Does social expenditure mitigate the effect of environmental shocks on health?

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Introduction

- Extreme high/low temperatures are known to have adverse effects on health, especially among the young and elderly.
  - Temperatures are growing and this may lead to higher extreme temperatures.
  - These issues are emphasized by population aging.
- Policy makers should address services that allow to offset the effect of extreme temperatures.
  - Social care services may allow to reduce hospitalizations if they foster the utilization of home and nursing home care services by the elderly.

Literature review

Temperatures and health:

- Extreme temperatures increase mortality and hospital admission rates (Deschênes and Moretti, 2009, Karlsson and Ziebarth, 2018).
  - Cardiovascular and respiratory systems more stressed (Basu and Samet, 2002).
  - Elderly more exposed because of less responsive body thermo-regulation (Kenney and Hodgson, 1987).
- Long-run exposure to extreme temperatures makes population more resilient against weather thanks to offsetting behavior and reduces mortality rates (Barreca et al., 2016).
  - However, outdoor workers still exposed to heat-related diseases (Dillender, 2017).

Social expenditure and health:

Costa-Font et al. (2018): introduction of subsidies for social care reduce hospital utilization.

What we do

- We analyze the effect of temperatures on emergency hospitalization rates for cardiovascular and respiratory diseases among the elderly in Italy.
  - We use both temperature levels and deviations from municipality mean temperatures to account for local resilience.
- We investigate the role of municipal public social expenditure in mitigating the effect of extreme temperatures.

Institutional setting

Hospital care:

- The Italian NHS provides universal coverage for health care services funded by revenues from taxation (mainly VAT).
- Emergencies are treated in emergency wards, freely accessible.
  - Call center for emergencies that do not allow the sick person to reach the hospital.

Social expenditure:

- Mainly performed by municipal governments, but with regional guidelines.
- Funds services for families, the disabled and the elderly.
  - The elderly consume 25% of resources on average.
  - The main services for the elderly are home and nursing home care, and proximity services.

Data

Hospital admissions:

- Monthly hospital discharge data for cardiovascular and respiratory diseases of elderly people aggregated by municipality for the period Jan 2001 - Dec 2015 provided by the Italian Ministry of Health.

Temperature data:

- Global Summary Of the Day (GSOD) data by weather station (at least one per province) provided by NOAA.

Other data:

- Municipal government social expenditure (Ministry of the Interior)
- Demographic municipality characteristics (ISTAT)
- Personal income (Ministry of Economics and Finance)

Table 1: Emergency hospital admission rates by disease

	Obs	Mean	SD	Min	Max
Cardiovascular	1308024	43.638	21.763	0	2000
Respiratory	1308024	17.293	12.860	0	1250

Notes - Monthly emergency hospital admission rates per 10,000 elderly for the period Jan 2001 - Dec 2015. Statistics weighted by elderly population.

Temperature measures

Average daily temperature in a municipality:

$$T_{id} = \sum_k w_{ik} T_{kd} / \sum_k w_{ik} \tag{1}$$

with i denoting the municipality, d the day and k the weather station, and $w_{ik} = 1/distance_{ik}$. Considered weather stations are those within 30 km from a municipality's centroid.

Monthly temperature measures in a municipality:
Share of days in a month:

- within 10°F bins.
- within 0.4 std. dev. bins from municipal average temperature.
- within 0.2 std. dev. bins from municipal seasonal average temperature (robustness check).
    - positive dev. in Summer and negative dev. in Winter.

Identification strategy

Model specification:

$$H_{ipmy} = \sum_j \beta_j T_{jimy} + x'_{imy}\gamma + \alpha_i + \theta_{my} + \rho_{pm} + \delta_p t_{pmy} + \varepsilon_{imy} \quad (2)$$

with H_{ipmy} being the emergency hospital admission rate per 10,000 elderly for cardiovascular or respiratory diseases in municipality i in province p in month m and year y.

T_{jimy} = number of days with temperature falling in bin j.

