-difference models yielded very similar results

(Web Table 8). We used linear probability models instead of fixed-effects logistic models because the latter only examine changes among persons who reported the outcome (29). However, models using logistic regression yielded similar results, and those results are presented in the Web material (Web Table 9 for children, Web Table 10 for mothers). Our main model specification was as follows:

$$\text{Health}_{it} = \mu_t + \beta_1 \text{Recession}_{it} + \beta_2 x_{it} + \alpha_i + \varepsilon_{it},$$

where Health_{it} is the health outcome for individual i at time t , Recession_{it} represents a vector of changes in the economic circumstances of families linked to the recession (i.e., mother's job loss), x_{it} captures a vector of control variables, and ε_{it} is the error term. μ_t controls for effects of time that are constant across individuals, and α_i controls for individual time-invariant characteristics. We first present results from analyses that did not control for quintile of equivalized household income or the parents' employment statuses, as these variables may partly capture recession impacts on the household or they may be mediators of the relationship between changes in household circumstances due to the recession and children's health. In a separate model, we show estimates that control for both equivalized household income quintiles and parents' employment statuses. In sensitivity analyses, the models also adjusted for child health outcomes for mother's self-rated health (Web Table 11). All analyses were conducted in Stata, version 14 (StataCorp LP, College Station, Texas) (32).

RESULTS

The recession in Ireland had sizeable impacts on families: 61.1% of mothers reported experiencing a significant or very significant effect of the recession in 2011, and this increased to 65.1% in 2013 (Table 1). Table 2 shows that the recession had the largest impact on disadvantaged families, disproportionately affecting parents who had lower income, education, and occupational grade prior to the recession. The most common forms of economic hardship families suffered by 2011 as a result of the recession were a reduction in wages (62.2%), a reduction in social welfare benefits (48.1%), and difficulty affording basic necessities (28.5%) (Table 1). By 2013, these percentages increased for all forms of economic hardship, with larger increases for social welfare benefit reduction (59.9%) and difficulty affording basics (38.2%). Children and mothers from households that reported a very significant effect of the recession were also more likely to be in poor health prior to the recession.

Figure 3 shows changes in health outcomes before, during, and after the onset of different measures of economic hardship as a result of the recession, derived from fixed-effect models. Figure 3 suggests that, except for wage reduction, the onset of all measures of economic hardship was associated with an increase in the probability that mothers reported any child health problems, an effect that persisted until the next wave for most measures. Mother's job loss, welfare reduction, being behind on housing or utility bill payments, and difficulty affording basics were also associated with a sustained increase in the probability of asthma and atopy symptoms.

Table 1. Percentage of the Study Sample Reporting an Impact of the Great Recession on the Household, Growing Up in Ireland Infant Cohort Study ($n = 8,468$), 2011 and 2013

Extent of Recession Effects on the Household	% of Sample	
	2011	2013
Overall recession effect on household ^a		
No effect	6.4	6.5
Small effect	32.5	28.4
Significant effect	38.1	40.0
Very significant effect	23.0	25.1
Specific effects of the recession		
Mother's job loss	10.6	11.3
Father's job loss	18.8	20.1
Reduction in working hours ^b	21.7	26.6
Reduction in wages ^b	62.2	65.7
Reduction in social welfare benefits	48.1	59.9
Falling behind on rent/mortgage	7.2	11.7
Falling behind on utility bills	11.6	14.6
Inability to afford basic necessities	28.5	38.2
Total no. of recession effects reported ^c		
0	9.8	10.0
1	28.3	19.4
2	28.8	26.1
3	17.8	19.9
4	9.4	13.1
5	4.1	6.4
6	1.4	3.2
7	0.3	1.4
8	0.1	0.3

^a At study wave 2 in 2011 and study wave 3 in 2013, mothers were asked to rate the extent to which the recession had had an impact on their family, using a 4-point scale: "no effect on the family," "small effect on the family," "significant effect on the family," or "very significant effect on the family."

^b For either partner.

^c Values were missing for 2 respondents in 2013.

