**The Effect of the Great Recession on Health:
A Longitudinal Study of Irish Mothers 2001-2011**

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Abstract

The relationship between recessions and health is mixed, with some evidence from the most recent financial crisis finding a positive effect on heath behaviours. This study uses longitudinal data spanning the periods before, during and after the Irish crisis of 2008, to test the impact of economic expansion and contraction on mothers physical and mental health and health behaviours. Three waves of data from the Irish Lifeways Cohort Study for the period 2001-2011, and local area employment rates from the Irish Census, are used to capture the impact of the recession on health, independent of individual employment status. The results from fixed effect linear probability models demonstrate that increases in the local unemployment rate are associated with significant increases in the probability of mothers reporting poor self-rated health and poor mental well-being. Yet the association between local area unemployment and health behaviours is mostly positive, with higher unemployment reducing the probability of being obese and tobacco consumption. The relationship with physical activity is more ambiguous. These results are largely consistent with the US literature, which is predominantly based on working men, thus demonstrating the universal impact of recessions on health.

JEL Classification: I1, I12, I14, I18, C33, J10

Keywords: Lifestyles; Health; Macroeconomic conditions; Panel data; Unemployment; The Great Recession

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[1]Authors declarations of interest: none

[2]The funding body had no involvement in the collection, analysis or interpretation of the data, the writing of the report or the decision to submit the article for publication.

1. Introduction

Evidence on the relationship between recessions and health is far from clear, with much of the original literature reporting a negative relationship (Economou et al., 2008), and more contemporary research emerging from the recent economic crisis reporting the opposite (Ásgeirsdóttir et al., 2014). This paper explores the relationship between recessions and health by utilising longitudinal data spanning the periods before, during, and after the onset of the Great Recession in Ireland. In the mid-1990s, the Irish economy emerged from a prolonged period of high unemployment, tax levels, and formidable public debt. There followed a period of rapid growth and protracted expansion, with unemployment falling from ~20 per cent in the early nineties to 4.5 per cent in 2006. Ireland was described as experiencing "essentially full employment for the first time in modern history" (Honohan, 2009, p. 2). Nonetheless, following two decades of expansion, Ireland's economy collapsed more severely than almost all other countries during the global credit crisis of 2007. Between 2007 and 2009, the unemployment rate almost tripled to 13 per cent and the average growth rate plummeted to −3.1%, while annual inflation became negative (Barrett & McGuinness, 2012).

The scale of the Irish recession was described by the Governor of the Central Bank of Ireland as amongst the worst in the EU (Honohan, 2009). Following a rescue package from the IMF, ECB and the EU the economy recorded tentative growth and recovery from 2011 onwards, with positive average growth, a switch from negative to positive inflation and decreases in the unemployment rate (Barrett & McGuinness, 2012). While the recession had obvious economic consequences for the country, given the size and significance of the shock, it may also have had consequences for the health of the nation. Thus, Ireland provides a unique setting in which to examine the health effects of recessions. Indeed, Currie et al. (2015) describe the paucity of European studies investigating this relationship.

While there is a well-documented association between recessions and health, this paper makes several contributions to the literature. Using panel data from the Irish Lifeways Cohort Study, a familial birth cohort comprising three generations of the same family sampled before, during and after the onset of the recession, allows us to test the impact of recessions on health using comparable pre- and post-recessionary data. Although the impact of recessions is often restricted to those who experience direct changes in their employment status, such as working men (Dave & Kelly, 2012), the literature on community-level recessionary effects and psychological distress suggests that both the employed and non-employed can experience negative health shocks as a result of a recession (Berkman & Kawachi, 2000; Gabel, et al., 2009; Ruhm, 2000, 2003). This motivates our focus on

mothers, a group with traditionally variable employment histories. By using local area unemployment, we investigate the impact of the recession on health regardless of actual labour force participation (Currie et al., 2015; Gabel, et al., 2009; Ruhm, 2003). As unemployment rose during the financial crisis, the government was compelled to cut social protection payments to all families with children, with direct income consequences for mothers for whom these universal social transfers made up a proportion of their financial resources. These income effects were not insignificant, with estimates indicating that by 2013 such policies had reduced private consumption by more than 7% nationally (O'Farrell, 2013).[3] However, even if mothers do not experience a reduction in personal income, increases in local unemployment may lead to anticipated declines in economic well-being resulting in changes in health behaviours (Berkman & Kawachi, 2000; Grossman, 2000). Clark (2003; 2011) notes the key influences of social norms and comparative psychological perceptions and expectations in determining individual health and wellbeing. Evidence suggests that there are significant effects on physical and mental health of austere macroeconomic policies, increases in community antisocial behaviour and declines in social cohesion and neighbourhood quality (Antonakakis and Collins, 2014, 2015; Nixon et al., 2015; Reeves et al. 2012). Local employment changes also influence the opportunity cost of time by changing realised or expected returns to the labour market, and child-care time investments made by both caregivers (Juster and Stafford, 1991). Changes in the opportunity cost of time has implications for investment in time-intensive health behaviours such as physical activity, healthy diet and cigarette cessation (Ruhm, 2000, 2005). Therefore, it is possible that exposure to changes in labour market conditions, outside personal experiences, may impact health through multiple mechanisms.

Using fixed effects regressions which control for individual-specific effects which may be correlated with both the likelihood of poor health and of living in an area with high unemployment, we find that increases in local unemployment are associated with significant increases in the probability of mothers reporting poor mental well-being and poor self-assessed health, yet a reduction in the probability of obesity, smoking and regular cigarette consumption. The probability of mild exercise increases, but the probability of strenuous exercise falls. There are no significant effects on alcohol consumption. The remainder of the paper is organised as follows: Section 2 discusses related literature, Section 3 describes the data, Section 4 sets out the methodology, Sections 5 and 6 present and discuss the results respectively, and Section 7 concludes.

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[3]Estimation of the effect of the recession on the median income of households with children demonstrates that Irish families lost the equivalent of ten years of income progress, with these welfare cuts fundamentally responsible for this loss (Fanjul, 2014; Hick, 2014).

2. The literature: Recessions and Health

Much of the previous research on recessions and health has focused on working men, yet emerging evidence demonstrates that recessions may influence the health of the employed and those who are unemployed, homemakers, students, or otherwise classified (Berkman & Kawachi, 2000; Davey et al., 2001; Gabel et al., 2009; Ruhm, 2003). In an attempt to better define this relationship, Dave and Kelly (2012), Jofre-Bonet et al. (2018), Currie et al. (2015), Stafford et al. (2005) and Ruhm (2000) analyse changes in individual health outcomes and regional unemployment rates, in the expectation that the health effects of recessions are not only restricted to those in the labour market.

Currie et al. (2015) use longitudinal data to examine the impact of the Great Recession on mother's health in the US and find a deterioration in mental and self-assessed health as a result of increases in the state unemployment rate, regardless of their labour force participation. In the UK, Stafford et al. (2005) find that the residential environment is more relevant for declines in women's self-rated health than individual economic activity, reporting local unemployment effects that are greater than individual socioeconomic characteristics. Jofre-Bonet et al. (2018) also investigate the effects of regional unemployment rates on health during the Great Recession in the UK. They find that increased local area unemployment is associated with an increase in mental health problems and a decrease in the consumption of cigarettes and alcohol. These effects are stronger for women than for men. The authors hypothesise that the uncertainty and negative expectations generated by a fall in regional employment changes health outcomes and behaviours more than a worsening of individual economic conditions. Ruhm (2003) similarly finds that tobacco consumption, physical exercise and obesity declines, while diet improves, with increases in the US state unemployment rate during recessions. Dave and Kelly (2012), in examining the determinants of health behaviours during recessions, find that "rather than the individual's actual unemployment status, it is the area-specific unemployment rate that is the relevant and appropriate determinant" (Dave & Kelly, 2012, p. 12). In general, these studies conclude that an individual's actual employment status only partially captures the pathway through which recessions affect health, arguing that the use of local area unemployment more proximally captures the effect of recessions as within-area changes in unemployment also reflect other aspects of the recession. Cumulatively this research suggests that local unemployment can be considered a proxy for austere macroeconomic policies, increased economic insecurity and uncertainty, declines in neighbourhood quality and changes in the opportunity cost of time.

