



**Understanding Society**

THE UK HOUSEHOLD LONGITUDINAL STUDY

# **Unemployment, Underweight and Obesity: Findings from UKHLS**

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## Overview of the presentation

From research recently published in *Preventive Medicine* (April 2017, pp.19–25)

- Background: unemployment and mortality
  - Previous work on the unemployment-adiposity relationship
  - The Data: Understanding Society
  - Measures
  - Statistical analysis
  - Results
  - Interpretation
  - Summary and conclusions
-



## Background

Unemployed people\* are at increased risk of mortality compared to employed controls (Roelfs, Shor et al 2011)

\*International Labour Organization definition of unemployment: the state of being in the labour force and available for work, but currently without work(ILO 1982)

Distinct from broader non-employment (including retired people, students, people out of the labour force due to sickness...)

Mechanisms involved are complex, but explanations can be broadly categorised into three groups

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## 1. 'Selection' into unemployment by factors which lead to increased mortality risk

- Socioeconomic background: unemployment disproportionately affects more disadvantaged individuals (Montgomery, Bartley et al. 1996)
- Pre-existing poor health: may increase chance of job loss/reduce chance of re-employment(Schmitz 2011)

## 2. Direct physiological effects of stress

- Chronic stress is an established risk factor for cardiovascular disease (Steptoe and Kivimaki 2012)
  - Unemployment represents a substantial source of stress for both financial and non-financial reasons (Jahoda 1981; Warr 1987)
  - Some evidence for elevated 'stress pathways' linked to cardiovascular health during unemployment (Hughes, McMunn et al. 2015)
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3. Unemployment increases mortality risk by causing changes in health-related behaviours (smoking, alcohol consumption, diet and exercise)

- As a result of financial restriction
- In response to stress: the 'coping hypothesis' (Roelfs, Shor et al. 2011)

This paper focuses on a possible pathway via changes in adiposity - i.e., fatness or thinness (Body mass index, BMI)

Obesity is a major public health focus: risk factor for heart disease, stroke, diabetes, and some cancers (WHO 2016)

→ A plausible mediator of unemployment-mortality associations

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Previous studies into unemployment and adiposity have been strikingly mixed

- Increase in weight with unemployment, but gender specific (Marcus 2014; Monsivais, Martin et al. 2015) or dependent on pre-unemployment body mass index (Deb, Gallo et al. 2011; Marcus 2014)
- Fall in BMI/BMI ranking with unemployment, possibly gender-specific (Montgomery, Cook et al. 1998; Jonsdottir and Asgeirsdottir 2014)

Studies typically use linear regression methods to compare average BMI/BMI change (Schunck and Rogge 2010; Jonsdottir and Asgeirsdottir 2014; Monsivais, Martin et al. 2015)

- Reflects current focus in public health research on obesity as public health crisis
  - Assumes any effects in the direction of weight loss are negligible
  - May not be justified for a population experiencing severely restricted income
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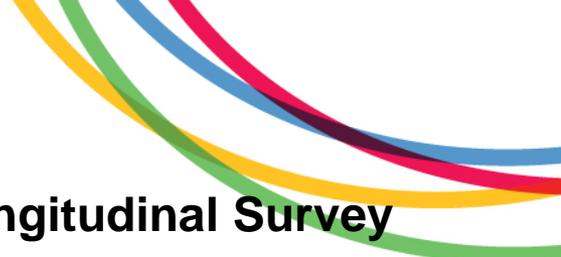


Previously overlooked 'U-shaped' association, with increased obesity and underweight?