Results from child fixed-effect models are shown in Table 3. In models that controlled separately for each change in family economic circumstances, a reduction in working hours, a reduction in welfare benefits, being behind on rent or mortgage payments, being behind on utility bills, and difficulty affording basics predicted an increase in reports of child health problems, asthma, and atopy symptoms. In models that simultaneously controlled for all changes in family economic circumstances, a reduction in working hours ($\beta = 0.024$, 95% confidence interval (CI): 0.004, 0.043) and difficulty affording basics ($\beta = 0.019$, 95% CI: 0.001, 0.038) were both associated with an increased risk of reporting fair/poor child health, while a reduction in welfare benefits was associated with an increased risk of reporting asthma ($\beta = 0.014$, 95% CI: 0.004, 0.023) and atopy symptoms ($\beta = 0.014$, 95% CI: 0.001, 0.027). Model 3 in Table 3 additionally controlled for quintile of equivalized household income and

Table 2. Baseline Characteristics of Participant Families ($n = 8,468$) According to the Extent of the Great Recession's Effect on the Family in 2011, Growing Up in Ireland Infant Cohort Study, 2008

Baseline Characteristic	No. of Persons	Extent of Recession's Effect on Household in 2011 ^{a, %^b}			
		No Effect	Small Effect	Significant Effect	Very Significant Effect
No. of children in household					
1	3,175	7.6	34.9	37.3	20.2
≥2	5,293	5.6	31.0	38.6	24.7
Quintile of equivalized household income					
1 (lowest)	1,501	5.4	27.3	35.2	31.8
2	1,413	6.2	26.6	39.0	28.2
3	1,543	5.5	30.8	39.5	24.1
4	1,795	5.0	35.8	40.3	18.9
5 (highest)	1,615	9.8	40.7	36.7	12.8
Missing data	601	6.2	31.0	36.8	26.1
Household's occupational class					
Professional/managerial	4,385	7.0	36.6	39.5	16.9
Nonmanual/skilled manual	2,514	5.3	27.9	37.8	29.0
Semiskilled/unskilled manual	729	6.7	30.0	33.3	29.6
Other/unknown	38	10.5	36.8	26.3	26.3
No social class/never employed	802	5.6	26.2	36.4	31.8
Household's region					
Urban	3,615	6.7	33.1	37.9	22.3
Rural	4,821	6.1	31.9	38.3	23.6
Missing data	32	6.3	37.5	34.4	21.9
Mother's ethnicity					
Irish	6,985	5.7	33.1	38.6	22.6
Other white	992	9.7	32.4	35.1	22.5
African or black	242	6.6	19.0	36.0	38.4
Chinese or Asian	189	6.9	29.1	41.8	22.2
Other or mixed	36	27.8	27.8	22.2	22.2
Missing data	24	20.8	29.2	25.0	25.0
Mother's age range, years					
16–29	2,475	6.5	31.4	35.6	26.4
30–39	5,405	6.1	33.2	39.4	21.3
≥40	588	8.2	30.1	36.7	25.0
Mother's educational level					
Primary	876	5.4	26.6	33.1	34.8
Secondary	1,546	5.7	31.4	36.9	26.1
Postsecondary nontertiary	2,868	5.8	30.2	39.7	24.3
Tertiary	3,174	7.5	36.7	38.6	17.2
Missing data	4	0.0	0.0	50.0	50.0
Mother's employment status					
Employed	5,051	6.4	34.2	39.0	20.3
Unemployed	255	4.7	30.2	32.9	32.2
Out of labor force	3,158	6.3	29.9	37.1	26.6
Missing data	4	50.0	25.0	0.0	25.0