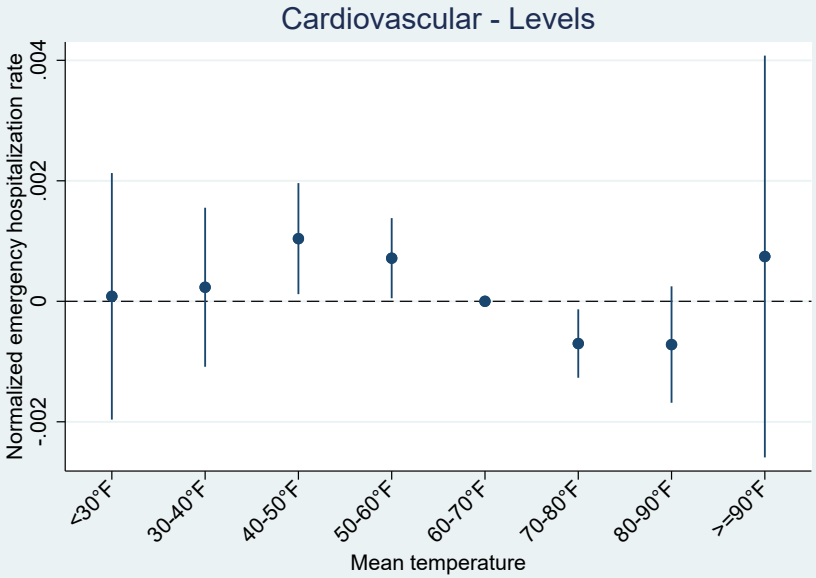
x'_{imy} = monthly precipitation, monthly pollution (CO, O3, NO2, PM10), yearly personal income.

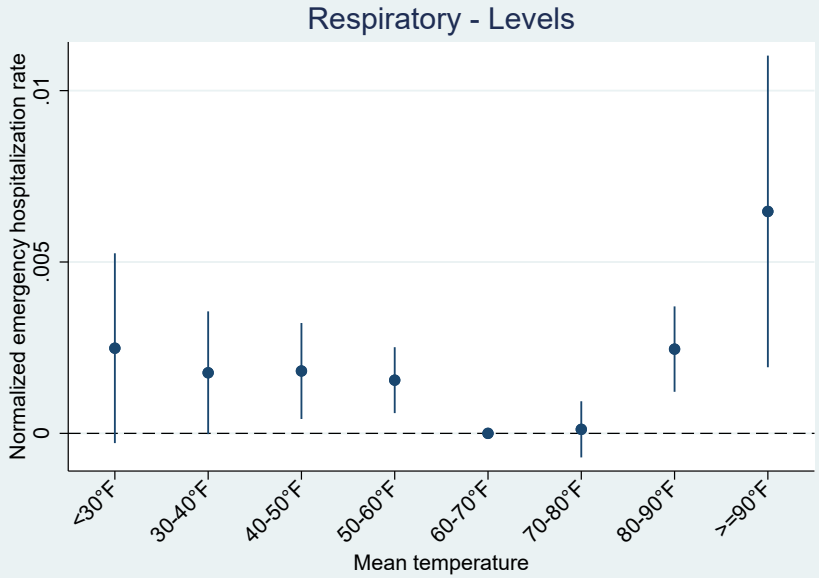
Regressions weighted by elderly population.

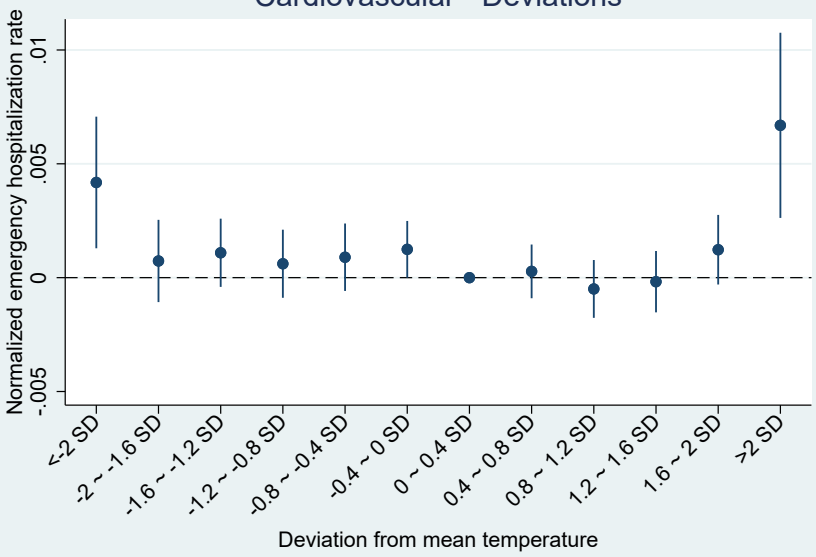
Robust standard errors clustered by province $\rightarrow$ accounts for spatial correlation in temperatures.

