



ALMA MATER STUDIORUM
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Food purchasing choices, stress and mental health

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Food Choices and Response to Public Policies:
New Evidence on the Behavioral Dimension

Research question

Can readily available, detailed food purchase data help predict and monitor mental health outbreaks (in specific sub-populations)?

- Background
 - Stress, anxiety & emotional food choice
 - Italian Covid-19 pandemic natural experiment
- Data: Drug sales & home scan purchase data
- Empirical models
- Findings and next steps



Background - Pandemic and food shopping



Lockdowns & food shopping

- Replace out-of-home food/drink
- Less frequent shopping, hoarding behaviours, on-line shopping
- Smart working & home cooking
- Comfort food & **emotional eating/drinking**

Emotional eating

Eating in response to negative emotions (Reichenberger et al., 2020)

Food groups

Strong evidence on the *association* between stress and anxiety and consumption of

- Ultra-processed, energy-dense foods, unhealthy foods (Hill et al., 2022)
- Sugar-dense foods (sweets, chocolate, desserts; Oliver et al., 2000)
- Higher consumption of savoury snacks (Tuck et al., 2023)
- Alcohol, binge drinking (Theunissen et al., 2011)

Global prevalence of anxiety and depression increased by 25% during the first year of the pandemic (WHO, 2022)

- Unprecedented stress caused by social isolation
- Constraints on people's ability to work and financial worries
- Loneliness, fear of infection, suffering and death for oneself and for loved ones, grief after bereavement
- Increased sales of anxiolytics and anti-depressants



Covid-19 pandemic & movement restrictions, Italy

Period	Date	Regulation
Baseline	January, 31	First public information campaign, start of testing and contact tracing for suspected cases
	February, 23	Lockdown in eleven municipalities of northern Italy
	March, 4	National school closure
Lockdown	March, 10	National lockdown
Post-lockdown	May, 18	<i>Shops, restaurants and museum opened,</i> no restriction on gatherings
	June, 3	No restriction on movements
New restrictions	September, 27	<i>Schools open (new cases)</i>
	October, 14	Restrictions on bars and restaurants
	October, 23	Targeted restrictions on gatherings, shops, schools, gyms and theatres, and curfew
	November, 6	National curfew at 10pm and regional colour zoning system implemented
	December, 24-27,31	Italy red zone





YouGov

Pharmaceutical Sales Data

Italian Medicines Agency (AIFA) provides consumption data for medical drugs – volume (number of packages) of drugs purchased for pharmaceutical assistance under approved care regimes and those purchased by healthcare facilities managed by the Italian National Health Service (NHS)

Panel of regional monthly sales between Jan 2016 and Dec 2021

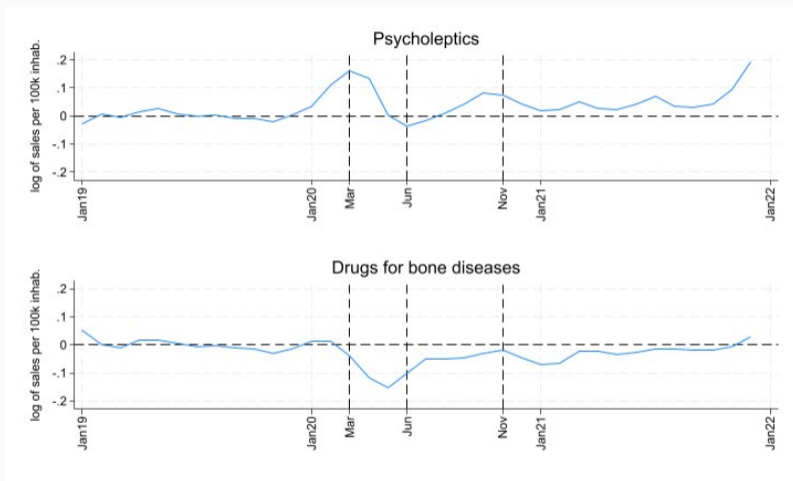
Household food purchases

YouGov Consumer Panel, all individual daily purchases (volume, expenditure, prices) for about 10,000 households in Italy, home scanned (any retail outlet type)

We use 4,985 households always in the panel between Jan 2019 and Dec 2021, recording variable weight purchases – Weekly aggregation