Table continues

Table 2. Continued

Baseline Characteristic	No. of Persons	Extent of Recession's Effect on Household in 2011 ^a , % ^b			
		No Effect	Small Effect	Significant Effect	Very Significant Effect
Mother's marital status					
Married and living together	5,915	6.5	33.7	38.8	20.9
Married and separated	135	4.4	24.4	37.8	33.3
Divorced or widowed	102	7.8	34.3	29.4	28.4
Never married	2,240	5.7	29.7	37.1	27.5
Missing data	76	11.8	29.0	29.0	30.3
Father's educational level					
Primary	1,082	4.7	26.8	36.7	31.8
Secondary	1,194	5.3	31.3	37.4	26.0
Postsecondary nontertiary	2,232	6.9	31.7	39.9	21.4
Tertiary	2,259	7.5	39.0	37.8	15.7
No father survey completed	815	6.8	28.7	38.9	25.5
Single-mother household	878	5.4	29.4	36.6	28.7
Missing data	8	0.0	50.0	0.0	50.0
Father's employment status					
Employed	6,070	6.5	34.8	38.5	20.1
Unemployed	508	5.3	19.5	35.2	40.0
Out of labor force	190	6.3	22.1	37.4	34.2
No father survey completed	815	6.8	28.7	38.9	25.5
Single-mother household	878	5.4	29.4	36.6	28.7
Missing data	7	0.0	0.0	42.9	57.1
Child's health status					
No health problems	7,009	6.4	33.0	37.6	23.0
Any health problems	1,431	5.9	29.9	40.7	23.4
Missing data	28	14.3	28.6	32.1	25.0
Asthma in child					
No	8,133	6.4	32.6	38.0	22.9
Yes	335	4.5	27.8	41.8	26.0
Atopy symptoms in child					
None	7,143	6.4	32.6	38.2	22.8
Any	1,325	6.1	31.2	37.7	25.1
Mother's smoking status					
Nonsmoker	6,549	6.8	33.8	38.6	20.8
Current smoker	1,918	4.8	27.8	36.6	30.7
Mother's alcohol consumption, units ^c /week					
<5	7,340	6.5	32.5	38.1	22.9
≥5	1,128	5.3	32.1	38.5	24.1
Mother's overweight/obesity status ^d					
Not overweight/obese	4,345	7.0	34.7	37.6	20.7
Overweight/obese	3,739	5.9	30.4	38.5	25.2
Missing data	384	4.2	27.1	40.6	28.1

^a At study wave 2 in 2011, mothers were asked to rate the extent to which the recession had had an impact on their family, using a 4-point scale: "no effect on the family," "small effect on the family," "significant effect on the family," or "very significant effect on the family."

^b Row percentages are shown. Percentages may not total 100 because of missing data.

^c 1 unit of alcohol = 1 pint of beer, 1 glass of wine, or 1 measure of spirits.

^d Based on World Health Organization cutpoints for body mass index (weight (kg)/height (m)²) (27). Overweight was defined as body mass index ≥25; obesity was defined as body mass index ≥30.