The literature suggests several mechanisms through which increased unemployment during a recession may affect health behaviours. An income-effect, for example, may cause the consumption of food, alcohol, tobacco or even exercise at the gym, to decrease as employment related incomes

fall (Colman & Dave 2014; Neumayer, 2004). Evidence shows that not just experienced, but also anticipated, declines in economic well-being result in less health-related expenditures during recessions (Grossman, 2000; Berkman & Kawachi, 2000; Ruhm, 2000, 2003). The opportunity cost of time is another potential mechanism. Opportunity cost depends on the availability of leisure time but also on labour market opportunities and the expected returns to the labour market (Ásgeirsdóttir et al., 2014). As regional unemployment increases, the opportunity cost of time decreases (Ruhm, 2003). Ruhm (2000) argues that recessions can thus result in healthier behaviours such as exercise, smoking cessation and the preparation of healthier meals, due to this decline. Conversely, Dávalos et al. (2012) suggest that if a negative health behaviour, such as alcohol consumption, tobacco consumption or physical inactivity, is a desirable activity, then as the opportunity cost of time decreases, negative health behaviours also increase.

Recessions may also affect physical and mental health. Guðjónsdóttir et al. (2012) report a spike in female cardiac emergency visits during the week of the October 2008 economic collapse in Iceland. Novo et al. (2001) analyse the relationship between health and local unemployment rates and find that those who are employed, as well as students or those in labour market programmes, still experience significant effects of recessions due to pessimism about the future and perceived economic insecurity, with the effect being larger for women. Overall, they find greater somatic ill health, such as cough, cold, headache, gastric complaints, allergy, shoulder and back pain, and psychological ill health, in women. Drydakis (2015) finds that women's self-reported mental well-being and physical health decline sharply, and to a greater extent than their male counterparts, as regional unemployment increases. Hauksdóttir et al. (2013) find significant increases in psychological stress mainly for women following a recession. This increase occurs for both unemployed and employed women. Likewise, Rahmqvist and Carstensen (1998) limit their analysis of the 1991 Swedish recession to those who remained employed and still find significant increases in the prevalence of psychological distress. Jofre-Bonet et al. (2018) find that local employment declines are associated with decreases in psychological well-being in women due to anticipated harmful economic change. Bambra and Eikemo (2008) suggest that mothers, particularly cognizant of greater exposure to labour market fluctuations, may experience a greater vulnerability to psychological distress during recessions. Research also supports the role of stress as a mediator for an individual's propensity to consume alcohol and tobacco, and to exercise during times of recession (Dávalos et al., 2012; Ng & Jeffery, 2003).

Patterson et al. (2004) provides evidence that recessions create a society-wide shock that may affect social cohesion, which in turn has implications for poor mental and physical health. Likewise, antisocial behaviour and particularly property crime has been shown to escalate in neighbourhoods

which experience increases in community unemployment (Hooghe et al., 2011). Hill and Angel (2005) find that in the wake of such economic changes, there is a significant decline in mental and physical well-being, as the stress of living in a neighbourhood characterised by problems with unemployment, crime, and antisocial behaviours leads to fearful anxiety and depression in mothers.

Thus, the literature suggests that the impact of recessions on health are unlikely to be captured entirely by individual employment change. Even for individuals who do not become unemployed, an economic downturn may affect labour market returns, opportunities for employment, expected economic wellbeing and social provision, and thus alter the marginal costs and benefits of unhealthy behaviours. There is also evidence of psychological and community-level recessionary effects on mental and physical health. Therefore, considering the local area unemployment rate provides a reduced-form estimate of the net impact of the recession on individual health operating through all individual and ecological channels of effect (Dave & Kelly, 2012).

3. Data

The analysis is based on data from the Irish Lifeways Cohort Study which is a prospectively gathered, longitudinal dataset established in 2001 with information on health outcomes, health behaviours, demographic, occupation and social characteristics. The data include a mix of self-reported, objective and anthropometric measurements, such as self-rated health, height, weight, body mass index and mental well-being. Data are derived from a sample of 1,099[4] pregnant women who were randomly recruited at their first maternity hospital booking visit in two of the largest maternity hospitals in Ireland, one urban (Coombe Women's Hospital in Dublin, in East Ireland) and one rural (University College Hospital Galway, in West Ireland) between 2001 and 2002. Previous analysis demonstrates that the Lifeways cohort is representative of Irish-born mothers of childbearing age (Niedhammer et al., 2009). The data have been used to analyse social inequalities in preterm delivery, the determinants of health services usage, maternal macronutrient intake and associations with child weight status, and cross-generation associations for body mass index (see papers referenced in O'Reilly et al., 2016).

Mothers who delivered a live-born child and gave written, informed consent took part in a recruitment interview and completed a self-administered questionnaire in 2002 (wave 1). They also gave consent for linkages to their hospital birth records. In 2007 they had a home examination for anthropometric measurement of height, weight and waist circumference and completed a self-administered questionnaire (wave 2). In 2011 they completed a self-administered postal

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[4]The core Lifeways group comprises 1,082 mothers, but 17 mothers with missing hospital booking records were suitable for inclusion in this article.

questionnaire (wave 3). They also had the option of recording anthropometric measurements with their general practitioner (GP) in 2011. Three waves of data are used in this study from 2002 (1,099 mothers sampled), 2007 (643 of the same mothers) and 2011 (460 of the same mothers). There are 681 mothers who have data in wave 1 and in at least wave 2 or wave 3, providing a 62% overall response rate.

A limitation, common in many cohort studies, is attrition over time. To be eligible for the current analysis, mothers had to have data for at least two of the three waves. While the attrition rates appear high, there were few formal withdrawals from the study, with much of the attrition influenced by logistical issues. For example, the market research group tasked with the second wave of data collection in the home ended the fieldwork when a response rate of 50% was reached (C. Kelleher, personal communication, April 24, 2018). In addition, GP co-operation was necessary for the collection of the anthropometric measures at wave 3, which had a consequential effect on the numbers of mothers included in this wave[5] (C. Kelleher, personal communication, April 24, 2018). For a mother to be included in all waves, she had to have maternity hospital linkage records, the co-operation of a GP, and to have been randomly selected by the market research group using their 50% sampling strategy. The presence of these exogenous factors suggests that the data may be missing at random, although this will be tested later in the paper.

Local area unemployment rates were obtained from the Small Area Population Statistics (SAPS) gathered by the Irish Census. These SAPS were collected at the Irish county level (sub-national divisions that are similar to US states) in 2002, 2006[6] and 2011, with larger counties broken down into their larger cities and geographic areas. The Lifeways dataset includes mothers in 30 of the 34 SAP geographic locations. Local unemployment rates were created as a percentage of each county's total labour force and added to the Lifeways dataset for the original 1,099 respondents using the mother's baseline county of residence. Currie et al. (2015) advise that using baseline residency helps to capture endogenous migration as a result of changing unemployment rates. Migration could underestimate the relationship between unemployment rates and health if women move out of counties with higher unemployment rates. In Lifeways, the rate of between-county migration across waves is relatively low (5% of mothers) and is thus unlikely to influence our results.