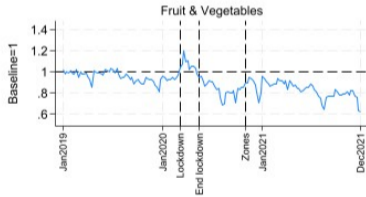
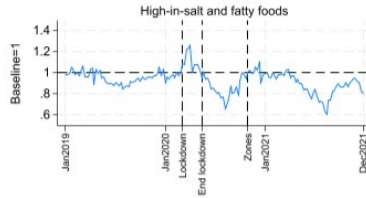
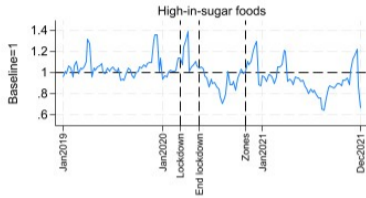
Monthly pharmaceutical sales in Italy, 2019-2021



Psycholeptics: antipsychotic drugs, anxiolytics, hypnotics and sedatives, antidepressants, psychostimulants, ADHD agents, and nootropics



Household purchases, 2019-2021



High-in-sugar foods: cakes, biscuits, sweets, chocolate
High-in-salt & fatty foods: savoury snacks, processed meat, cheese



Regional monthly diff-in-diff model

$$D_{rtz} = \alpha_r + \sum_{i=2}^{12} \beta_i M_{it} + \sum_{i=2}^{12} \gamma_i M_{it} z + \sum_{y=2019}^{2022} \sum_{i=1}^{12} \delta_{iy} Y_{yt} M_{it} + \sum_{y=2019}^{2022} \sum_{i=1}^{12} \mu_{iy} Y_{yt} M_{it} z + \rho_0 t + \rho_1 t z + \epsilon_{rtz}$$

D_{rtz} is the natural log of per capita sales of the drug z in region r at month t

$z = 1$ for *psycholeptic drugs* and $z = 0$ for *bone disease drugs*

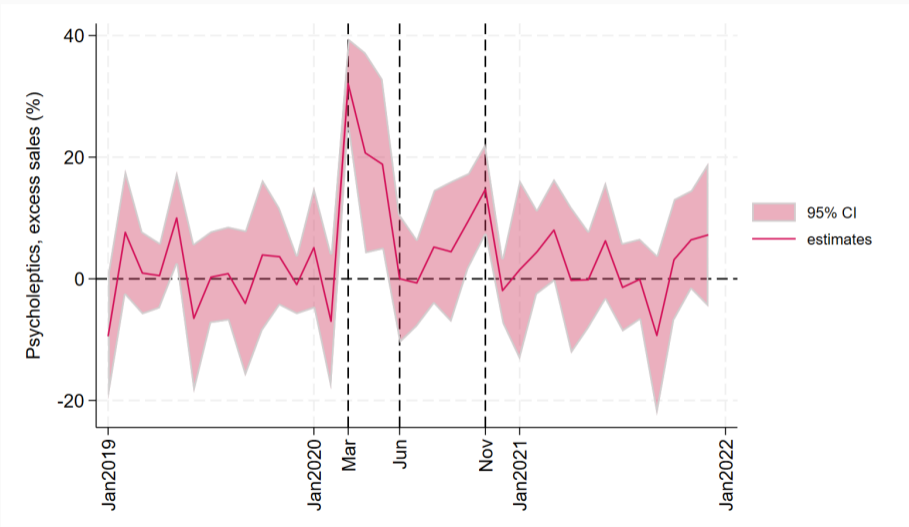
M_{it} monthly binary variable

Y_{yt} yearly binary variable

μ_{iy} estimate the **differential monthly effects**, relative to the baseline period 2016-2018 and conditional on differential linear trends



Results: "Excess" sales of psycholeptic drugs



Panel model

$$V_{nt} = \alpha_n + \beta P_{rt} + \sum_{i=2}^6 \gamma_{1i} T_{it} + \sum_{i=1}^6 \gamma_{2i} T_{it} Y_{t \in 2020} + \sum_{i=1}^6 \gamma_{3i} T_{it} Y_{t \in 2021} + \delta_1 C_{nt} + \delta_2 K_{nt} + \varepsilon_{nt}$$

V_{nt} scaled purchases made by household n during week t

T_{it} binary variable (1 for purchases is in period T_i)

P_{rt} is the average regional weekly price

C_{nt} and K_{nt} (scaled) volumes purchased of cleaning and cooking goods, respectively

γ_{2i} and γ_{3i} **average changes in purchased volumes** relative to the baseline

Model variations

- Monthly variables M_{it} instead of T_{it}
- Model estimated at the **individual household level**