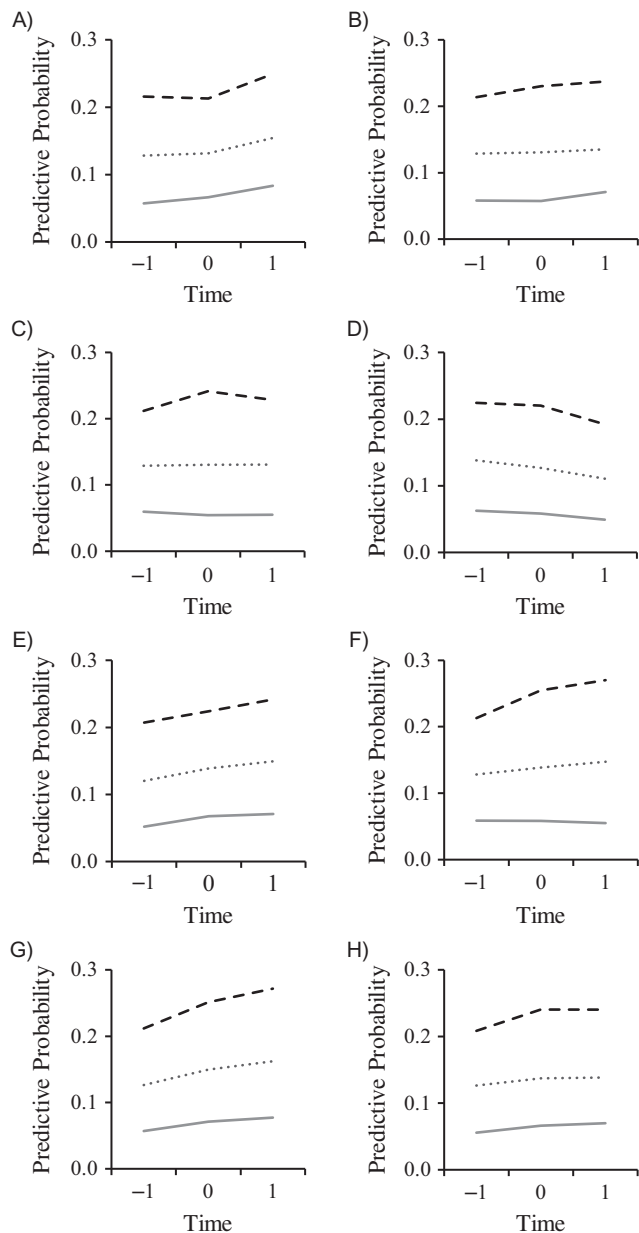


Figure 3. Predictive probability of any reported child health problems (black dashed lines), atopy (gray dotted lines), and asthma (gray solid lines) in study waves falling before (2008; point -1), during (2011; point 0), and after (2013; point 1) exposure to economic hardship during the Great Recession that followed the financial crisis of 2008, Growing Up in Ireland Infant Cohort Study, 2008–2013. A) Mother's job loss; B) father's job loss; C) reduction in working hours (either partner); D) reduction in wages (either partner); E) reduction in welfare benefits; F) falling behind on rent or mortgage payments; G) falling behind on utility bills; H) being unable to afford basic necessities. Predictive probability was derived from fixed-effects models that used treatment variables coded to designate the time of onset and 1 wave after onset, with each change in family economic circumstances being analyzed in a separate model. All models controlled for study wave, mother's age, mother's marital status, mother's educational level, father's educational level, and household region.

parents' employment statuses. Adjusting for these variables led to relatively small changes in coefficients; overall, these models confirmed that reductions in welfare, being behind on utility bills, and inability to afford basic necessities were the most prominent factors in explaining the impact of the recession on health.

Sensitivity analyses revealed similar results from logistic regression models (Web Table 9) and models that controlled for mother's self-rated health (Web Table 11). In particular, associations between welfare reduction and asthma and atopy were maintained in all models.

Table 4 shows results from fixed-effect models for 3 indicators of maternal health behaviors hypothesized to contribute to child health. There was a reduction in the prevalence of smoking among mothers whose partner experienced job loss and among mothers who reported being unable to afford basics; however, these associations did not meet the significance threshold of $P < 0.05$ in fully adjusted models. A reduction in wages predicted an increase in the probability of mothers' consuming 5 or more units of alcohol per week ($\beta = 0.020$, 95% CI: 0.006, 0.033) and an increase in mothers' being overweight or obese ($\beta = 0.019$, 95% CI: 0.004, 0.034). By contrast, a spouse's job loss and being behind on utility bills were associated with a decrease in the probability of consuming 5 or more units of alcohol per week, but in fully adjusted models the association was maintained only for spouse's job loss ($\beta = -0.025$, 95% CI: -0.041 , -0.009). A reduction in working hours was also associated with an increased risk of being overweight or obese, but this association did not meet the significance threshold of $P < 0.05$ in fully adjusted models.

DISCUSSION

To our knowledge, this is the first longitudinal study to have examined the impact of the recent financial crisis on the health of young children in Ireland, a country that was strongly hit by the recession. Our findings suggest that the recession negatively impacted the health of children, particularly those who were socioeconomically vulnerable, during this sensitive period of development. Reductions in welfare benefits linked to the recession were consistent predictors of increased risk of asthma and atopy symptoms.

Our findings are in line with previous studies suggesting that socioeconomic circumstances in early childhood are associated with child health outcomes (33), including asthma and atopy (34, 35). Our results support previous findings that cuts in social welfare benefits have negative implications for health (36). Results also suggest that existing inequalities in child health in Ireland (37) may have been exacerbated by the recession, particularly as the number of children living in consistent poverty increased and child benefit welfare payments decreased between 2008 and 2013 (38, 39).