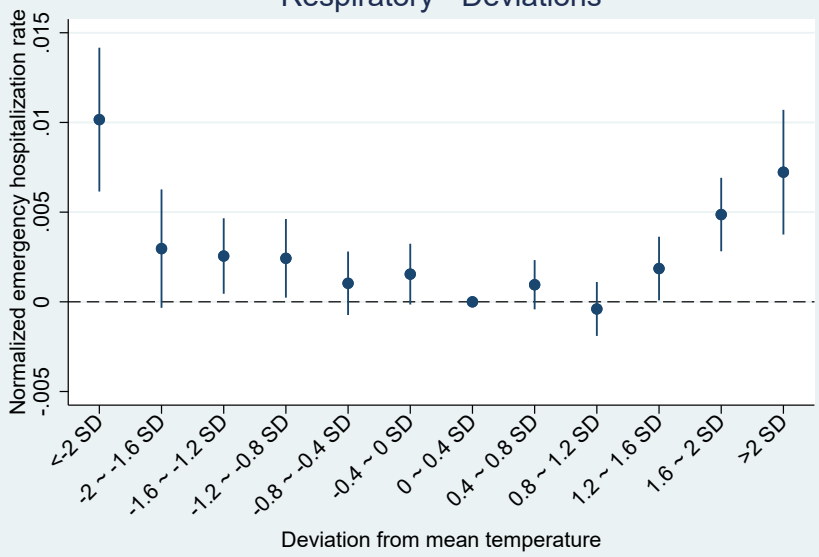
Results

Seasonal | Elective







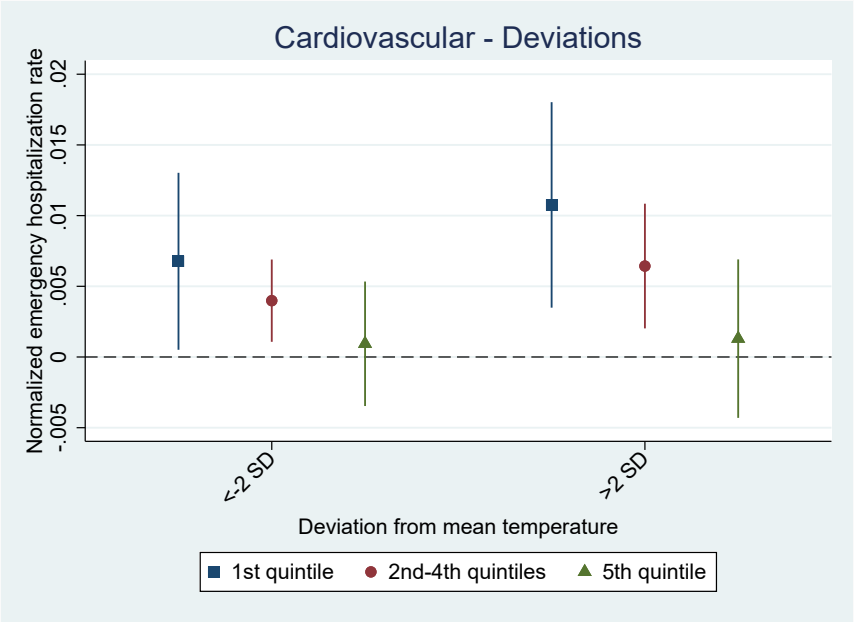


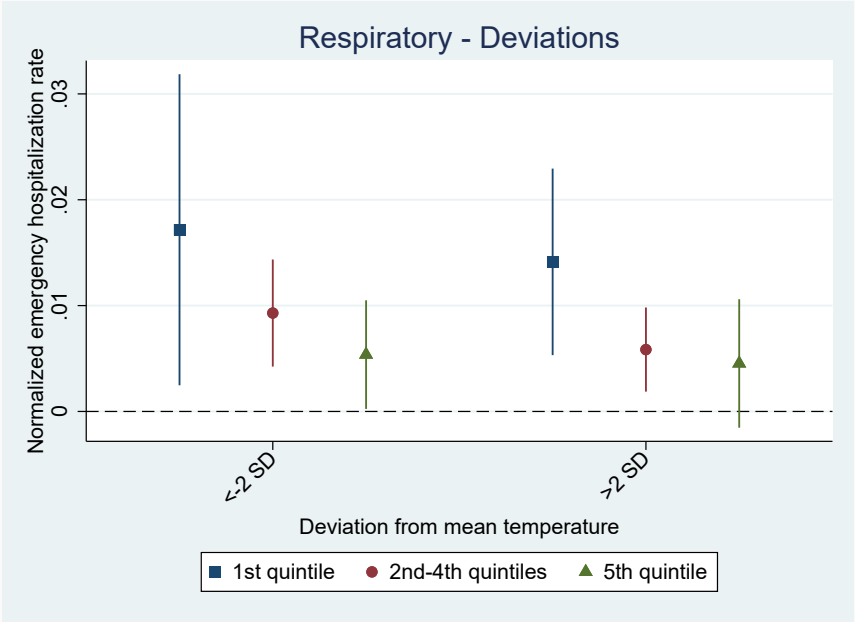
Mitigating effect of social expenditure (1)

- We classify municipalities based on quintiles of per capita social expenditure lagged by 1 year.
- Classification by region and by year.
  - by region mitigates the effect of regional heterogeneity in regulation and spending levels.
  - by year allows to generate time-variant classes.
- We estimate Eq. 2 within each group of municipalities to assess the effect of social expenditure.
  - Together with the lagged social expenditure, this mitigates endogeneity of social expenditure due to reverse causality.

Mitigating effect of social expenditure (2) Full set of bins

Regression results of log hospital admission rates by social expenditure quintiles





Conclusions