3.1 Outcome measures

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[5]It was necessary for the GPs to contact Lifeways mothers directly to organise appointments to gather the data. When GP's did not do this, mother's anthropometric measures are not available.

[6]It should be noted that local unemployment numbers were recorded in the SAPS data a year before the Lifeways data was collected for the middle wave (2007). Nonetheless numbers unemployed are equivalent across 2006 and 2007. The Central Statistics Office (CSO) report that the unemployment rate in Ireland was 4.3% in 2006 and 4.6% in 2007 (CSO, 2007).

Mothers in this age-group are generally expected to be healthy, thus, self-rated health and health behaviours are particularly useful when clinical endpoints such as hospitalization or death are unusual (Hammarström et al., 2011). Thirteen outcome measures are considered including 3 physical health outcomes, 2 mental well-being outcomes, and 8 health behaviours. Binary variables are recoded as 1 if a mother reports a health outcome or behaviour or 0 otherwise. Previous studies suggest that the time period under analysis provides an adequate duration for the selected outcomes and behaviours to respond to recessionary effects (Charles & DeCicca, 2008; Currie et al., 2015; Ruhm, 2005). Relevant covariates are included where appropriate and as described below.

3.2 Physical Health Outcomes

- Self-rated health: Reporting health as 'excellent' or 'very good' vs 'good', 'fair' or 'poor'.
- Overweight: BMI above 25 vs BMI below 25.
- Obesity: BMI greater than or equal to 30 vs BMI below 30.

3.3 Mental Wellbeing

Mental well-being is measured in the first and third wave. In the first wave it is measured using the General Health Questionnaire (GHQ-12) and the Center for Epidemiologic Studies Depression Scale (CES-D). In the third wave it is measured using the Short Warwick–Edinburgh Mental Well-being Scale (SWEMWBS). All measures are self-reported and include 12, 20 and 7 items respectively. A binary measure of poor mental well-being is created from the GHQ-12 and CES-D classifications of poor mental well-being linked to the SWEMWBS classification of poor mental wellbeing. In order to compare changes in well-being over time, the SWEMWBS scores and their comparability with the GHQ-12 and CES-D scores are informed by previous literature and personal correspondence with the authors of the SWEMWBS (N. Shah, personal communication, October 26, 2017). The derivation of equivalent cut-off scores for each instrument are discussed further in Appendix A.

3.4 Health Behaviours

The following self-reported measures of health behaviours are included in waves 1 and 2:
- Smoker: Consumes any cigarettes vs no cigarettes.
- Number of cigarettes consumed per day greater than the national smoking average or not.[7]
- Regular smoker: Mother describes herself as a regular smoker or not.
- Usually drinks alcohol in a typical week or not.

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[7]According to the March 2017 Health Information and Quality Authority (HIQA) report on national averages, Irish women consume 10 cigarettes per day on average (Ryan, 2017).

- Quantity of alcohol consumed on days drinking.

- Strenuous exercise:[8] Mother engages in strenuous exercise for at least 20 minutes a week or not.

- Moderate exercise:[8] Mother engage in moderate exercise for at least 20 minutes a week or not.

- Mild exercise:[8] Mother engages in mild exercise for at least 20 minutes a week or not.

3.5 Control Variables

Currie et al. (2015) state that it is not necessary to control for mother-specific covariates in fixed effects analyses of local area unemployment and health and only include an indicator for year of data collection. Ásgeirsdóttir et al. (2014) similarly illustrate that specifications including covariates do not change the estimated effects of a recession on health behaviours. Nonetheless, a basic set of covariates are included in the analysis. These are restricted to exogenous sociodemographic factors to avoid "over-controlling" for factors that may be potential pathways of effect (Dave & Kelly, 2012). Age, year, education (greater than secondary level vs less than secondary), and baseline parity (number of children in the household in addition to the study child at wave 1) are included in all three waves as informed by the corresponding literature (Ásgeirsdóttir et al., 2014; Dave & Kelly, 2012; Ruhm, 2000, 2003).[9]

3.6 Descriptive Statistics

Table 1 provides descriptive statistics for the 681 mothers who appeared in wave 1 and at least one other wave. Descriptive statistics for all mothers in wave 1 are included in Table B1 in Table 3 by attrition status. Across the three waves, self-rated health declines and rises again, while levels of overweight, obesity, mental well-being, alcohol consumption and exercise slightly decline. Medical card ownership, which is means-tested, more than doubles across the three waves.

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[8]These exercise markers are independent questions and non-exclusive. A mother can concurrently engage in any combination of at least 20 minutes of mild exercise a week, 20 minutes of moderate exercise a week and 20 minutes of strenuous exercise a week. For example, in a week a mother may take a leisurely walk on one day (20 minutes of mild exercise), swim laps on another (20 minutes of moderate exercise) and lift weights on another (20 minutes of strenuous exercise).

[9]When examining a mother's health during recessions, her partner's employment status and household income may affect the economic circumstances of the family. For example, her partner may experience a lay-off or wage cut. Although it would be informative to have a measure of household income or partners employment, this information is not available in the data. However, our study is informed by Dave and Kelly (2012) who provide evidence that a reduced-form net impact analysis of the local area unemployment rate on health is reflective of all economic factors through which a recession may influence individual health. They maintain that this includes all individual and ecological channels of effect, including the unemployment of a spouse or family member, and corresponding research on local employment change does not consider the unemployment status of a partner on one's behaviours or health (Jofre-Bonet et al., 2018). Moreover, by not including income or partner employment as an economic indicator, these specifications avoid the potential endogeneity of these variables (Jofre-Bonet et al., 2018).

Table 1

Descriptive Statistics

	Wave 1	Wave 2	Wave 3
	(2002)	(2007)	(2011)
Health outcomes			
Self-rated health excellent or very good	76%	72%	76%
Overweight		53%	51%
Obese		18%	17%
Poor Mental Wellbeing			
SWEMWBS linked to GHQ-12	10%		9%
SWEMWBS linked to CESD	9%		9%
Health Behaviors			
Smoker	19%	21%	
Regular smoker	16%	17%	
Daily number cigarettes consumed	7%	10%	
greater than the Irish national average			
Usually drink alcohol in a typical week	64%	54%	
Average number of drinks consumed on days	2.55	2.12	
when alcohol is drank	(2.84)	(2.69)	
Exercise			
20 mins mild exercise per week	71%	61%	
20 mins moderate exercise per week	67%	60%	
20 mins strenuous exercise per week	23%	27%	
Demographic Characteristics			
Age	31.21	36.21	41.21

	(5.60)	(5.60)	(5.60)
Number other children at baseline	1.05		
	(1.10)		
Medical card	13%	18%	27%
Marital Status			
Married	72%	84%	84%
Cohabiting	10%	8%	5%
Separated	0%	1%	0%
Divorced	1%	0%	2%
Widowed	1%	0%	1%
Single/Never married	16%	6%	7%
Education			
Primary school education	1%		
Some secondary school	15%		
Complete secondary education	32%		
Some third level education	18%		
Complete third level education	34%		
Economic Status			
Homemaker	19%	37%	31%
Unable to work owing to permanent sickness/disability	2%	0%	2%
At school/student	3%	2%	3%
Seeking work for the first time	0%	1%	0%
Employed	65%	49%	54%

|			
Unemployed	6%	1%	3%
Self-employed	5%	10%	7%
Local area unemployment			
Local area unemployment rates	7%	8%	17%
	(2)	(2)	(3)

Note: Empty cells reflect that not all characteristics were measured in all waves. The estimation sample (N) comprises those 681 mothers who were in Wave 1 and at least one other Wave.