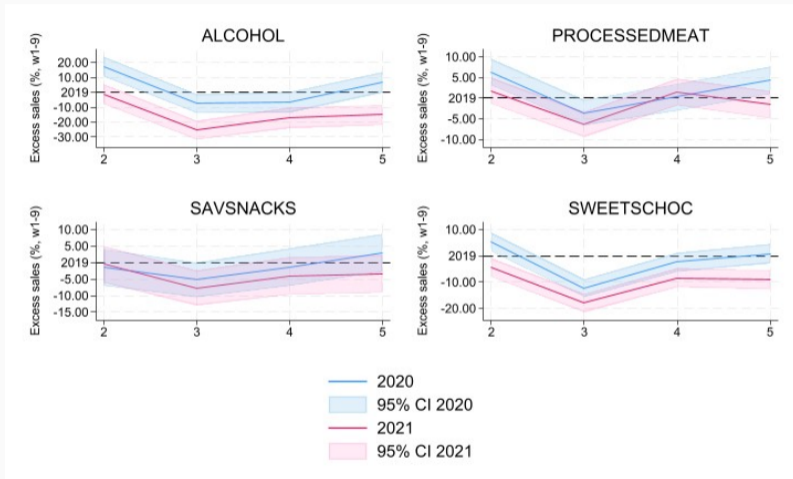


Pandemic periods

Period	2019	2020	2021
T_1 Baseline	7 Jan - 17 Feb	6 Jan - 16 Feb	4 Jan - 14 Feb
T_2 Lockdown	11 Mar - 19 May	9 Mar - 17 May	8 Mar - 16 May
T_3 Post-lockdown	3 Jun - 1 Sep	1 Jun - 30 Aug	31 May - 29 Aug
T_4 Autumn	2 Sep - 3 Nov	31 Aug - 1 Nov	30 Aug - 30 Oct
T_5 Regional zones	4 Nov - 5 Jan 20	2 Nov - 3 Jan 21	31 Oct - 2 Jan
T_6 Other	Any other date not included above		

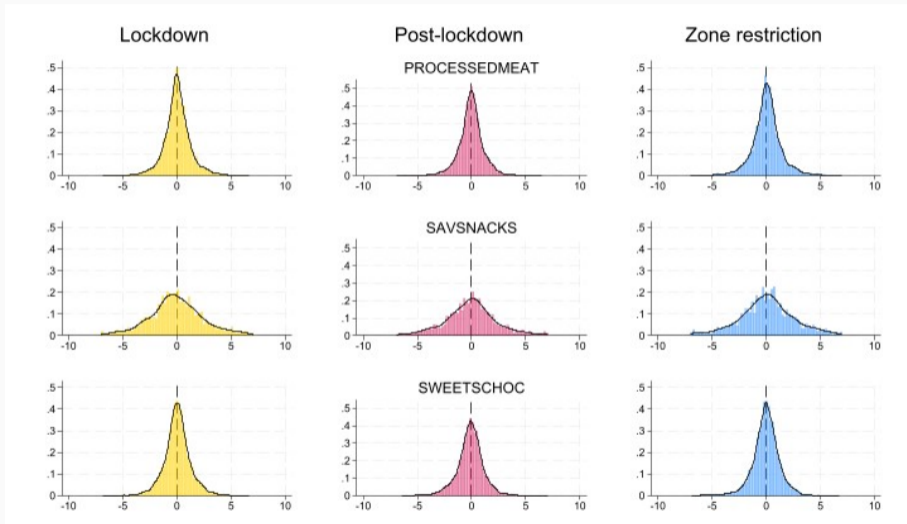


Results: "Excess" purchases, selected foods, averages by period



Periods: 2 = Lockdown; 3 = Post-lockdown; 4 = Autumn; 5 = Regional zones

Results: "Excess" purchases, individual household model



Empirical definition

- **Threshold:** Excess consumption, defined as the 90th percentile in January 2020.
- **Prevalence:** Proportion of households above the baseline threshold in subsequent months