- Extremely hot and cold temperatures increase emergency hospital admissions for cardiovascular and respiratory diseases among the elderly.
- Public social expenditure has a role in mitigating the effect of temperatures on cardiovascular diseases, but it does not appear to have a relevant role for respiratory diseases. Possible reasons:
  - The services provided are not effective in preventing temperature-related diseases.
  - Measurement error: we cannot precisely measures social expenditure for elderly services.
- Considering the aging trend, policy makers should identify measures that allow to reduce temperature-related diseases among the elderly:
  - promote heating/air-conditioning systems
  - informative campaigns to foster individual offsetting behavior

Thanks for the attention!

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Appendix

Yearly cycles in hospital admission rates

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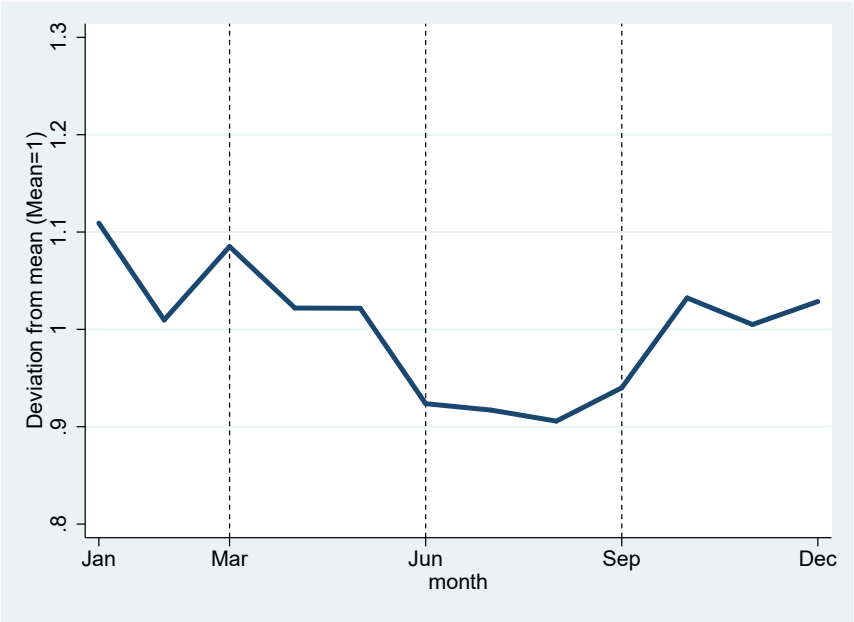