3.7 Disaggregated Local Area Unemployment Rates

Figure 1 maps the local area unemployment SAPS figures to the residential areas of mothers examined in this study.[10] It reveals remarkable changes in local area unemployment rates across each wave. Just under a third of all areas experienced an increase in unemployment between waves 1 and 2. Furthermore, 100% of areas experienced an increase between waves 2 and 3 and waves 1 and 3, with unemployment levels frequently doubling or tripling. This reveals that local area employment change was more pervasive than the changes experienced by mothers in the estimation sample, as described in Table 1. Thus, the data provide a valuable natural experiment to examine the impact of recessions on health for a group whose labour market position was largely unaffected by the recession.

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[10]Map of Ireland provided courtesy of d-maps:
https://d-maps.com/carte.php?num_car=5179&lang=en

Figure 1.
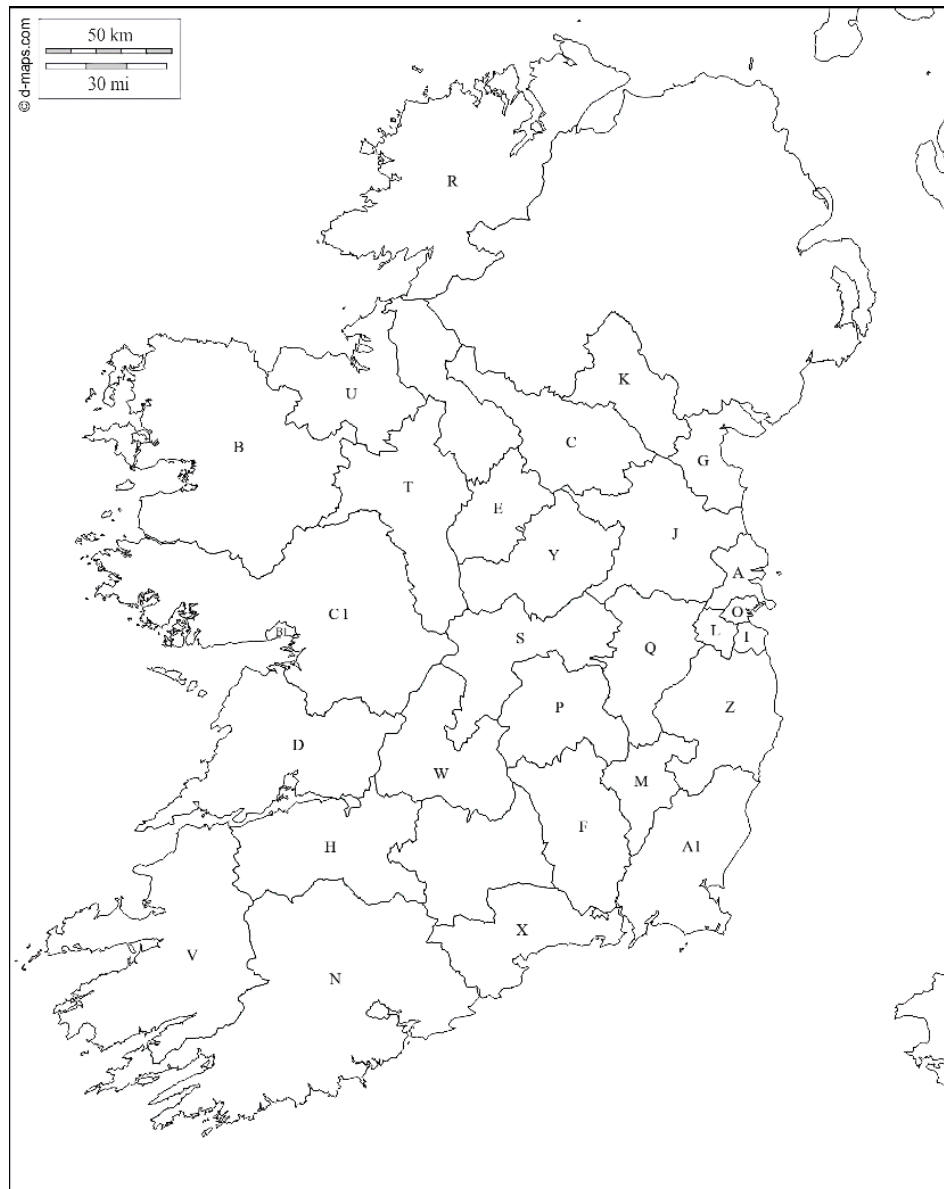
Census provided local area unemployment rates mapped to the residential areas of mothers examined in this study.

Index	County	% Unemployed 2002	% Unemployed 2006	% Unemployed 2011
A	Fingal	6.86	7.66	15.95
B	Mayo	10.68	9.11	19.47
C	Cavan	7.94	8.17	21.16
D	Clare	7.64	7.61	18.78
E	Longford	10.11	11.42	24.75
F	Kilkenny	7.65	7.51	19.44
G	Louth	13.23	11.1	23.77
H	Limerick	6.63	6.98	17.48
I	Dún Laoghaire-Rathdown	5.71	5.41	11.23
J	Meath	6.56	6.53	17.98
K	Monaghan	9.93	7.74	20.64
L	South Dublin	7.97	8.97	19.64
M	Carlow	9.53	9.29	23.25
N	Cork	6.41	5.9	14.82
O	Dublin City	10.4	10.68	18.52
P	Laois	9.83	7.43	21.4
Q	Kildare	6.15	6.28	17.88
R	Donegal	15.6	12.94	26.15
S	Offaly	8.76	8.5	23.19
T	Roscommon	7.03	6.27	19.36
U	Sligo	8.72	7.5	18.11
V	Kerry	8.96	8.66	19.51
W	Tipperary North	7.56	7.49	18.96
X	Waterford	8.69	8.13	19.14
Y	Westmeath	8.53	8.23	21.09
Z	Wicklow	8.12	8.09	19.33
A1	Wexford	10.45	9.34	23.96
B1	Galway City	10.01	10.57	18.65
C1	Galway	8.72	7.71	18.12

4. Methodology

Analysis of the relationship between recessions and health can suffer from endogeneity due to reverse causality and omitted variable bias. For example, poor health may increase the probability of unemployment, yet unemployment may cause poor health (Schuring et al., 2007). In addition, certain individuals may be more likely to experience both ill-health and unemployment due to some underlying unobservable characteristics. To address such endogeneity, and to explore the impact of recession on those outside the labour market, we use local area unemployment rates in fixed effects models. Currie et al. (2015), Dávalos et al. (2012) and Dávalos & French, (2011) adopt a similar approach using cohort studies from the US. Local area unemployment reflects the respondent's macroeconomic environment during a recession yet may be unrelated to their own individual characteristics. By measuring the respondent's outside economic environment, concerns regarding reverse causality are reduced as the characteristics of the respondent should not affect local unemployment (Jofre-Bonet et al., 2018). In fixed effects models, individual mothers serve as their own controls, thus adjusting for unobserved characteristics which may be correlated with both the likelihood of poor health and of living in an area with high unemployment.