Public health researchers don't really think about underweight in high-income countries

U-shape plausible because:

- Would mirror U-shape relationship of BMI with mortality (Aune, Sen et al. 2016)
  - Both underweight and obesity are associated with psychosocial stress, of which unemployment is an established source (Jahoda 1981; Warr 1987)
  - Precedent for bidirectional BMI response to psychosocial stress: job strain predicted weight gain for men in the highest quintile of BMI, weight loss for men in the lowest quintile of Whitehall II (Kivimaki, Head et al. 2006)
  - We investigated whether a 'U-shaped' association exists of BMI and unemployment, which could explain inconsistent results so far
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## The Data: Understanding Society, The UK Household Longitudinal Survey

A household panel survey of >40,000 UK Households

Began in 2009, subsequent annual waves of data collection

Comprises two distinct sample components:

- A larger, nationally representative General Population Sample (75.6%)
- A smaller component of participants from the pre-existing British Household Panel Survey (24.4%)

Biomedical visit including BMI measurement and blood sample collection occurred five months after wave 2 (GPS participants) or wave 3 (BHPS participants)

BMI measurements taken Spring 2010-Summer 2012

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2009				2010				2011				2012				2013			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Wave 1 annual interview – GPS subsample only																			
Incorporation of British Household Panel Survey 				Wave 2 annual interview (GPS participants)															
				Wave 2 annual interview (BHPS participants)															
				Nurse visit (GPS subsample)															
								Wave 3 annual interview (GPS subsample)											
								Wave 3 annual interview (BHPS participants)											
										Nurse visit (BHPS subsample)									
												Wave 4 annual interview (all participants)							



## The sample

Nurse visit subsample of Understanding Society: 20,699 participants aged 16+ from England, Wales and Scotland

Restricted to people aged 22-64

Excluded people not working due to sickness/disability

Exclusions for missing data, final N=10,737

Mean follow-up/exposure period was 17 months

- Exposure period begins with entry into UKHLS (W1 interview for GPS, W2 interview for BHPS)
- Ends at measurement of BMI, 5 months after W2/W3

At BMI measurement, 5.2% currently unemployed

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## Measures

### Unemployment

At every annual interview, detailed information on current employment and former employment since previous year's interview

Participants chose from a list: self-employed; in paid employment (full or part time); unemployed; retired; on maternity leave; looking after family or home; full-time student; long-term sick or disabled....

The nurse visit fell between two annual waves, so employment reports from the annual interviews either side used to determine employment status at BMI measurement itself

Unemployment groups classified as:

- Not unemployed during follow-up (reference group in all models)
  - Formerly unemployed during follow-up
  - Currently unemployed at BMI measurement
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To investigate unemployment duration:

- Currently unemployed participants split at  $<10/\geq 10$  months
  - Only possible for the 75.1% of currently unemployed participants with this information
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## Adiposity

Objectively measured as Body Mass Index: weight in kg/(height in metres)<sup>2</sup>

Calculated from height and weight measurements taken by a trained nurse according to standard procedures (McFall, Petersen et al. 2014)

BMI was classified using WHO categories of recommended weight (18.5–24.9), overweight (25.0–29.9), obesity ( $\geq 30$ ), or underweight ( $< 18.5$ )

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## Covariates (controls)

- Age, gender
- Highest educational qualification
- Self-reported long-term illness
- General Health Questionnaire score
- Smoking (never/ex-/current,  $\leq 10$ /day/current, 11–20/day/current,  $\geq 21$ /day)
- Physical activity measures:
  - Frequency of leisure-time physical activity (never, <once a week, 1–3 times per week, or > 3 times per week)
  - walking frequency measure: how often in the past month participants had walked for 10 min continuously (never/one day in four/2–3 days in four/more often)

Robustness check for alcohol consumption (substantial extra missingness)

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## Covariates (modifiers)

- Age
- Gender
- Equivalized household income
- Smoking status

Where interaction terms significant, stratum-specific results calculated

Covariates came from the annual wave immediately preceding the nurse visit (age, gender, education, long-term illness, equivalised household income)

Smoking, physical activity, alcohol consumption came from W2 for all participants

- 5 months before BMI measurement/start of the follow-up period for GPS/BHPS component respectively
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## Statistical Analysis:

Multinomial logistic models with recommended weight (BMI 18.5-24.99) as the reference. Normal logistic models:

- calculate within groups (e.g., by employment status) the 'odds' for an outcome (e.g. obesity)
- In each group: number of obese people/non-obese people  $N_{\text{obesity}}/(1-N_{\text{obesity}})$
- The odds in different groups are compared by dividing one by the other → an odds ratio
- Represents, as a ratio, the excess likelihood of the outcome in one group vs the other

Multinomial logistic models: simultaneous comparison between groups of multiple, mutually exclusive outcomes, compared to a common reference outcome

Allows comparison of the excess likelihood that an unemployed person is any other weight status than 18.5-24.99

Inverse-probability weights applied to all models to account for non-response

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# RESULTS



**Table 1: UKHLS participants at BMI measurement in 2010-12 (weighted proportions, analytic sample) stratified by unemployment. N=10,737**

<i>Unemployment categories</i>		Not during follow-up	Formerly unemployed	Currently unemployed
		N=9629	N=550	N=558
		%	%	%
Age (years)	22-35	29.1	48.1	41.2
	36-50	36.7	28.0	29.7
	51-65	34.2	24.0	29.1
Sex	Male	43.3	50.3	57.2
	Female	56.7	49.7	42.8
BMI (kg/m <sup>2</sup> ) categories	Recommended weight (18.5-24.99)	31.8	30.5	33.0
	Overweight (25.0-29.99)	37.8	39.1	28.4
	Obesity (≥30)	29.7	28.3	34.6
	Underweight (<18.5)	0.7	2.0	3.9
Highest educational qualification	Degree/ higher degree	42.8	32.8	21.6
	A-level	20.5	19.8	18.4
	O-level	21.2	28.6	23.1
	Other qualification	8.9	9.3	17.9
	No qualification	6.6	9.4	19.0
Long-term illness	No	72.1	71.4	61.5
	Yes	27.9	28.6	38.5
GHQ score	0-3	83.3	76.1	66.3
	4+	16.7	23.9	33.7

**Table 1, continued: UKHLS participants at BMI measurement in 2010-12 (weighted proportions, analytic sample) stratified by unemployment. N=10,737**

<i>Unemployment categories</i>		Not during follow-up N=9629	Formerly unemployed N=550	Currently unemployed N=558
		%	%	%
Smoking	Never	43.3	34.8	30.2
	Ex	36.8	30.3	20.2
	Current, ≤10/day	10.3	18.8	23.3
	Current, 11-20/day	8.4	14.1	20.4
	Current, >20/day	1.3	2.1	5.9
Frequency of moderate leisure-time activity	Never	25.5	29.0	46.3
	<1/week	35.9	37.3	27.0
	1-3 times/week	22.1	18.9	13.6
	>3 times/week	16.6	14.8	13.1
Frequency of walking for 10 minutes continuously	Never	10.0	9.1	12.5
	1 day in 4	22.4	22.4	19.3
	>1, ≤3 days in 4	30.7	28.4	29.1
	>3 days in 4	36.8	40.1	39.0
Frequency of alcohol consumption in past 7 days	Not at all	24.1	25.3	30.2
	1-2 days	35.2	36.0	31.3
	3-4 days	19.9	17.2	13.7
	≥5 days	14.2	11.7	12.1
	Missing	6.6	9.7	12.7