There are several mechanisms through which recession-induced economic hardships and welfare benefit reductions may have led to poorer health outcomes for children. First, household financial stress may lead to a home environment that is less conducive to healthy childhood development. For instance, reductions in working hours may lead to parents' working nonstandard or inflexible hours, as well as increased perceptions of job insecurity, all of which have been linked to

Table 3. Associations Between Changes in Family Economic Circumstances due to the Great Recession and Reported Child Health Problems (Fixed-Effect Models), Growing Up in Ireland Infant Cohort Study, 2008–2013

Outcome and Recession Effect ^a	Model 1 ^{b,c}			Model 2 ^{c,d}			Model 3 ^{c,d}		
	β	95% CI	P Value ^e	β	95% CI	P Value ^e	β	95% CI	P Value ^e
Any health problems									
Mother's job loss	0.007	-0.018, 0.032		-0.002	-0.027, 0.024		0.005	-0.022, 0.033	
Father's job loss	0.019	-0.002, 0.039		0.006	-0.015, 0.027		0.005	-0.018, 0.027	
Reduction in working hours	0.027	0.008, 0.046	<0.01	0.024	0.004, 0.043	<0.05	0.020	-0.000, 0.040	
Reduction in wages	-0.005	-0.024, 0.013		-0.008	-0.027, 0.011		-0.008	-0.028, 0.012	
Reduction in welfare benefits	0.017	0.000, 0.034	<0.05	0.008	-0.009, 0.025		0.009	-0.009, 0.027	
Falling behind on housing bills ^f	0.046	0.018, 0.073	<0.01	0.023	-0.006, 0.053		0.023	-0.009, 0.054	
Falling behind on utility bills	0.044	0.011, 0.069	<0.001	0.025	-0.002, 0.052		0.029	0.001, 0.057	<0.05
Inability to afford basic necessities ^g	0.032	0.015, 0.049	<0.001	0.019	0.001, 0.038	<0.05	0.024	0.005, 0.044	<0.05
Asthma									
Mother's job loss	0.014	-0.001, 0.028		0.013	-0.002, 0.027		0.019	0.003, 0.035	<0.05
Father's job loss	0.003	-0.009, 0.015		0.000	-0.012, 0.013		0.003	-0.010, 0.017	
Reduction in working hours	-0.005	-0.016, 0.005		-0.007	-0.018, 0.004		-0.009	-0.021, 0.002	
Reduction in wages	-0.004	-0.015, 0.006		-0.003	-0.013, 0.008		-0.002	-0.013, 0.010	
Reduction in welfare benefits	0.016	0.007, 0.025	<0.001	0.014	0.004, 0.023	<0.01	0.013	0.003, 0.023	<0.01
Falling behind on housing bills	-0.001	-0.017, 0.016		-0.011	-0.029, 0.007		-0.007	-0.026, 0.012	
Falling behind on utility bills	0.016	0.000, 0.031	<0.01	0.014	-0.003, 0.030		0.010	-0.008, 0.027	
Inability to afford basic necessities	0.011	0.001, 0.021	<0.01	0.007	-0.004, 0.018		0.009	-0.003, 0.020	
Any atopy symptoms ^h									
Mother's job loss	0.008	-0.012, 0.028		0.006	-0.014, 0.026		0.011	-0.011, 0.032	
Father's job loss	0.002	-0.016, 0.019		-0.003	-0.020, 0.015		-0.003	-0.022, 0.015	
Reduction in working hours	-0.007	-0.022, 0.007		-0.007	-0.022, 0.008		-0.007	-0.022, 0.009	
Reduction in wages	-0.016	-0.030, -0.001	<0.05	-0.013	-0.028, 0.002		-0.012	-0.027, 0.003	
Reduction in welfare benefits	0.016	0.003, 0.029	<0.05	0.014	0.001, 0.027	<0.05	0.015	0.002, 0.029	<0.05
Falling behind on housing bills	0.008	-0.014, 0.029		-0.006	-0.029, 0.017		-0.000	-0.024, 0.024	
Falling behind on utility bills	0.026	0.007, 0.046	<0.01	0.023	0.001, 0.044	<0.05	0.017	-0.005, 0.039	
Inability to afford basic necessities	0.013	-0.001, 0.027		0.007	-0.007, 0.022		0.009	-0.007, 0.024	

Abbreviation: CI, confidence interval.

^a The reference category for each recession effect was no change in that variable.

^b Model 1: Each recession effect was analyzed in a separate model.

^c All models controlled for study wave, mother's age, mother's marital status, parents' educational levels, and household region. Model 3 additionally controlled for quintile of equalized household income and parents' employment statuses.