Cardiovascular

Respiratory

Average hospital admission rates by municipality

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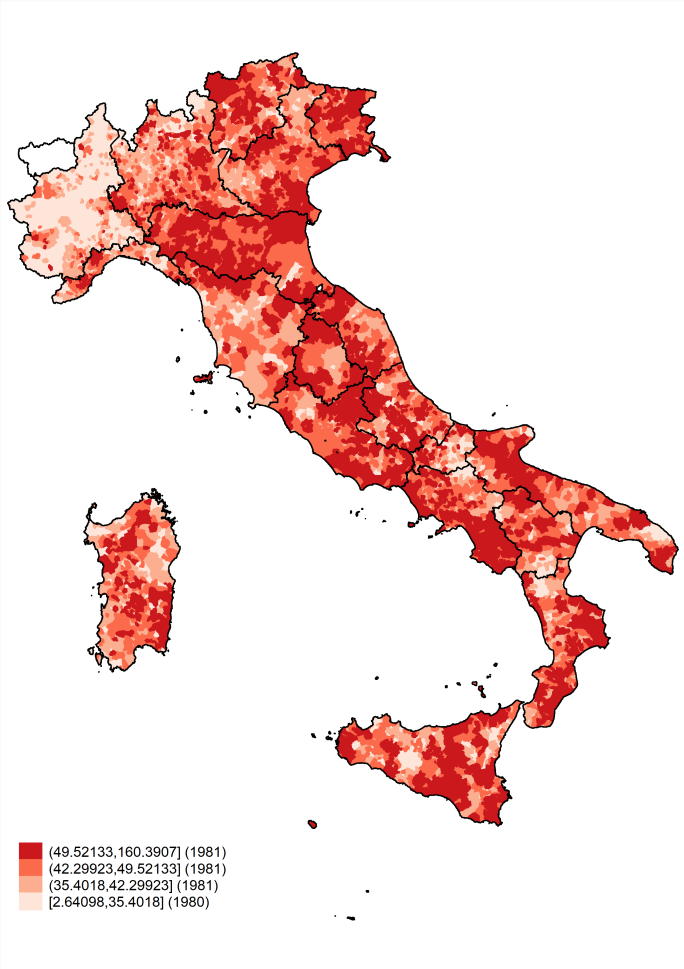
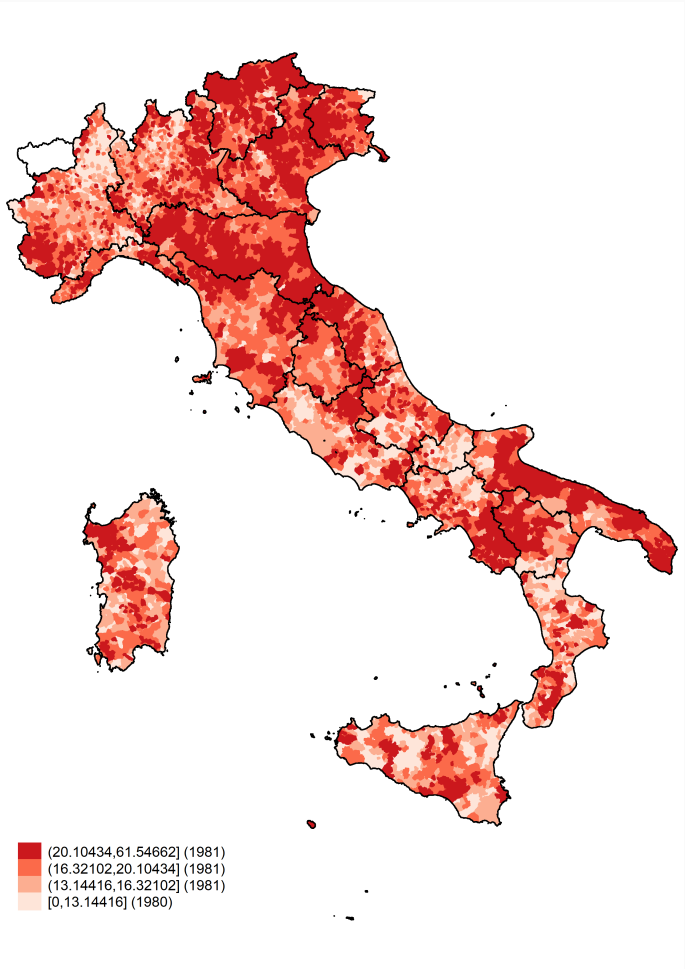