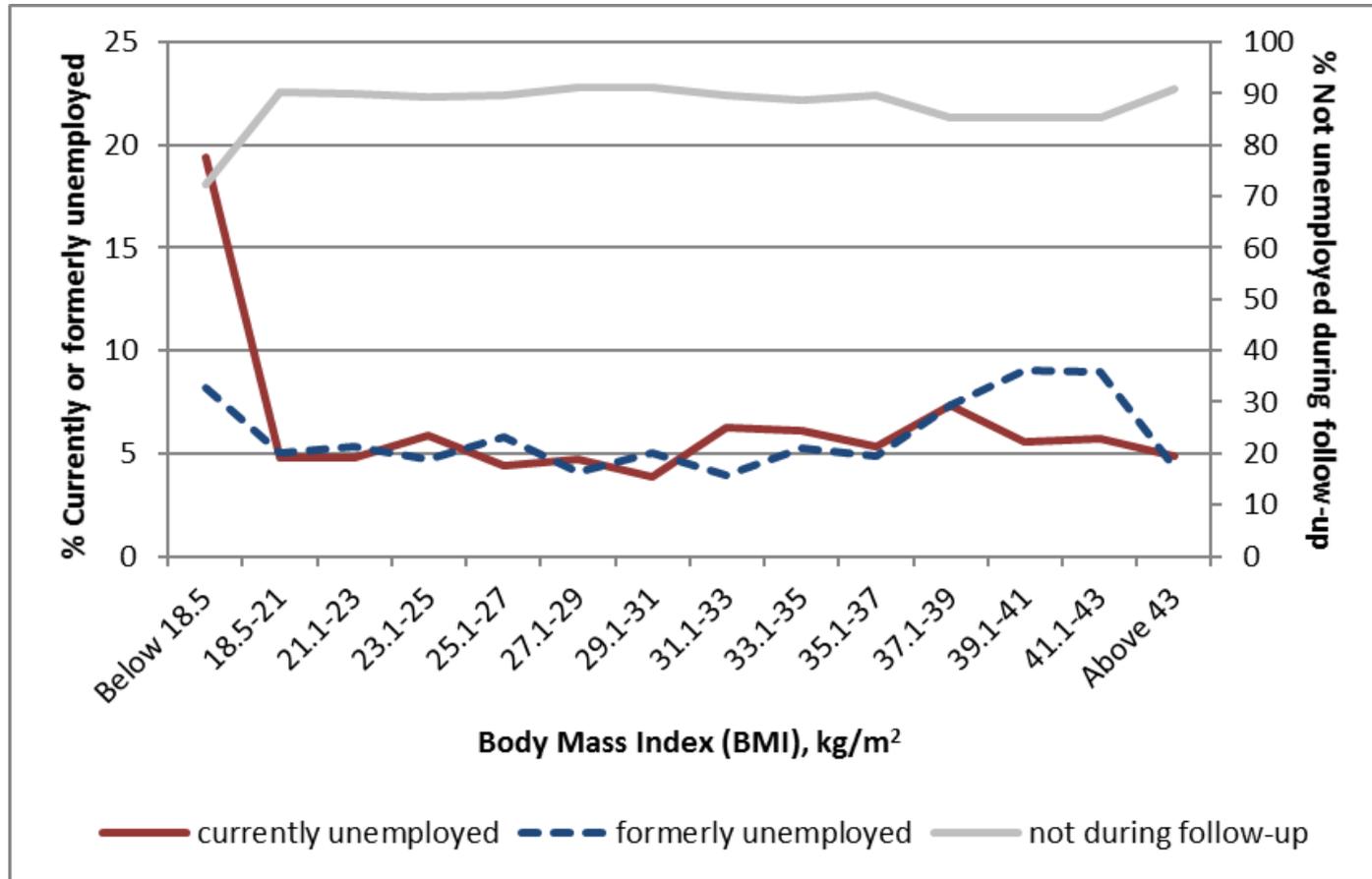
Association of current unemployment with adiposity was not supported by models assuming unidirectional effects:

- Linear model, unemployment predicting BMI (coeff.:  $-0.30$ , CI:  $-0.90-0.31$ )
- Logistic model, unemployment predicted obesity (OR:  $1.15$ , CI:  $0.92-1.43$ )

However, significant overall non-linearity of the BMI-unemployment relationship

- $p=0.004$  for quadratic term of centred BMI in model with unemployment as outcome
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Figure 1: Distribution of unemployment by BMI in the sample (unadjusted)





## Adjusted results from multinomial logistic models

In age- and gender-adjusted models, currently unemployed participants were:

- More likely to be underweight: odds ratio of 4.68
  - Less likely to be overweight: odds ratio of 0.72
  - Effect size for underweight reduced slightly in fully-adjusted models, but still both significant and substantial
  - No differences for obesity
  
  - Formerly unemployed participants somewhat more likely to be underweight, more likely to be overweight, but effects were weaker and did not reach significance
  - Again, no obesity differences
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## Adjusted results from multinomial logistic models

**Table 2: Associations of Body Mass Index (BMI) with unemployment among UKHLS participants in 2010-12 (N=10,737)**

Adjustment level	Age and gender		Age, gender, education, LTI <sup>a</sup> and GHQ <sup>b</sup>		Age, gender, education, LTI and GHQ, smoking, physical activity	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
<i>Underweight (BMI &lt; 18.5 kg/m<sup>2</sup>)</i>						
Formerly unemployed	2.32	0.95, 5.67	2.24	0.91, 5.56	2.05	0.81, 5.17
Currently unemployed	4.68	2.59, 8.46	4.57	2.40, 8.72	4.05	2.12, 7.73
<i>Overweight (BMI 25.0-25.99 kg/m<sup>2</sup>)</i>						
Formerly unemployed	1.19	0.92, 1.53	1.16	0.90, 1.49	1.18	0.91, 1.52
Currently unemployed	0.72	0.56, 0.93	0.68	0.53, 0.88	0.71	0.55, 0.92
<i>Obesity (BMI ≥ 30.0 kg/m<sup>2</sup>)</i>						
Formerly unemployed	1.16	0.89, 1.50	1.02	0.79, 1.33	1.07	0.82, 1.39
Currently unemployed	1.19	0.93, 1.53	0.93	0.72, 1.20	1.00	0.77, 1.30

<sup>a</sup> LTI: Long-term illness, <sup>b</sup>GHQ: General Health Questionnaire score

Addition of alcohol consumption (frequency or heaviness) doesn't affect much



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## Addition of alcohol consumption (frequency or heaviness) doesn't affect much

**Table 3: Addition of alcohol to fully-adjusted<sup>a</sup> models of Body Mass Index (BMI) and unemployment among UKHLS participants in 2010-12**  
**Frequency of drinking in past 7 days (N=10,040)**

<i>Underweight (BMI&lt;18.5kg/m<sup>2</sup>)</i>	Odds Ratio	95%CI
Formerly unemployed	2.42	0.92,6.37
Currently unemployed	4.91	2.51,9.61
<i>Overweight (BMI 25.0-25.99 kg/m<sup>2</sup>)</i>	Odds Ratio	95%CI
Formerly unemployed	1.25	0.95,1.64
Currently unemployed	0.72	0.55,0.95
<i>Obesity (BMI≥30.0 kg/m<sup>2</sup>)</i>	Odds Ratio	95%CI
Formerly unemployed	1.17	0.88,1.55
Currently unemployed	0.95	0.72,1.26
<b>Maximum units consumed on a single day of past 7 days (N=9847)</b>		
<i>Underweight (BMI&lt;18.5kg/m<sup>2</sup>)</i>	Odds Ratio	95%CI
Formerly unemployed	2.42	0.91,6.40
Currently unemployed	4.97	2.50,9.85
<i>Overweight (BMI 25.0-25.99 kg/m<sup>2</sup>)</i>	Odds Ratio	95%CI
Formerly unemployed	1.19	0.91,1.56
Currently unemployed	0.76	0.58,1.00
<i>Obesity (BMI≥30.0 kg/m<sup>2</sup>)</i>	Odds Ratio	95%CI
Formerly unemployed	1.13	0.86,1.49
Currently unemployed	0.99	0.74,1.31

<sup>a</sup>Adjusted for age, gender, education, long-term illness, General Health Questionnaire score, smoking status, physical activity

## Results of models investigating impact of unemployment duration

Effects driven by longer-term unemployed people ( $\geq 10$  months)

Excess underweight and decreased overweight more extreme in the long-term unemployed group than shorter-term unemployed group

After full adjustment:

- ORs for underweight were 2.44 in short-term group, 5.76 in long-term groups
  - ORs for overweight were 0.86 in short-term group, 0.59 in long-term groups
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**Table 4: Associations of Body Mass Index (BMI) with unemployment among UKHLS participants in 2010-12, by unemployment duration (N=10,598)**

<b>Model 1: Age and sex</b>	<b>Age and gender</b>		<b>Age, gender, education, <sup>a</sup>LTI, <sup>b</sup>GHQ</b>		<b>Age, gender, education, LTI, GHQ, smoking, physical activity</b>	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
<i>Underweight (BMI&lt;18.5 kg/m<sup>2</sup>)</i>						
Formerly unemployed	2.32	0.95,5.66	2.25	0.91,5.56	2.06	0.82,5.18
Current, <10 months	2.80	0.77,10.12	2.73	0.77,9.65	2.44	0.68,8.78
Current, ≥10 months	6.89	3.47,13.68	6.67	3.07,14.50	5.76	2.61,12.68
<i>Overweight (BMI 25.0-25.99 kg/m<sup>2</sup>)</i>						
Formerly unemployed	1.19	0.92,1.53	1.16	0.89,1.49	1.17	0.91,1.52
Current, <10 months	0.87	0.54,1.39	0.84	0.52,1.35	0.86	0.54,1.39
Current, ≥10 months	0.61	0.43,0.86	0.56	0.39,0.80	0.59	0.41,0.84
<i>Obesity (BMI≥30.0 kg/m<sup>2</sup>)</i>						
Formerly unemployed	1.16	0.90,1.50	1.02	0.79,1.33	1.06	0.82,1.39
Current, <10 months	1.18	0.70,1.97	1.04	0.61,1.77	1.10	0.66,1.85
Current, ≥10 months	1.08	0.76,1.52	0.82	0.57,1.17	0.90	0.63,1.29

<sup>a</sup>LTI: Long-term illness, <sup>b</sup>GHQ: General Health Questionnaire score

## Models investigating modifying factors (effect heterogeneity)

Significant interactions for gender, household income and smoking, but not age

Group-specific estimates by gender, income and smoking show that:

- Increased underweight among currently unemployed stronger for men (though still apparent for women)
  - Decreased overweight among currently unemployed stronger for men (not significant for women)
  - Increased underweight among currently unemployed entirely driven by jobseekers from poorer households
  - Decreased overweight among currently unemployed entirely driven by jobseekers from poorer households
  - Increased underweight among currently unemployed stronger for smokers but still apparent for non-smokers
  - Smoking modified direction of associations with obesity: unemployed non-smokers more likely to be obese, unemployed smokers less likely to be obese
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# Significant interactions for gender, household income and current smoking

Table 5: Fully-adjusted <sup>a</sup> associations of Body Mass Index (BMI) with current unemployment among UKHLS participants in 2010-12, stratum-specific estimates					
SUBGROUP BY					
Gender		Men N(unemployed)=305		Women N(unemployed)=253	
		Odds Ratio	95% CI	Odds Ratio	95% CI
	<i>Underweight</i>	5.99	2.27-15.80	2.81	1.17-6.75
	<i>Overweight</i>	0.58	0.41-0.82	0.94	0.65-1.35
	<i>Obesity</i>	0.87	0.60-1.24	1.18	0.82-1.70
Household income		Above median N(unemployed)=90		Below median N(unemployed)=468	
		Odds Ratio	95% CI	Odds Ratio	95% CI
	<i>Underweight</i>	0.0 <sup>b</sup>		3.79	1.88-7.63
	<i>Overweight</i>	1.56	0.85-2.89	0.69	0.52-0.92
	<i>Obesity</i>	1.54	0.77-2.34	0.98	0.74-1.30
Current smoking		No N(unemployed)=282		Yes N(unemployed)=276	
		Odds Ratio	95% CI	Odds Ratio	95% CI
	<i>Underweight</i>	4.76	1.96-11.55	2.96	1.21-7.27
	<i>Overweight</i>	0.84	0.58-1.20	0.77	0.54-1.10
	<i>Obesity</i>	1.52	1.06-2.18	0.67	0.46-0.98
Underweight: BMI<18.5kg/m <sup>2</sup> , Overweight: BMI 25.0-25.99 kg/m <sup>2</sup> , Obesity: BMI≥30.0 kg/m <sup>2</sup>					
<sup>a</sup> Adjusted for age, gender, education, long-term illness, General Health Questionnaire score, smoking status (except smoking-stratified analyses), physical activity					
<sup>b</sup> An odds ratio could not be calculated, since not a single underweight unemployed person came from a household above median income					