As not all outcomes were collected across all waves, separate regressions are run for waves 1, 2 and 3, waves 1 and 2, waves 2 and 3, and waves 1 and 3. Similarly to Ruhm (2000, 2005), Charles & DeCicca (2008) and Dávalos & French (2011), to support ease of interpretation, linear probability models (LPM) are estimated. Standard errors are clustered by the mother's county, i.e. the area at which unemployment is measured, to allow for within-area correlation in the observations. The following equation describes the fixed effects models:

$$Y_{i,t} = \beta_0 + \beta 1 (Unemployment\ Rate)_{i,t} + \beta 2\ x'_{i,t} + \alpha_i + \alpha_c + \alpha_y + \varepsilon_{it} \qquad (1)$$

Where i refers to each individual and t refers to different measurement points for the same individual. Y_{it} is the outcome of interest and refers to the health outcomes or behaviours at time t for individual i. $\beta 1 (Unemployment\ Rate)_{i,t}$ refers to the local area unemployment rate and is the coefficient of interest. The $\beta's$ are regression coefficients representing the effects of the observed covariates, ε_{it} is the independent error term and is different for each individual at each time point, x'_{it} is a vector of individual specific covariates and α_y and α_c are year and baseline county indicators. The county indicators account for time-invariant, county-specific effects which may influence health outcomes. As county of location is measured at baseline it is unlikely to be at risk of endogenous change due to local area employment change (Currie et al. 2015). Indicators for year are included to absorb year-specific effects which could influence local area unemployment and health.

In panel data it is reasonable to assume independence across but not within individuals as there is likely to be unobserved heterogeneity across respondents (Jones et al., 2007). As described, subjects act as their own controls in fixed effects models, this is accomplished by estimating how changes within individuals across time affect outcomes (Allison, 2009). In our model α_i is an individual-specific parameter representing the effect of unobserved individual characteristics. In simple terms α_i and ε_{it} both represent error terms. While ε_{it} differs for each mother at each time point, α_i remains constant within mothers across time but differs between mothers, representing the time-invariant characteristics of mothers that have not been included in the model. When α_i and $x_{i,t}$ are correlated, the fixed effects estimator will control for time-invariant variables that are not measured, but that influence the outcome of interest $y_{i,t}$ (Allison, 2009).

5. Results

Table 2 describes the results of the impact of local area unemployment rates on health outcomes and behaviours, based on an estimation sample comprising mothers who appear in at least two waves. The coefficients reflect the change in the outcome that is associated with a one percentage point increase in the local area unemployment rate. Self-rated health is statistically significant across waves 1, 2 and 3, and waves 2 and 3, where an additional unit of local area unemployment decreases the probability of reporting excellent or very good health by 1.1 and 1.6 percentage points respectively. An increase in local area unemployment causes the probability of objectively measured obesity to decrease by 0.8 percentage points. The association between local area unemployment and poor mental well-being is positive. Both measures of well-being suggest that as local area unemployment rises, the probability of poor mental well-being rises (a statistically significant increase of 1.3 percentage points for the GHQ-12 linked to SWEMWBS and 3.1 percentage points for the CES-D linked to the SWEMWBS). Tobacco consumption is negatively associated with local area unemployment. A one-unit increase in unemployment lowers the probability of consuming cigarettes by 2.6 percentage points and of self-describing as a regular smoker by 2.6 percentage points. A one-unit increase in local area unemployment increases the probability of engaging in at least 20 minutes of mild exercise per week by 8.3 percentage points and reduces the probability of engaging in at least 20 minutes of strenuous exercise per week by 6.5 percentage points. There are no effects on overweight or alcohol use. In sum, the results suggest that local employment declines led to improvements in health behaviours, yet reductions in physical and mental health.

Table 2: Local area unemployment rates, health and health behaviours

	Waves 1, 2, 3		Waves 1, 2		Waves 2, 3		Waves 1, 3	
	Coeff	Std. Errors	Coeff	Std. Errors	Coeff	Std. Errors	Coeff	Std. Errors
Self-Rated Health	-0.011*	0.004	0.009	0.021	-0.016**	0.006	-0.007	0.005
BMI: Overweight					0.003	0.009		
BMI: Obese					-0.008†	0.005		
Mental Health Scale: GHQ							0.013*	0.005
Mental Health Scale: CESD							0.031***	0.006
Cigarette Use			-0.026†	0.014				
Regular Smoker			-0.026†	0.013				
Daily N. Cigarettes Cons. > Nat. Average			-0.004	0.014				
Usually drinks alcohol in a typical week			-0.007	0.021				
Quantity Alcohol Cons. on days drinking			-0.161	0.138				
20 Minutes Mild			0.083*	0.036				

Exercise per Week 20 Minutes Moderate			-0.028	0.035		
Exercise per Week 20 Minutes Strenuous			-0.065*	0.031		
Exercise per Week						
N	681		681		681	681

Note: Coefficients are from unique linear probability fixed effects models. The estimation sample includes mothers who are in at least 2 of the 3 waves. Control variables are included for education, age, baseline county and baseline parity. Standard errors are clustered at the mother's baseline county. The number of observations varies by the health behaviour or outcome considered. Standard errors are reported. † p< .10, * p<0.05, ** p<0.01, and *** p<0.001.

5.1 Testing for Bias Due to Attrition

Missing data is a pervasive characteristic of cohort studies (Howe et al., 2013). As mothers leave the sample, the potential for selection bias increases if the characteristics associated with dropping out of the study are also correlated with health outcomes. Table 3 compares the wave 1 health outcomes and socioeconomic characteristics of mothers who participated in wave 1 only to those who participated in more than one wave. As informed by Mostafa and Wiggins (2014), who discuss attrition in the 1970 British Cohort Study, to determine if the baseline characteristics of mothers are associated with the probability of leaving the sample, a binary variable is created which is equal to one if a respondent was in wave 1 but missing from both waves 2 and 3, and zero otherwise, giving a complete attrition rate of 38%. The probability of being a stayer is computed using binary logit models. Control variables are included for education, medical card ownership, parity, local area unemployment, current county and age at baseline. Standard errors are clustered at the mother's baseline county. The results reported in Table 3 find little evidence of selective attrition. While there is some evidence that smokers, younger mothers and home makers are more likely to leave the study, there are no significant differences on any of the health outcomes or other SES factors. In particular, the results suggest that attrition is not systematically linked to local area unemployment (p-value of 0.680). However, there is some evidence to suggest that the effects of unemployment on health may be underestimated. Thus, we address this possibility with several robustness tests.

To assess the importance of sample selection due to missing data when considering the effects of the 2008 recession for Icelanders, Ásgeirsdóttir et al. (2014) analyse longitudinal data using all possible cases and then using only cases that have non-missing data and compares the results. We adopt a similar approach. The estimation sample for Table 2 comprised mothers who appeared in at least 2 waves. In Table 4 a new estimation sample is analysed using only mothers who appeared in all waves. The results show that the estimates are virtually unchanged from before, suggesting the same direction and magnitude of effect. Thus, our estimates are robust to the exclusion of observations with missing data.

To address this issue more fully, Inverse Probability Weighting (IPW) is utilised. First, we estimate the probability of being a stayer using binary logit models including a range of control variables. As directed by Jones et al. (2013), who similarly model economic change, health and attrition in the British Household Panel Survey (BHPS), this includes the baseline values of all the regressors in the main model. The inverse of these predicted probabilities are then used as weights in our outcome analysis, such that mothers who have a lower probability of being a stayer are given a

higher weight in the analysis, to compensate for similar mothers who are missing (Wooldridge, 2007). The inverse probability weighted results, as shown in Table 5, confirm a lack of any substantive difference to the main results reported in Table 2.

Jones et al. (2005) also find no evidence of non-response bias in models of economic change and health in their analysis of the British Household Panel Survey (BHPS) and the European Community Household Panel (ECHP). In their review of the literature on cohort studies, Howe et al. (2013) report that although attrition is often most concentrated amongst the least advantaged and least healthy, several longitudinal studies show this creates only a minimal bias in exposure-outcome associations. Howe et al. (2013) consider the influence of attrition in the Avon Longitudinal Study of Parents and Children (ALSPAC), a longitudinal study that is very similar in design and population considered to the Lifeways study. In support of the results found in this analysis, they find that even with substantial non-response (>50%) in ALSPAC, qualitative inferences on the direction and approximate magnitude of economic effects were unchanged for most of their analysis.