Association between prevalence & psycholeptic drugs sales

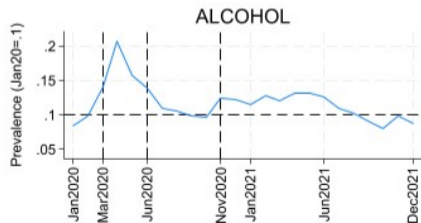
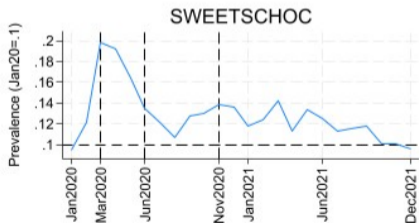
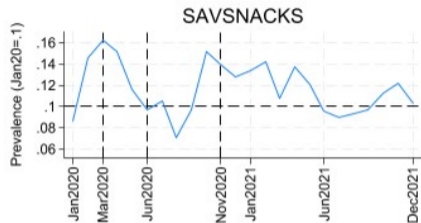
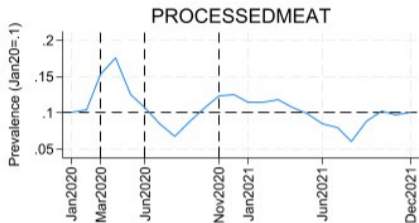
$$H_{rt} = \alpha_r + \beta F_{rt} + \sum_{i=2}^{12} \gamma_i M_{it} + \eta_{rt}$$

H_{rt} log of excess per capita sales of psycholeptic drugs

F_{rt} prevalence of excess consumption



Results: Prevalence in excess purchases of emotional foods



Results: Associations

	Correlations		Elasticities	
	Contemporaneous	Lagged prevalence	Contemporaneous	Lagged prevalence
Alcohol	0.040 (0.460)	-0.027 (0.628)	0.512 (0.315)	0.372 (0.326)
Sweets & Chocolate	0.183*** (0.001)	0.082 (0.143)	1.097*** (0.392)	0.918** (0.412)
Sugary foods	0.177*** (0.001)	0.096 (0.086)	2.281*** (0.633)	1.760*** (0.663)
Savoury snacks	0.218*** (0.001)	0.262*** (0.001)	0.372 (0.275)	0.489 (0.288)
Processed Meats	0.229*** (0.001)	0.072 (0.195)	1.410*** (0.459)	-0.133 (0.480)
Chamomile	0.127** (0.063)	-0.037 (0.596)	0.086 (0.057)	-0.101 (0.058)
Salty snacks & foods	0.320*** (0.001)	0.222*** (0.001)	1.793*** (0.476)	0.743 (0.507)
Unhealthy foods	0.212*** (0.001)	0.154*** (0.006)	0.407*** (0.122)	0.357*** (0.129)

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors in parentheses.



Results: Associations by sub-groups

	Full sample		Worst-hit regions		Age HRP < 55. North	
	Corr	Elast	Corr	Elast	Corr	Elast
Alcohol	0.040 (0.460)	0.512 (0.315)	0.398*** (0.001)	1.315 ** (0.570)	0.084 (0.364)	1.184 *** (0.323)
Sweets & Chocolate	0.183 *** (0.001)	1.097*** (0.392)	0.490*** (0.001)	2.648*** (0.620)	0.205*** (0.025)	1.113 *** (0.405)
Sugary foods	0.177 *** (0.001)	2.281 *** (0.633)	0.567 *** (0.001)	4.131 *** (0.858)	0.319 *** (0.001)	2.284*** (0.636)
Savoury snacks	0.218 *** (0.001)	0.372 (0.275)	0.471 *** (0.001)	2.234 *** (0.704)	0.464*** (0.001)	1.163 *** (0.307)
Processed Meats	0.229*** (0.001)	1.410 *** (0.459)	0.435 *** (0.001)	2.130 ** (0.858)	0.290*** (0.001)	1.261 *** (0.436)
Chamomile	0.127 ** (0.063)	0.086 (0.057)	-0.099 (0.505)	-0.132 (0.180)	0.140 (0.242)	0.168 (0.127)
Salty snacks & foods	0.320*** (0.001)	1.793 *** (0.476)	0.594*** (0.001)	3.173 *** (0.765)	0.522 *** (0.001)	2.102 *** (0.438)
Unhealthy foods	0.212 *** (0.001)	0.407*** (0.122)	0.584*** (0.001)	0.869*** (0.177)	0.360*** (0.001)	0.532 *** (0.110)

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors in parentheses.

Findings and next steps

- We find an association between the prevalence of excess purchases of emotional foods and excess sales of psychotropic drugs over the Covid years 2020-21, regional-monthly aggregation
- The association is stronger when focusing on the smaller sample of worst-hit regions
- Focusing on sub-samples of households does not improve predictions (although there are differences in the predictive power by socio-demographic groups)

Next steps - Micro-level evidence

- Mental health indicator by region-month (National Omnibus survey)
- 5-question Mental Health survey on households in our sample
- Explore alternative food aggregations