## Interpretation

Linear regression with BMI, logistic model for obesity risk found no differences between employment groups

Multinomial models support a U-shaped relationship

- ↑ obesity among non-smoking jobseekers are consistent with studies reporting weight gain following unemployment (Monsivais et al., 2015; Marcus, 2014 ; Deb et al., 2011).
- ↑ underweight, ↓ overweight among all jobseekers consistent with studies suggesting weight loss following unemployment (Montgomery et al., 1998; Jonsdottir and Asgeirsdottir, 2014).

‘Dose-response’ pattern: underweight and overweight effects driven by longer-term jobseekers

Suggests excess underweight and excess obesity may have masked each other in previous studies → multiple groups at risk of adverse health outcomes obscured

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Reflect a non-linear effect of unemployment on BMI?

- Results accord with evidence suggesting a) psychosocial stress and b) financial restriction could have heterogeneous effects on energy balance

Heterogeneity in impact of unemployment on in energy intake:

- Tendency towards 'stress eating' varies considerably between individuals, attributed to both psychological and genetic factors (Schepers and Markus, 2015)
- Energy-dense, nutrient-poor foods deliberately chosen to stretch a restricted food budget (Drewnowski and Specter, 2004)
- UK's Low Income Diet and Nutrition Survey: low-income men had lower overall energy intake than general population(Nelson, Erens et al. 2007)

→ a severely restricted income can lead to less food being consumed overall

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Heterogeneity in impact of unemployment on in energy expenditure:

British Time Use Survey: participants not in employment more likely to engage in active transport and less likely to have access to a car(Adams 2010)

Reduced overweight and increased underweight among jobseekers not explained by addition of physical activity to models.

- Measures available were crude; may not adequately capture caloric expenditure
  - Or, could indicate associations are driven by differences in energy intake
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Reflect a non-linear impact of BMI on likelihood of unemployment?

1. Obesity effect among non-smokers:

Negative impacts of obesity on employment participation:

- Discrimination by employers against obese candidates (Puhl and Heuer, 2009)
- obesity-associated health problems (Dackehag et al., 2015)

Analyses often use an outcome of any non-employment, including due to ill-health, where a sizeable impact of obesity-associated health problems is unsurprising (Larose et al., 2016; Greve, 2008).

Determinants (and consequences) of unemployment and disability may differ substantially

- Such an approach may conflate distinct processes
  - A recent study which separated non-employment types supports an impact of obesity on disability, but not unemployment (Kinge, 2016)
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## 2. Underweight effect (smokers and nonsmokers)

Chronic illness associated with underweight (Aune et al., 2016) could influence job loss/re-employment

Adjustment for chronic illness, depressive/anxiety symptoms will have minimised such 'health-selection'

This is conservative, given likely impact of unemployment on depressive/anxiety symptoms (Paul and Moser, 2009)

→ may have over-adjusted with respect to effects on BMI mediated by mental health

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Since pre-unemployment BMI is not known, residual health selection and employer discrimination cannot be ruled out.

However, a causal effect of BMI on unemployment cannot easily explain:

3. Decreased overweight among jobseekers (smokers and nonsmokers)

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## Modification effects

Increased underweight, reduced overweight not seen for more affluent jobseekers

→ household income buffers against weight-loss impacts of unemployment?