Table 3 *Wave 1: Baseline Health Distributions for Leavers and Stayers*

	Leavers	Stayers	P-value
Health outcomes			
Self-rated health excellent or very good	61%	76%	0.107
Overweight	27%	29%	0.561
Obese	9%	8%	0.643
SWEMWBS linked to GHQ	14%	10%	0.228
SWEMWBS linked to CES-D	17%	9%	0.141
Health Behaviours			
Smoker	32%	19%	0.135
Daily number cigarettes consumed greater than the Irish national average	12%	7%	0.235
Regular smoker	29%	16%	0.027*
Consume Alcohol	60%	64%	0.606
Average number of drinks consumed on days when alcohol is drank	2.93 (3.96)	2.55 (2.84)	0.149
Exercise			
20 mins mild exercise per week	73%	71%	0.750
20 mins moderate exercise per week	66%	67%	0.802
20 mins strenuous exercise per week	27%	23%	0.408
Demographic Characteristics			
Age	28.12 (5.97)	31.21 (5.60)	0.000***
Number other children at baseline	1.14 (1.26)	1.05 (1.10)	0.403
Medical card	26%	13%	0.500
Marital Status			
Married	51%	72%	*0.243*
Cohabiting	17%	10%	0.252
Divorced	2%	1%	0.403
Widowed	1%	1%	0.319
Single/Never married	29%	16%	0.529
Education			
Primary school education	2%	1%	0.430
Some secondary school	20%	15%	0.107
Complete secondary education	33%	32%	0.796
Some third level education	24%	18%	0.143
Complete third level education	21%	34%	0.626
Economic Status			
Homemaker	24%	19%	0.000***
Unable to work owing to permanent sickness or disability	2%	2%	0.987
At school/student	4%	3%	0.005**
Seeking work for the first time	0%	0%	0.844
Employed	58%	65%	0.561
Unemployed	10%	6%	0.707
Self-employed	2%	5%	0.598
Local area unemployment			
Local area unemployment rates	7% (2)	7% (2)	0.680
N	418	681	

*Notes: The first two columns describe baseline characteristics for all mothers in wave 1, the third column includes the results of the logit models to determine if certain characteristics make mothers more likely to drop out of the study. The P-values describe if baseline characteristics had a statistically significant impact on the probability of leaving the sample after wave 1. * p<0.05, ** p<0.01, and *** p<0.001 as per Table 2.*

Table 4: Local area unemployment rates, health and behaviours: A complete case analysis

	Waves 1, 2, 3		Waves 1, 2		Waves 2, 3		Waves 1, 3	
	Coeff	Std. Errors	Coeff	Std. Errors	Coeff	Std. Errors	Coeff	Std. Errors
Self-Rated Health	-0.010†	0.005	0.009	0.021	-0.016**	0.006	-0.007	0.005
BMI: Overweight					0.003	0.009		
BMI: Obese					-0.008†	0.005		
Mental Health Scale: GHQ							0.013*	0.005
Mental Health Scale: CESD							0.031***	0.006
Cigarette Use			-0.026†	0.014				
Regular Smoker			-0.026†	0.013				
Daily N. Cigarettes Cons. > Nat. Average			-0.004	0.014				
Usually drinks alcohol in a typical week			-0.007	0.021				
Quantity Alcohol Cons. on days drinking			-0.161	0.138				
20 Minutes Mild Exercise per Week			0.083*	0.036				
20 Minutes Moderate Exercise per Week			-0.028	0.035				
20 Minutes Strenuous Exercise per Week			-0.065*	0.031				
N		422		643		422		460

Note: Coefficients are from unique linear probability fixed effects models. Analysis is analogous to Table 2, but the estimation sample only includes mothers who are in all waves of analysis. Control variables are included for education, age, baseline county and baseline parity. Standard errors are clustered at the mother's baseline county. The number of observations varies by the health behaviour or outcome considered. Standard errors are reported. † $p< .10$, * $p<0.05$, ** $p<0.01$, and *** $p<0.001$.

Table 5: Local area unemployment rates, health and behaviours: Inverse probability weights

	Waves 1, 2, 3		Waves 1, 2		Waves 2, 3		Waves 1, 3	
	Coeff	Std. Errors	Coeff	Std. Errors	Coeff	Std. Errors	Coeff	Std. Errors
Self-Rated Health	-0.009*	0.004	0.016	0.024	-0.015**	0.005	-0.004	0.005
BMI: Overweight					0.008	0.009		
BMI: Obese					-0.009*	0.003		
Mental Health Scale: GHQ							0.022*	0.011
Mental Health Scale: CESD							0.050***	0.012
Cigarette Use			-0.024†	0.014				
Regular Smoker			-0.021†	0.011				
Daily N. Cigarettes Cons. > Nat. Average			0.005	0.018				
Usually drinks alcohol in a typical week			0.001	0.027				
Quantity Alcohol Cons. on days drinking			-0.143	0.127				
20 Minutes Mild Exercise per Week			0.097*	0.038				
20 Minutes Moderate Exercise per Week			-0.035	0.036				
20 Minutes Strenuous Exercise per Week			-0.070*	0.034				
N	681		681		681		681	

Note: Coefficients are from unique linear probability fixed effects models. The estimation sample includes mothers who were in at least 2 of 3 waves. Analysis is analogous to Table 2, but inverse probability weights are applied. Control variables are included for education, age, baseline county and baseline parity. Standard errors are clustered at the mother's baseline county. The number of observations varies by the health behaviour or outcome considered. Standard errors are reported. † p< .10, * p<0.05, ** p<0.01, and *** p<0.001.

5.2 Local area unemployment as a macro-social indicator

It is possible that the local area unemployment rate is acting as a proxy for other latent macro-social characteristics of the area. This would suggest that the observed relationship between unemployment and health could be due to inherent, and non-recessionary, differences in area specific macro-social characteristics, i.e. innate levels of area specific deprivation or disadvantage. Although we control for local area fixed effects in our analysis, we further investigate the possibility that inherent, and non-recessionary, differences in area specific macro-social characteristics are driving the changes in health we observe by replacing the local area unemployment rate with another variable from the SAPS data, which should not influence changes in health. The total number of social housing units in the area as a percent of the total local housing stock at each wave is used. Social housing stock is relatively stable over time and, as state subsidised housing, is considered an indicator of latent deprivation (Taylor, 1998). If there is a relationship between the proportion of local area social housing and individual health, this would suggest that area-based deprivation affects changes in health rather than unemployment per say. In Table 6, fixed effects models are estimated similar to those reported in Table 2. The results show that local area social housing has no impact on mother's health and health behaviours at any of the timepoints. This falsification test provides little evidence of a concealed, non-recessionary, macro-social effect on health due to the fundamental characteristics of the local areas analysed, indicating that changes in health are not a result of innate levels of area specific deprivation or disadvantage.

