A Note on a Possible Link Between Fruit and Vegetable Consumption and Reduced Risk of Depression

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This brief note is designed as a possible complement to our forthcoming American Journal of Public Health article on well-being and diet.

The results in this note are new; they have not been refereed; they are designed for researchers who are interested in the original Mujcic-Oswald paper which did not examine data on clinical depression.

A Note on a Possible Link Between Fruit and Vegetable

Consumption and Reduced Risk of Depression

Might the tenor of our results in Mujcic-Oswald (2016) extend to a possible role for fruit and vegetables as a factor associated with lower risk of clinical depression? There is emerging new evidence on this complex issue -- see Liu et al. (2016) and Kingsbury et al. (2016) -- but the evidence is currently mixed.

In this note we consider a relatively objective measure of poor mental health (only available in waves 2007 and 2009 of the HILDA Survey[1]), namely a binary indicator of whether or not the survey respondent had ever been diagnosed with long-term depression or anxiety by a medical doctor or health care professional:

> "*Have you ever been told by a doctor or nurse that you have any of the long-term health conditions listed below? Please only include those conditions that have lasted or are likely to last for six months or more: Depression/Anxiety".*

We restrict our analysis to a balanced panel of individual respondents who answered the above question in both survey waves (n=7,108). Across the two survey periods, approximately 17% of respondents indicated to have been diagnosed with such a mental health condition.

Following only individuals (n=5,949) who were *not* diagnosed with depression/anxiety in the first period (year 2007), Table 1 relates the estimated probability of those same individuals *being* diagnosed with depression/anxiety in the next period (year 2009) to their daily fruit-and-vegetable intake in the previous period, as well as a number of added demographic and socioeconomic covariates including age, education and income levels, and other lifestyle factors. The results in Table 1 are hence interpreted from a prospective point of view, as it is quite common within much of the medical and health literature.

The broad conclusions are somewhat consistent with the Mujcic-Oswald (2016) paper's findings (which were on happiness and life satisfaction).

[1]The Household, Income and Labour Dynamics in Australia (HILDA) Survey is a nationally representative panel survey that began in 2001. The HILDA Survey collects annual longitudinal information from members of Australian households who are at least 15 years of age (see Watson and Wooden 2002). Mujcic and Oswald (2016) provide a more detailed description of the HILDA Survey, including summaries of the dietary and lifestyle measures (e.g., fruit and vegetable consumption) as well as demographic and socioeconomic variables used in the present study.

There is apparently some evidence here that the probability of being diagnosed with depression/anxiety in the next period is negatively related to the consumption of fruit and vegetables in the current period. This is for a group of individuals never previously diagnosed.

The estimated marginal effect of -0.004 implies that individuals who increase their daily intake of fruit and vegetables from, say, 0 to 8 portions a day are on average 3.2 percentage points less likely to experience depression or anxiety within the next 24 months. While in absolute terms such a benefit to a person's mental well-being may seem quite small, this is not the case. To understand this, we need to compare the calculated effect size (-0.032) relative to that of other major life events such as 'becoming unemployed' or 'being divorced'. From Table 1, such an improved diet is predicted to offset slightly less than half of the increased risk of future depression resulting from current unemployment (0.075) and, more so, the entire increased risk following marital divorce or separation (0.035). The implied effect-sizes are quite substantial.

These findings should be seen as preliminary and treated cautiously.

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Table 1. Predicted Probability of Being Diagnosed with Depression/Anxiety on Lagged Fruit and Vegetable Consumption and Covariates, HILDA Survey 2007 (period *t*) and 2009 (period *t+1*). *[Sample of Individuals Never Previously Diagnosed with Depression/Anxiety.]*

Dependent variable: Diagnosed with depression/anxiety $_{t+1}$			
Independent variables	*β*	*CI*	*p*
Fruit and vegetable portions/day $_t$	-0.0041	[-0.008, -0.001]	.017
Log of household income $_t$	-0.0031	[-0.012, 0.006]	.489
Age $_t$	0.0004	[-0.002, 0.003]	.743
Age-squared/100 $_t$	-0.0005	[-0.003, 0.002]	.729
Male $_t$	-0.0395	[-0.053, -0.026]	.000
Masters or doctorate $_t$	0.0011	[-0.033, 0.035]	.948
Bachelor or honors $_t$	0.0061	[-0.023, 0.035]	.679
Graduate diploma or certificate $_t$	0.0154	[-0.006, 0.037]	.162
Advanced diploma $_t$	0.0200	[-0.003, 0.043]	.094
Professional qualification $_t$	0.0108	[-0.008, 0.030]	.262
Year 12 high school $_t$	-0.0009	[-0.021, 0.019]	.933
Full-time student $_t$	0.0233	[-0.007, 0.054]	.135
Unemployed $_t$	0.0747	[0.029, 0.120]	.001
Not in the labor force $_t$	0.0069	[-0.013, 0.027]	.496
Married $_t$	-0.0108	[-0.031, 0.009]	.294
Separated $_t$	0.0353	[-0.006, 0.077]	.097
Divorced $_t$	0.0343	[0.006, 0.063]	.018
Widowed $_t$	-0.0605	[-0.101, -0.020]	.003
Long-term health condition $_t$	0.0551	[0.037, 0.073]	.000
# children under the age of 4 $_t$	0.0006	[-0.013, 0.014]	.928
# children aged 5-14 $_t$	0.0005	[-0.009, 0.010]	.910
Drink alcohol 2 or 3 days/month $_t$	-0.0067	[-0.025, 0.011]	.464
Drink alcohol 1 or 2 days/week $_t$	-0.0167	[-0.038, 0.004]	.118
Drink alcohol 3 or 4 days/week $_t$	-0.0158	[-0.036, 0.004]	.120
Drink alcohol 5 or 6 days/week $_t$	0.0019	[-0.021, 0.025]	.872
Drink alcohol everyday $_t$	-0.0079	[-0.033, 0.017]	.535
Non-smoker $_t$	-0.0377	[-0.055, -0.020]	.000
Never eat red meat $_t$	0.0449	[0.005, 0.085]	.027
Never eat fish $_t$	0.0095	[-0.012, 0.031]	.390
Eat breakfast regularly $_t$	0.0008	[-0.015, 0.016]	.923
Drink low fat or skim milk $_t$	0.0047	[-0.008, 0.018]	.477
Avoid fatty foods $_t$	-0.0013	[-0.017, 0.014]	.867
BMI $_t$	-0.0001	[-0.001, 0.001]	.921
Exercise regularly $_t$	-0.0022	[-0.015, 0.011]	.742
Constant	0.1411	[0.044, 0.238]	.004
Adjusted R^2		.023	
Number of observations		5,949	

Notes: Linear probability model. Dependent variable equals 1 if individual was diagnosed with depression/anxiety in period t+1 (year 2009), 0 otherwise. The sample consists of n=5,949 HILDA Survey respondents who were *not* diagnosed with anxiety/depression in period *t* (year 2007). Values in square parentheses are 95% confidence intervals (CIs).

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