Non-smoking jobseekers more likely to be obese, smoking jobseekers less likely

→ widespread smoking among jobseekers may, despite numerous health risks, be protective against obesogenic effects of unemployment

- Appetite-suppressing effects of nicotine (Audrain-McGovern and Benowitz, 2011 ; Mineur et al., 2011)
- Smoking raises resting metabolic rate (Audrain-McGovern and Benowitz, 2011)

However, it may also reflect competing priorities between tobacco, food, and other essentials in the context of a severely restricted budget

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## Gender modification

Increased underweight and decreased overweight of jobseekers was more apparent for men

Consistent with recent UK study of obesity and different non-employment outcomes: in an SA, increased underweight among male jobseekers only (Kinge, 2016)

Results are consistent with literature on unemployment and mortality reporting stronger associations for men (Roelfs et al., 2011a), may reflect:

- Smaller impact of women's own unemployment on living standards (men typically contribute more to household income than female partners)
  - The 'homemaker role' may provide women with a legitimate alternative identity during unemployment, reducing psychologically-mediated health impacts (Paul and Moser, 2009)
    - Applies to women who self-describe as unemployed, since women often occupy multiple roles (McMunn et al., 2006)
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## Limitations

We made adjustments for confounding factors such as long-term illness, educational qualifications, mental health

However: cross-sectional data: do not know pre-unemployment BMI

- Implicated by previous studies as an important modifier
- Impact of BMI on unemployment cannot be definitively ruled out (although the negative overweight association not easily explained this way)

Information on smoking, drinking, and physical activity measures came from wave 2 (5 months before BMI measurement for GPS participants, baseline for BHPS participants)

- Ideally, would have multiple measurements in these also, to track change during unemployment

Histories were 17 months: results implicate duration of unemployment as a key factor, but the impact of longer unemployment spells could not be investigated

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Partial information on benefits; have not (yet) incorporated benefits into the picture

- Annual 'snapshots'
- No information on benefit sanctions
- No information on foodbank use



Associations of unemployment with other aspects of health modified by welfare policies (Bambra and Eikemo 2009)

Our study uses data from 2010-12. Since then:

- New JSA sanctions regime was introduced end of 2012, subsequent rise in sanctions (DWP 2013)
- Linked to foodbank use (Loopstra, Fledderjohann et al. 2016)

Changes introduced from April 2013, following Welfare Reform Act:

- cap on household benefits; abolition of council tax benefits; removal of the spare room subsidy/‘bedroom tax’; rollout of Universal Credit

Reduction in housing benefit linked to ↓ mental health (Reeves, Clair et al. 2016)

Qualitative study of spare room subsidy removal: negative impact on mental health, ability to meet basic needs including food (Moffatt, Lawson et al. 2016)

Suggests if we repeated this analysis now, effects could be different

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## Summary and conclusions

In a large UK sample 2010-12, unemployment was positively associated with underweight and negatively associated with overweight

Effects more apparent for longer-term jobseekers, men, and jobseekers from lower-income households

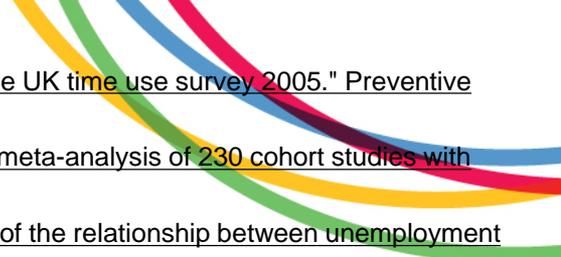
Unemployment was positively associated with obesity among non-smokers, but negatively associated with obesity among smokers

Results identify groups especially vulnerable to both underweight and obesity during unemployment

Failure of previous studies to document non-linear effects may have caused systematic underestimation of a key pathway linking unemployment with chronic disease and mortality

Longitudinal work considering pre-unemployment BMI, heterogeneity in effects between demographic groups, and benefit receipts, is now needed

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