Cardiovascular



Respiratory

Seasonal temperature deviations

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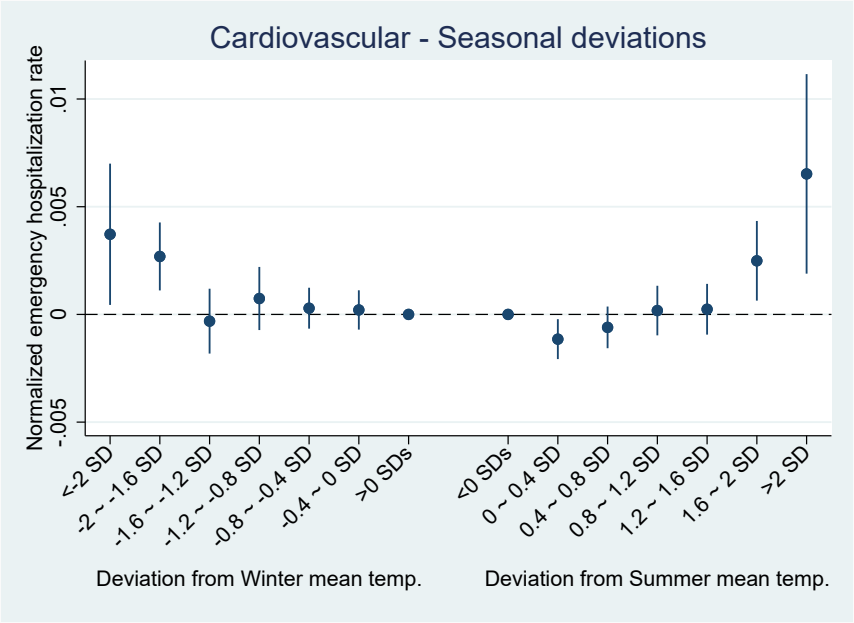

