

1 **Supplement 1 – Dietary behaviours**

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3 **Table S1 - Dietary behaviours (% (n))**

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	Male	Female	Overall
Sugary drinks			
Never/Occasionally	76.4 (2396)	80.4 (3543)	78.7 (5939)
1-3 times a week	15.1 (475)	12.5 (553)	13.6 (1028)
4-6 times a week	3.7 (117)	3.0 (131)	3.3 (248)
Daily	4.0 (125)	3.6 (158)	3.8 (283)
More than once a day	0.7 (23)	0.5 (23)	0.6 (46)
Wholemeal bread			
Never/Occasionally	26.2 (923)	22.1 (974)	23.8 (1797)
1-3 times a week	27.9 (876)	34.9 (1539)	32.0 (2415)
4-6 times a week	19.9 (623)	20.2 (892)	20.1 (1515)
Daily	22.8 (715)	20.9 (921)	21.7 (1636)
More than once a day	3.2 (99)	1.9 (82)	2.4 (181)
Fruit servings/day			
0	6.5 (205)	4.4 (194)	5.3 (399)
1	26.8 (841)	19.7 (870)	22.7 (1711)
2-3	48.7 (1526)	54.9 (2420)	52.3 (3946)
4-5	13.5 (424)	16.5 (729)	15.3 (1153)
6+	4.5 (140)	4.4 (195)	4.4 (335)
Vegetable servings/day			
0	2.2 (68)	1.3 (57)	1.7 (125)
1	20.7 (650)	14.3 (630)	17.0 (1280)
2-3	64.1 (2009)	66.7 (2939)	65.6 (4948)
4-5	11.1 (349)	15.3 (673)	13.5 (1022)
6+	1.9 (60)	2.5 (109)	2.2 (169)
Overall diet quality			
Mean (SD)	12.84 (2.15)	13.14 (1.96)	13.01 (2.05)

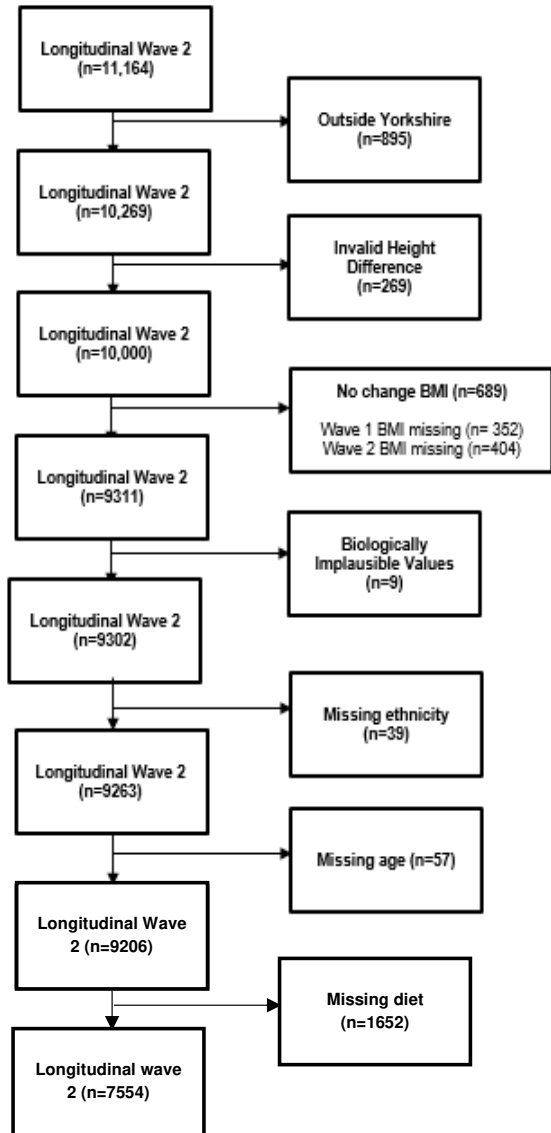
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6 **Supplement 2 - Flow of participants**

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8 **Figure S2.1:** Flowchart of participants: reasons for exclusions

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19 **Supplementary 3:**

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21 **Table S3.1** - Sensitivity analysis between; (i) original sample (n=11,164); (ii) those with valid dietary

22 data (n=7,554).

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	Incomplete diet data (n=7554)	Original data (n=11,164)
Age (mean (SD))	59.65 (14.20)	61.19 (14.75)
<i>Missing</i>	0.00 (0)	2.43 (271)
Gender		
Male	41.60 (3136)	43.1 (4809)
Female	58.40 (4408)	56.90 (6355)
BMI (mean (SD))	26.33 (4.71)	26.41 (5.23)
<i>Missing</i>	0.00 (0)	0.00 (0)
Weight status		
Underweight	1.00 (75)	1.20 (129)
Healthy weight	43.10 (3248)	40.70 (4542)
Overweight	38.10 (2871)	36.70 (4097)
Obese	17.90 (1350)	17.40 (1947)
<i>Missing</i>	0.00 (0)	4.00 (449)
Long standing health condition		
Yes	64.60 (4872)	62.20 (6943)
No	35.40 (2672)	35.00 (3908)
<i>Missing</i>	0.00 (0)	2.80 (313)

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34 **Supplement 4:** Direct, indirect, and total effects from SEM models (*due to the small effect of some
 35 effects data are reported to three decimal places)

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37 **Sensitivity analysis 1** - fast-food (independent variable), body mass index as the outcome and diet
 38 as the mediator.