^d Models 2 and 3: All recession effects were included in a single model.

^e 2-sided *P* value.

^f Rent/mortgage.

^g Food, clothing, etc.

^h Atopy symptoms included asthma and eczema.

worse child developmental outcomes (40). Reductions in welfare benefits may also contribute to income instability, which has been linked to negative child developmental outcomes (41). Difficulties affording housing payments, utility bills, and basic necessities such as food and clothing are indicators of material deprivation or vulnerability to poverty, which have long been linked to poor child development and later life outcomes (1, 42).

Previous research has documented how household financial hardship in the context of economic downturns is associated with increases in parents' psychological stress, parental relationship strain, child maltreatment, and harsh parenting, as well as with decreases in warm, nurturing, and supportive parent-child interactions (14, 43, 44). These experiences of family stress may directly and indirectly increase children's

Table 4. Associations Between Changes in Family Economic Circumstances due to the Great Recession and Mothers' Health Behaviors (Fixed-Effect Models), Growing Up in Ireland Infant Cohort Study, 2008–2013

Outcome and Recession Effect ^a	Model 1 ^{b,c}			Model 2 ^{c,d}			Model 3 ^{c,d}		
	β	95% CI	P Value ^e	β	95% CI	P Value ^e	β	95% CI	P Value ^e
Current smoker									
Mother's job loss	-0.006	-0.023, 0.011		-0.002	-0.020, 0.015		0.003	-0.016, 0.022	
Father's job loss	-0.017	-0.032, -0.002	<0.05	-0.013	-0.028, 0.002		-0.015	-0.031, 0.001	
Reduction in working hours	-0.012	-0.025, 0.001		-0.012	-0.025, 0.002		-0.012	-0.026, 0.002	
Reduction in wages	0.007	-0.005, 0.019		0.010	-0.003, 0.023		0.010	-0.004, 0.023	
Reduction in welfare benefits	0.004	-0.007, 0.015		0.008	-0.003, 0.020		0.009	-0.003, 0.021	
Falling behind on housing bills ^f	-0.016	-0.036, 0.005		-0.012	-0.033, 0.010		-0.014	-0.037, 0.009	
Falling behind on utility bills	-0.004	-0.021, 0.013		0.006	-0.013, 0.024		0.007	-0.012, 0.027	
Inability to afford basic necessities ^g	-0.014	-0.025, -0.002	<0.05	-0.012	-0.025, 0.000		-0.011	-0.024, 0.003	
Alcohol consumption ^h									
Mother's job loss	0.006	-0.012, 0.024		0.011	-0.007, 0.029		0.010	-0.008, 0.029	
Father's job loss	-0.024	-0.039, -0.009	<0.01	-0.021	-0.036, -0.006	<0.01	-0.025	-0.041, -0.009	<0.01
Reduction in working hours	-0.011	-0.024, 0.003		-0.013	-0.027, 0.001		-0.015	-0.030, -0.001	<0.05
Reduction in wages	0.018	0.005, 0.031	<0.01	0.020	0.006, 0.033	<0.01	0.017	0.003, 0.030	<0.05
Reduction in welfare benefits	0.000	-0.011, 0.012		0.004	-0.008, 0.016		0.004	-0.008, 0.016	
Falling behind on housing bills	-0.018	-0.037, 0.001		-0.008	-0.029, 0.012		-0.015	-0.035, 0.006	
Falling behind on utility bills	-0.018	-0.035, -0.002	<0.05	-0.012	-0.030, 0.007		-0.012	-0.031, 0.007	
Inability to afford basic necessities	-0.006	-0.019, 0.006		-0.001	-0.014, 0.012		0.000	-0.013, 0.013	
Overweight/obesity status ⁱ									
Mother's job loss	-0.002	-0.022, 0.018		-0.003	-0.023, 0.018		0.004	-0.018, 0.026	
Father's job loss	0.007	-0.010, 0.023		0.007	-0.010, 0.024		0.008	-0.010, 0.027	
Reduction in working hours	0.016	0.000, 0.032		0.011	-0.005, 0.027		0.013	-0.005, 0.030	
Reduction in wages	0.022	0.008, 0.036	<0.01	0.019	0.004, 0.034	<0.05	0.020	0.004, 0.036	<0.05
Reduction in welfare benefits	0.004	-0.010, 0.018		0.004	-0.010, 0.018		0.004	-0.011, 0.019	
Falling behind on housing bills	-0.002	-0.022, 0.019		0.001	-0.021, 0.024		0.002	-0.022, 0.025	
Falling behind on utility bills	-0.007	-0.025, 0.011		-0.004	-0.024, 0.016		-0.004	-0.025, 0.017	
Inability to afford basic necessities	-0.007	-0.021, 0.008		-0.009	-0.024, 0.006		-0.010	-0.026, 0.006	