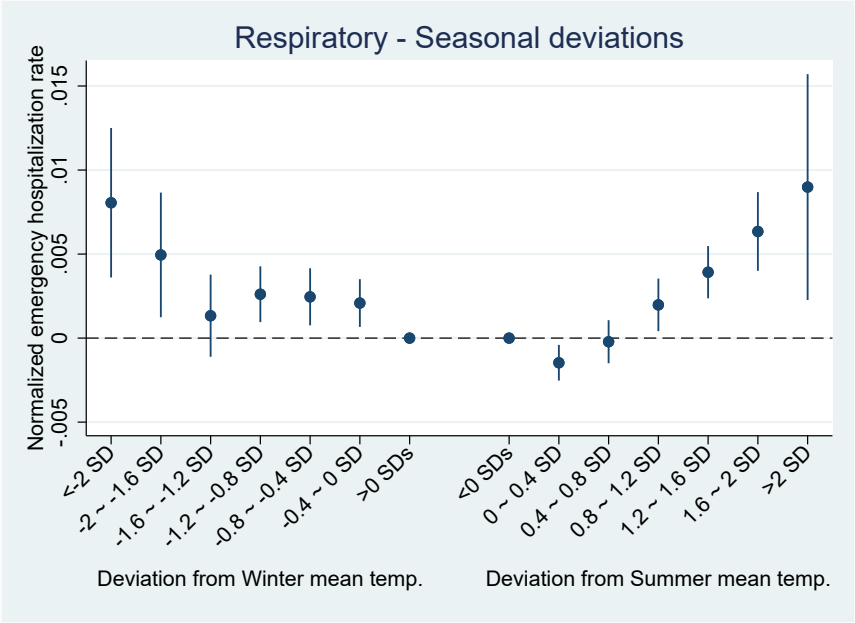

Elective hospital admissions

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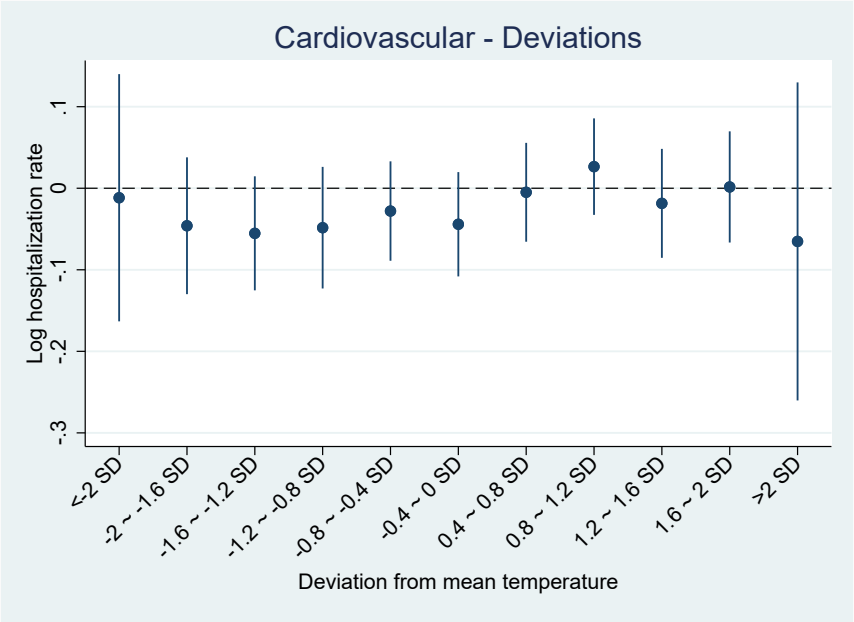