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40 **Table S4.1** - Direct effects

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	Coef.	Std. Err.	P	Std. Coef.
Structural				
Dietary quality <- Fast-food outlets	-0.001	0.002	0.494	-0.008
BMI <-				
Dietary quality	-0.197	0.027	0.000	-0.086
Fast-food outlets	-0.033	0.006	0.000	-0.070
Area-level deprivation	0.048	0.004	0.000	0.152
Age	0.018	0.004	0.000	0.054
Gender	-0.354	0.108	0.001	-0.037
Long standing condition	1.537	0.116	0.000	0.156

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43 **Table S4.2** - Indirect effects

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	Coef.	Std. Err.	P	Std. Coef.
Structural				
Dietary quality <- Fast-food outlets		(no path)		
BMI <-				
Dietary quality		(no path)		
Fast-food outlets	0.000	0.000	0.496	0.000
Area-level deprivation		(no path)		
Age		(no path)		
Gender		(no path)		
Long standing condition		(no path)		

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46 **Table S4.3** - Total effects

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	Coef.	Std. Err.	P	Std. Coef.
Structural				
Dietary quality <- Fast-food outlets	-0.001	0.002	0.494	-0.008
BMI <-				
Dietary quality	-0.197	0.027	0.000	-0.086
Fast-food outlets	-0.034	0.006	0.000	-0.069
Area-level deprivation	0.048	0.004	0.000	0.153
Age	0.018	0.004	0.000	0.054
Gender	-0.354	0.108	0.001	-0.037
Long standing condition	1.537	0.116	0.000	0.156

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50 **Sensitivity analysis 2** - Area-level deprivation (independent variable), BMI as the outcome and fast-
 51 food outlets as the mediator.

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Table S4.4 - Direct effects

	Coef.	Std. Err.	P	Std. Coef.
Structural				
Fast-food outlets <-				
Area-level deprivation	0.099	0.007	0.000	0.152
BMI <-				
Fast-food outlets	-0.035	0.006	0.000	-0.074
Area-level deprivation	0.051	0.004	0.000	0.162
Age	0.010	0.004	0.009	0.031
Gender	-0.442	0.107	0.000	-0.046
Long standing condition	1.578	0.116	0.000	0.160

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Table S4.5 - Indirect effects

	Coef.	Std. Err.	P	Std. Coef.
Structural				
Fast-food outlets <-				
Area-level deprivation		(no path)		
BMI <-				
Fast-food outlets		(no path)		
Area-level deprivation	-0.004	0.001	0.000	-0.011
Age		(no path)		
Gender		(no path)		
Long standing condition		(no path)		

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Table S4.6 - Total effects

	Coef.	Std. Err.	P	Std. Coef.
Structural				
Fast-food outlets <-				
Area-level deprivation	0.098	0.007	0.000	0.152
BMI <-				
Fast-food outlets	-0.036	0.006	0.000	-0.073
Area-level deprivation	0.048	0.004	0.000	0.151
Age	0.010	0.004	0.009	0.031
Gender	-0.442	0.107	0.000	-0.046
Long standing conditions	1.579	0.116	0.000	0.160

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66 **Full and indirect effects from Figure 2** - Associations between area-level deprivation, dietary
 67 quality, fast-food outlets, and BMI (pathways specified from fast-food outlets to BMI and fast-food
 68 outlets to diet quality).
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70 **Table S4.7** - Direct effects
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	Coef.	Std. Err.	P	Std. Coef.
Structural				
Fast-food outlets <-				
Area-level deprivation	0.098	0.007	0.000	0.152
Dietary quality <-				
Fast-food outlets	0.002	0.002	0.434	0.009
Area-level deprivation	-0.015	0.002	0.000	-0.112
BMI <-				
Fast-food outlets	-0.034	0.006	0.000	-0.070
Dietary quality	-0.197	0.027	0.000	-0.086
Area-level deprivation	0.048	0.004	0.000	0.152
Age	0.018	0.004	0.000	0.054
Gender	-0.354	0.108	0.001	-0.037
Long standing conditions	1.574	0.116	0.000	0.156

72 **Table S4.8** - Indirect effects
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	Coef.	Std. Err.	P	Std. Coef.
Structural				
Fast-food outlets <-				
Area-level deprivation	0	(no path)	0	
Dietary quality <-				
Fast-food outlets	0	(no path)	0	
Area-level deprivation	0.001	0.001	0.435	0.001
BMI <-				
Fast-food outlets	-0.001	0.000	0.436	0.000
Dietary quality		(no path)		
Area-level deprivation	-0.001	0.001	0.644	-0.001
Age		(no path)		
Gender		(no path)		
Long standing conditions		(no path)		