Abbreviation: CI, confidence interval.

^a The reference category for each recession effect was no change in that variable.

^b Model 1: Each recession effect was analyzed in a separate model.

^c All models controlled for study wave, mother's age, mother's marital status, parents' educational levels, and household region. Model 3 additionally controlled for quintile of equalized household income and parents' employment statuses.

^d Models 2 and 3: All recession effects were included in a single model.

^e 2-sided *P* value.

^f Rent/mortgage.

^g Food, clothing, etc.

^h Whether the mother consumed 5 or more units of alcohol per week (1 unit of alcohol = 1 pint of beer, 1 glass of wine, or 1 measure of spirits).

ⁱ Based on World Health Organization cutpoints for body mass index (weight (kg)/height (m)²) (27). Overweight was defined as body mass index ≥ 25 ; obesity was defined as body mass index ≥ 30 .

psychological stress, which has been linked to the development and exacerbation of asthma and atopy (45–47). Changes in the physical home environment induced by the recession may also be important. For example, using available data in GUI, we found that families who reported being behind on utility bills were more likely to report going without heating in the

past year (Web Table 12). Going without heating was independently associated with increases in asthma and atopy (Web Table 13). Lack of heating may have led to worsening housing conditions, such as chronic dampness, cold temperatures, and mold, all of which are connected to poor child health outcomes, especially asthma and atopy (20).

Currie et al. (48) found that increases in aggregate unemployment rates in the context of the Great Recession in the United States were associated with increased reports of poor health, smoking, and drug use among mothers. We found inconsistent evidence of this pattern in Ireland. For example, smoking prevalence declined among mothers whose partners lost their jobs and those who could not afford basic necessities. While a reduction in wages predicted higher alcohol consumption, there were no consistent associations between other measures of economic hardship and alcohol consumption. The most consistent association was found for overweight and obesity, which increased among mothers who experienced a reduction in wages. These findings suggest that changes in the quality of diet and food security may offer a potential explanation for the negative impacts on mother's weight and child health. Future studies with more detailed data on diet and food security should examine this potential explanation. In addition, further research is needed on how fathers' transitions during the recession impact child health.

There were several limitations to this study. First, families more negatively affected by the Great Recession may have been more likely to be lost to follow-up. Indeed, the 2,422 families lost to follow-up between waves 1 and 3 were more likely to be from lower income, social class, and educational attainment groups at baseline (49). If anything, this would have led to underestimation of the negative impact of the recession on child health. Another concern is that persons who reported being more affected by the recession were different from those who were less affected. However, this was a lesser concern in our study, which used fixed-effects models to isolate the impact of the recession from compositional differences. We were also limited by the health measures available in GUI, as mothers' reports for their own and their children's outcomes may have been affected by changing economic circumstances. However, it is reassuring that we also observed associations with asthma and atopy, which may be less susceptible to reporting bias than overall self-rated health measures. Finally, our study covered a relatively short time period after the recession. Future studies should therefore assess whether the impact of recessions during early childhood is sustained into adolescence and adulthood.

In conclusion, findings from this study suggest that the Great Recession had a negative impact on the health of children in Ireland. Our study provides important evidence that social policy responses are critical: Reductions in welfare benefits due to budget cuts in the aftermath of the recession were associated with increases in asthma and atopy symptoms. These impacts on child health and development may have long-lasting consequences for future socioeconomic and health outcomes, which may offset any government savings derived from reduced welfare payments for poor families. Our findings highlight the need to protect vulnerable families and children and illustrate the potential benefits of social protection programs for families during economic recessions.

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