Table 6: Health and behaviours with social housing as a macro-social indicator

	Waves 1, 2, 3		Waves 1, 2		Waves 2, 3		Waves 1, 3	
	Coeff	Std. Errors	Coeff	Std. Errors	Coeff	Std. Errors	Coeff	Std. Errors
Self-Rated Health	-0.031	0.021	-0.014	0.029	-0.024	0.054	-0.041	0.021
BMI: Overweight					0.007	0.046		
BMI: Obese					-0.002	0.031		
Mental Health Scale: GHQ							0.007	0.020
Mental Health Scale: CESD							0.041	0.028
Cigarette Use			-0.009	0.019				
Regular Smoker			-0.023	0.014				
Daily N. Cigarettes Cons. > Nat. Average			-0.006	0.027				
Usually drinks alcohol in a typical week			-0.002	0.019				
Quantity Alcohol Cons. on days drinking			-0.097	0.148				
20 Minutes Mild Exercise per Week			-0.012	0.042				
20 Minutes Moderate Exercise per Week			-0.037	0.033				
20 Minutes Strenuous Exercise per Week			-0.028	0.025				
N	681		681		681		681	

Note: Coefficients are from unique linear probability fixed effects models. The estimation sample includes mothers who are in at least 2 of the 3 waves. Analysis is analogous to Table 2 but the proportion of social housing in the local area is now the coefficient of interest. Control variables are included for education, age, baseline county and baseline parity. Standard errors are clustered at the mother's baseline county. The number of observations varies by the health behaviour or outcome considered. Standard errors are reported. † $p < .10$, * $p<0.05$, ** $p<0.01$, and *** $p<0.001$.

6. Discussion

A longitudinal study of Irish mothers measured before, during and after the recession of 2008 is used to estimate the impact of local area unemployment on health outcomes and behaviours. The results suggest that as local area unemployment rises both health and health behaviours change, although not always in the same direction. In particular, increases in unemployment are associated with significant increases in the probability of reporting poor self-rated health, poor mental well-being and mild exercise, and a decline in the probability of obesity, cigarette consumption and strenuous exercise.

We find that an additional unit of local area unemployment decreases the probability of reporting excellent or very good health by 1.1 and 1.6 percentage points respectively, obesity by 0.8 percentage points, consuming cigarettes by 2.6 percentage points, self-describing as a regular smoker by 2.6 percentage points and engaging in at least 20 minutes of strenuous exercise per week by 6.5 percentage points. The probability of poor mental well-being rises by 1.3 and 3.1 percentage points depending on the instrument used and the probability of engaging in at least 20 minutes of mild exercise per week rises by 8.3 percentage points.

It is useful to compare these results with findings from the literature, although much of this literature is based on the economic conditions of men in the US or those experiencing direct changes in employment. Ruhm (2000) finds that a one percentage point increase in the state unemployment rate reduces the probability of cigarette use by 0.30 percentage points. There are also declines in BMI, with the largest declines for the obese. In another study by Ruhm (2005), a one percentage point increase in state unemployment leads to a 0.08 and 0.17 percentage point reduction in female obesity and tobacco consumption respectively. Davalos and French (2011) find that increases in state unemployment during the 2001 US recession lead to declines in women's self-reported physical (1.0%) and mental (1.2%) health. Currie et al. (2015) similarly find that a 1 percentage point increase in mother's local unemployment rate is associated with a significant decrease in the probability of experiencing 'excellent' or 'very good' self-reported health. These studies are consistent with our findings of improvements in health behaviours and dis-improvements in physical and mental health among mothers as a result of the recession.

Macroeconomic changes may affect health outcomes and behaviours through multiple mechanisms, some of which act in opposite directions (Dávalos et al., 2012). For example, Ruhm (2000) suggests that declines in smoking, obesity and increases in physical activity following increases in local unemployment provides evidence that an individual's opportunity cost of time

changes with the macroeconomic environment, resulting in an increase in the amount of non-market time spent on lifestyle investments such as exercise, diet and smoking cessation (Ruhm, 2000, 2005). The literature also describes a labour supply disincentive for women who experience increased local unemployment (Bingley and Walker, 2001). While the percentage of mothers reporting unemployment in this sample is low and stays low across waves, the percentage reporting being employed falls after wave 1, with a corresponding rise in reporting being a homemaker. Conefrey (2011) finds that as unemployment increases during the Irish recession, there are associated declines in labour force participation, which he attributes to declines in the expected returns to the labour market. Lifeways mothers, cognisant of local labour market conditions, could similarly hold a lower expected return thus influencing their decision to become or remain a caregiver. Even if maternal employment preferences do not change, Bambra and Eikemo (2008) show that labour market opportunities for women are among the first to deteriorate as employment declines, due in part to their flexible employment histories. Thus, such mothers, unable to find employment, may substitute into the role of a caregiver, an option that is traditionally unavailable to their male partners (Garvey, 1988). Without adequate information on maternal employment preferences, however, the true significance of unemployment in the choice of the caregiver role is unclear. Regardless, mothers outside the labour market have a lower opportunity cost of non-market time to invest in healthier behaviours (Ásgeirsdóttir et al., 2014).

Likewise, most Lifeways mothers have a partner (92%). Previous research indicates that the father's role as a childcare provider changes across economic cycles (Juster & Stafford, 1991). Particularly, a model of family labour supply demonstrates that increases in national unemployment decreases the father's realised or expected returns to the labour market such that fathers provide significantly more time-intensive support in all aspects of childcare (Casper & O'Connell, 1998). This increased time investment by one caregiver is consistent with a greater availability of leisure time for the other. For mothers in our study, this may allow them to redirect their time towards healthier behaviours (Ruhm, 2000, 2005).

An income-effect may also explain our results, whereby reductions in income due to the recession causes the consumption of tobacco, food outside the home and strenuous exercise at the gym to decline (Neumayer, 2004). Lunn and Layte (2009) find significant declines in participation among women in exercise classes, sport and gym membership during the Irish recession, with related increases in milder physical activity, such as walking. They suggest that women substitute away

from costly strenuous exercise, towards milder activity with a lower cost during economic downturns. This supports our findings that changes in physical activity are occurring at the margins, although mild exercise increases, strenuous exercise declines.

Mothers in our sample are predominantly caregivers. Therefore, it is unlikely that they experienced income effects through direct changes in their employment. However, the extensive employment declines described in Figure 1 led to significant policy changes and major cuts in government expenditure (Bergin et al., 2013). The largest of these cuts were in familial, social supports including reductions in the universal cash transfers of child benefit and the early childcare supplement, the introduction of strict child benefit age limits, cuts to back-to-school clothing and footwear allowances, cuts to grants for schoolbooks and youth services, an increase in school transport fees, changes to lone-parent payments and a proposed taxation of child benefits (Barry and Conroy, 2013). As these transfers are typically paid directly to the mother, such reductions have a direct impact on their financial resources (Hick, 2014). UNICEF reports that in Ireland, these diminished child supports are essential components of familial wealth (Adamson, 2010). Indeed, following these cuts, Ireland experienced one of the most significant increases in child poverty among the OECD countries, with child poverty rising by over 10% and Irish child poverty ranked fifth highest of the 41 OECD countries (Fanjul, 2014).

Social benefit transfers have been declining since 2004 (Department of Employment Affairs and Social Protection, 2019). However, income effects on health are not limited to realised income loss. Expected income declines may also alter the marginal costs and benefits of health behaviours (Ruhm, 2000, 2003). Evidence shows that even for individuals who do not experience a reduction in income, anticipated declines in economic well-being can result in changes in health behaviours (Berkman & Kawachi, 2000; Grossman, 2000). Much like our analysis, Jofre-Bonet et al. (2018) find that in the years leading up to the UK recession, local employment declines had a negative income effect on health behaviours in women as the fear of economic deterioration reduced investments in health behaviours with an associated financial cost. Bunnings et al. (2017) find that as local employment falls, there are declines in men's perceived job-security with crossover effects on the health of their partner. Notably, these expected income effects are most significant in single-income couples where only the male partner is working, as is predominantly the case in the Lifeways sample. Changes in health behaviours at wave 2, when almost a third of all local areas had experienced increased unemployment, are consistent with this. The results of local employment change on health

behaviours prior to the recession may be interpreted as an indication that the mother's health behaviours responded to an expected or realised income effect.