75 **Table S4.9** - Total effects
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	Coef.	Std. Err.	P	Std. Coef.
Structural				
Fast-food outlets <-				
Area-level deprivation	0.099	0.007	0.000	0.152
W2diet_quality <-				
Fast-food outlets	0.002	0.002	0.434	0.009
Area-level deprivation	-0.015	0.002	0.000	-0.110
BMI <-				
Fast-food outlets	-0.034	0.006	0.000	-0.071
Dietary quality	-0.197	0.026	0.000	-0.086
Area-level deprivation	0.048	0.004	0.000	0.151
Age	0.018	0.004	0.000	0.054
Gender	-0.354	0.108	0.001	-0.037
Long standing conditions	1.54	0.116	0.000	0.156

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79 **Full and indirect effects from Figure 3** – Associations between area-level deprivation, dietary
 80 quality, fast-food outlets, and BMI (no pathways specified from fast-food outlets to diet quality or fast-
 81 food outlets to BMI).

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Table S4.10 - Direct effects

	Coef.	Std. Err.	P	Std. Coef.
Structural				
BMI <-				
Diet quality	-0.158	0.026	<0.00	-0.08
Area-level deprivation	0.045	0.004	<0.00	0.145
Age	0.034	0.004	<0.00	0.103
Gender	-0.425	0.107	<0.00	-0.045
Long standing condition	1.496	0.115	<0.00	0.153
Fast-food outlets <-				
Area-level deprivation	0.098	0.007	<0.00	0.152
Diet quality <-				
Area-level deprivation	-0.015	0.002	<0.00	-0.110

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Table S4.11 - Indirect effects

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	Coef.	Std. Err.	P	Std. Coef.
Structural				
BMI <-				
Diet quality		(no path)		
Area-level deprivation	0.002	0.004	<0.00	0.001
Age		(no path)		
Gender		(no path)		
Long standing condition		(no path)		
Fast-food outlets <-				
Area-level deprivation		(no path)		
Diet quality <-				
Area-level deprivation		(no path)		

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Table S4.12 - Total effects

	Coef.	Std. Err.	P	Std. Coef.
Structural				
BMI <-				
Diet quality	-0.138	0.026	<0.00	-0.08
Area-level deprivation	0.048	0.004	<0.00	0.153
Age	0.034	0.004	<0.00	0.103
Gender	-0.426	0.107	<0.00	-0.045
Long standing condition	1.496	0.115	<0.00	0.153
Fast-food outlets <-				
Area-level deprivation	0.099	0.007	<0.00	0.152
Diet quality <-				
Area-level deprivation	-0.015	0.002	<0.00	-0.110

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96 **Sensitivity analysis for different buffers**

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98 **Full and indirect effects from Figure 3 with 800m and 1600m radial buffer – Associations**99 between area-level deprivation, dietary quality, fast-food outlets, and BMI (no pathways specified from
100 fast-food outlets to diet quality or fast-food outlets to BMI) within an 800m and 1600m radial buffer.

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Table S4.13 - Direct effects

	800m radial buffer		1600m radial buffer	
	Coef.	P	Coef	P
Structural				
BMI <-				
Diet quality	-0.205	<0.00	-0.205	<0.00
Area-level deprivation	0.045	<0.00	0.043	<0.00
Age	0.022	<0.00	0.023	<0.00
Gender	-0.349	<0.00	-0.351	0.001
Long standing condition	1.526	<0.00	1.525	<0.00
Fast-food outlets <-				
Area-level deprivation	-0.006	0.002	-0.025	<0.00
Diet quality <-				
Area-level deprivation	-0.015	<0.00	-0.015	<0.00

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Table S4.14 - Indirect effects

	800m radial buffer		1600m radial buffer	
	Coef.	P	Coef	P
Structural				
BMI <-				
Diet quality		(no path)		
Area-level deprivation	0.003	<0.000	0.003	<0.00
Age		(no path)		
Gender		(no path)		
Long standing condition		(no path)		
Fast-food outlets <-				
Area-level deprivation		(no path)		
Diet quality <-				
Area-level deprivation		(no path)		

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Table S4.15 - Total effects

	800m radial buffer		1600m radial buffer	
	Coef.	P	Coef	P
Structural				
BMI <-				
Diet quality	-0.205	<0.00	-0.205	<0.00
Area-level deprivation	0.047	<0.00	0.047	<0.00
Age	0.022	<0.00	0.023	<0.00
Gender	-0.349	0.001	-0.351	0.001
Long standing condition	1.525	<0.00	1.525	<0.00
Fast-food outlets <-				
Area-level deprivation	-0.006	0.002	-0.025	<0.00
Diet quality <-				
Area-level deprivation	-0.015	<0.00	-0.015	<0.00