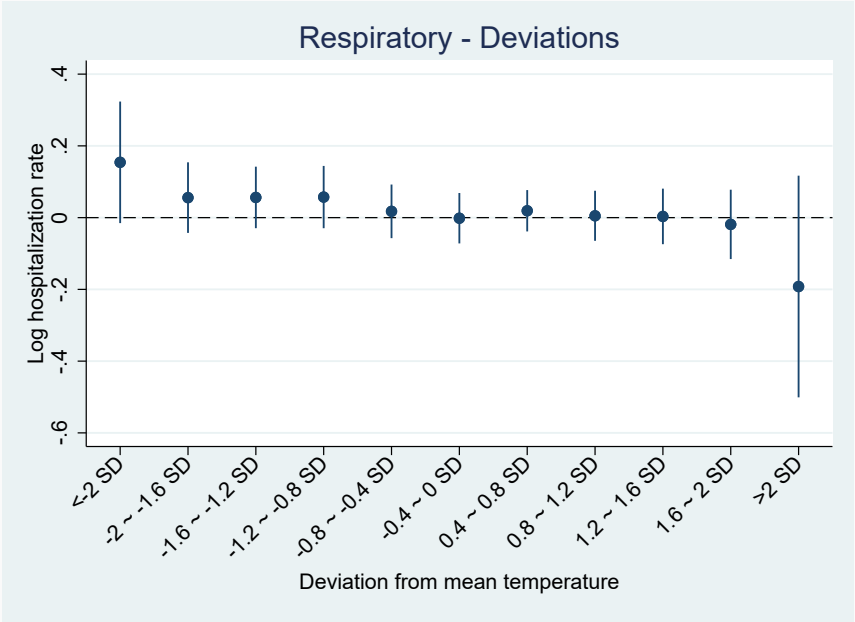

Mitigating effect of social expenditure: full set of bins

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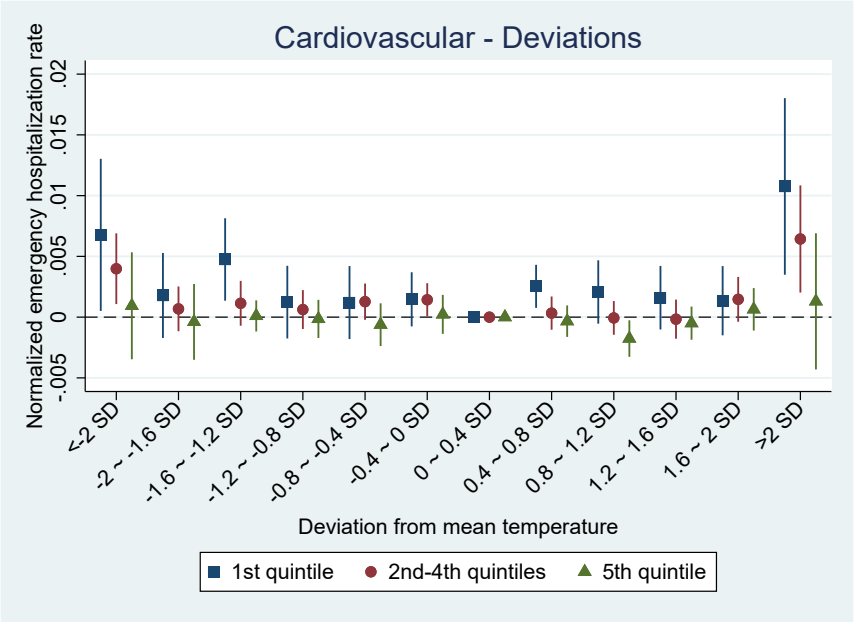
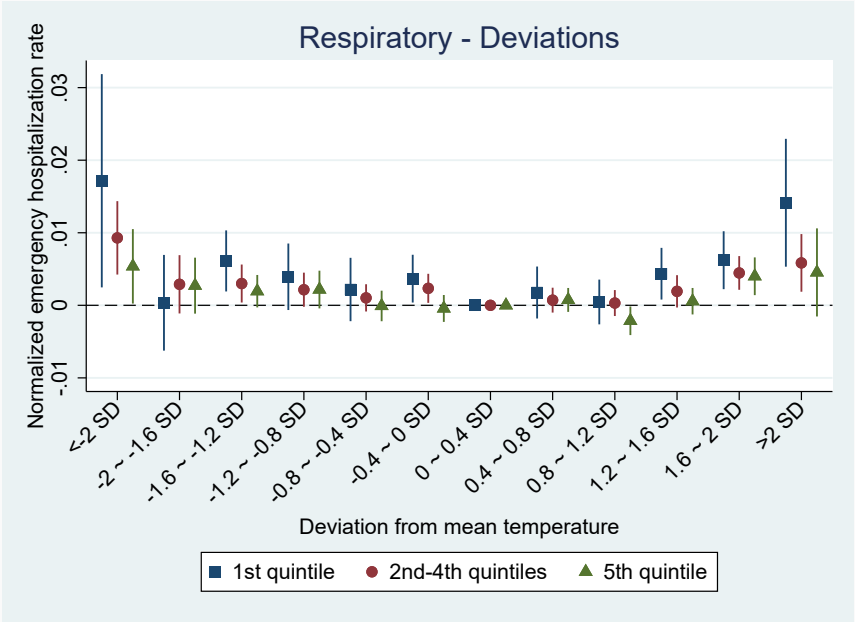
Regression results of log hospital admission rates by social expenditure quintiles





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