Lunn and Layte (2009) indicate that although opportunity costs may drive participation in mild physical activity, the income effect dominates for strenuous activity which involves a cost. As our exercise categories are non-exclusive, this may suggest that as unemployment increases mothers change their exercises habits away from strenuous exercise, which most likely implies a cost, towards milder exercise which may be obtained for free. An income effect could similarly explain the observed decline in tobacco consumption, as could declines in the opportunity cost of time. The fall in obesity might similarly suggest that mothers spend more time preparing meals at home, and less financial resources on eating outside the home.

The effects of local unemployment on mothers' mental wellbeing is not unexpected given evidence linking regional unemployment to severe mental morbidities such as suicide. Reeves et al. (2012) find a significant increase in suicide rates with increased unemployment across the US and most European countries. As suicides are an uncommon outcome of mental distress, these studies likely underestimate the impact of recessions on mental wellbeing. However, studies by Antonakakis and Collins (2014, 2015) also find a relationship between fiscal austerity across the Eurozone and declines in mental wellbeing. Nixon et al. (2015) study Irish families with children of similar age to the Lifeways cohort, finding that welfare reductions increase mental strain in mothers and to a greater extent than their male partners. Notably, they find that decreases in social welfare transfers result in greater declines in maternal wellbeing than reductions in employment-related income. This may reflect the significance of these transfers for mothers, as described above (Adamson, 2010).

Another potential mechanism concerns societal change. Regional employment declines have been associated with a deterioration in people's perception of the quality of their residential environment, decreases in social cohesion and increases in local crime, which can have psychological effects on health (Hooghe et al., 2011; Patterson et al., 2004; Reeves et al., 2012). Stafford et al. (2005) find that these factors lead to declines in self-rated health as local unemployment increases. Jofre-Bonet et al. (2018) find that these mechanisms explain the relationship between local unemployment and declines in mental health. Both studies find that women's welfare is more strongly associated with features of their neighbourhood than men's. Stafford et al. (2005) suggest that the stronger associations for women may result from more time spent in the neighbourhood due to lower rates of labour-force participation and their role as caregiver in the family. They conclude that occupational

factors are most critical to men's health, while the residential environment is fundamental to women's health. Although social cohesion and perceptions on neighbourhood quality are difficult to measure in our data, an analysis of Irish employment and crime beginning in 2003 finds that for every 1% increase in the number unemployed, property crime (rates of burglary and theft) rises by 0.5%, which is consistent with this mechanism (Hargaden, 2016).

7. Conclusion

Our findings are in line with, the literature which suggests that the cumulative effects of recessions on health behaviours depends on the behaviour versus the economic and time cost of the behaviour and recession-induced changes in relative time and expenditure. This implies that recessions will reduce health behaviours that are cost intensive (tobacco consumption, eating outside the home and strenuous exercise at the gym, in exercise classes or sport) while increasing those which are time intensive (smoking cessation, a healthy diet and milder exercise) (Ásgeirsdóttir et al., 2014). This, coupled with the importance of psychological and community effects for self-perceived mental and physical health during recessions, may explain the contrasting health outcomes and behaviours we observe.

There are limitations to this study. Differences exist in when and how some of the outcome variables and covariates are measured. For example, mental health is measured using different scales in waves 1 and 3. To mitigate this we selected cut-off scores that indicate severely diminished mental-health. In addition, we do not have a reliable measure of household income or partner employment to test the hypothesis of household economic change. However, medical card ownership provides a suitable proxy as it is a means-tested social welfare provision. As medical card ownership increased across waves, more than doubling between waves 1 and 3, this suggests that households did become poorer over time (even though mothers' unemployment largely did not change).

A reliance on cross-sectional data and insufficient attention to populations with varying attachment to the labour market are weaknesses of the existing research. We analyse the relationship between the recent Irish economic crisis and health and health behaviours in an under analysed cohort of Irish mothers. We are aware of only one other longitudinal study on the health effects of recessions in mothers specifically (e.g. Currie et al. 2015), and none in the context of our research. The Irish recession was one of the worse in Europe, and its impact, as demonstrated by dramatic changes in local area unemployment, was universal. By exploiting it, this study illustrates the health implications of rapid economic expansion and contraction and contributes to the literature by

characterising a need for research that explores the relationship between changes in economic conditions and health in a European context.

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Appendix

Appendix A: Mental wellbeing

One of the most utilized instruments for the epidemiological screening of depression, the CES-D is a short self-reported scale composed of 20 items that cover the core components of mental well-being. CES-D has been cross-culturally adapted and validated across the globe (Fletcher, 2010). The GHQ-12 is a similar measure of current mental well-being and, since its development almost five decades ago, has been extensively employed internationally. Originally developed as a 60-item questionnaire, in the Lifeways Study the shortened 12 item version of the questionnaire was employed, which has been shown to be an equally consistent and reliable instrument with increased ease of application (Apouey, & Clark, 2015). The SWEMWBS is the shorter seven-item version of the original Warwick–Edinburgh Mental Well-being Scale (WEMWBS) and is a validated instrument to measure mental well-being on a population level. SWEMWBS is identical to this earlier scale, the only difference being that some items have been removed to ensure superior scaling properties and reduced participant burden, while preserving a model that is analogous to the WEMWBS (Fat et al., 2017).

Fat et al. (2017) confirm a high level of comparability between SWEMWBS and GHQ-12 scores. Although little research has been completed on the relationship between the SWEMWBS and CES-D scores, Donatella (2012), indicates a highly significant negative correlation between the original WEMWBS and CES-D scores, while the above research by Fat et al. (2017) also confirms that correlations between SWEMWBS and WEMWBS are very high and statistically significant, with a high level of comparability and internal agreement between the SWEMWBS and the WEMWBS scores. Logically this, and the fact that the SWEMWBS is actually embedded in the WEMWBS, suggests that correlations between WEMWBS and CES-D scores should translate into similarly high levels of correlation between SWEMWBS and CES-D scores.

SWEMWBS scores that are used in this analysis, and their comparability with GHQ-12 and CES-D scores, are informed by the previous literature and personal correspondence with those responsible for the creation of the WEMWBS and the SWEMWBS (N. Shah, personal communication, October 26, 2017). The authors of the SWEMWBS derive a three-category version of the SWEMWBS. Categories for SWEMWBS are: 'low': 7–19.3; 'medium': 20.0–27.0; and 'high': 28.1–35 (Fat et al., 2017). There are several cut off scores for the GHQ-12 depending on the scale used. For the

traditional GHQ scale advocated by the authors the max score is 12, with a score of cut-off of 2 or greater indicating poor mental health and a score of 6 indicating severely diminished mental health (Russ et al., 2012). For the CES-D a score of greater than or equal to 15 indicates any level of poor mental health, while a score of greater than 22 indicates severely diminished mental health (Radloff, 1977). To mitigate differences across scales we chose the cut-off scores that indicate severely diminished mental-health. This should increase the sensitivity of our measure to ensure that only mothers who experience definite declines in mental-health are included in the analysis. To reflect implicit differences across scales this measure is defined as an indicator of "mental well-being" in our analysis, rather than a precise measure of mental-health. The "low" SWEMWBS score, GHQ score of 6 and CES-D score of 22 are the cut-offs employed in this study. We harmonise the two independent wave 1 measures of mental well-being to the SWEMWBS measure in wave 3. Corresponding directions and magnitudes of the recessionary effect across scales provides evidence to support comparability across measures.

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