



Socioeconomic Deprivation and Invasive Breast Cancer Incidence by Stage at Diagnosis: A Possible Explanation to the Breast Cancer Social Paradox



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Context and rationale of the study



The breast cancer (BC) social paradox

Compared to their affluent counterpart, **women with low socioeconomic status (SES) present¹:**

- **Lower BC incidence rates.**
- **Similar or even higher BC mortality rates.**

The influence of BC risk factors²

- **Lifestyle:** physical inactivity and alcohol consumption.
- **Reproductive history:** age at first full-term pregnancy, parity, age at menarche, contraceptive use, breastfeeding, menopausal status, age at menopause, and hormonal replacement therapy.
- **Anthropometric factors:** height and Body Mass Index (BMI).

The role of screening

- **Negative association between screening uptake and SES** documented in different European countries³.
- **Socioeconomic inequalities in screening uptake** have been related to a **higher proportion of advanced BC and lower survival rates** among people with **low SES**⁴.

1. Lundqvist, A.; et al. *Eur. J. Public Health*. 2016
2. Menvielle, G; et al. *Am. J. Epidemiol.* 2011
3. Smith, D.; et al. *Cancer Epidemiol.* 2019
4. Aarts, M.J.; et al. *Breast Cancer Res. Treat.* 2011

Objective of the study



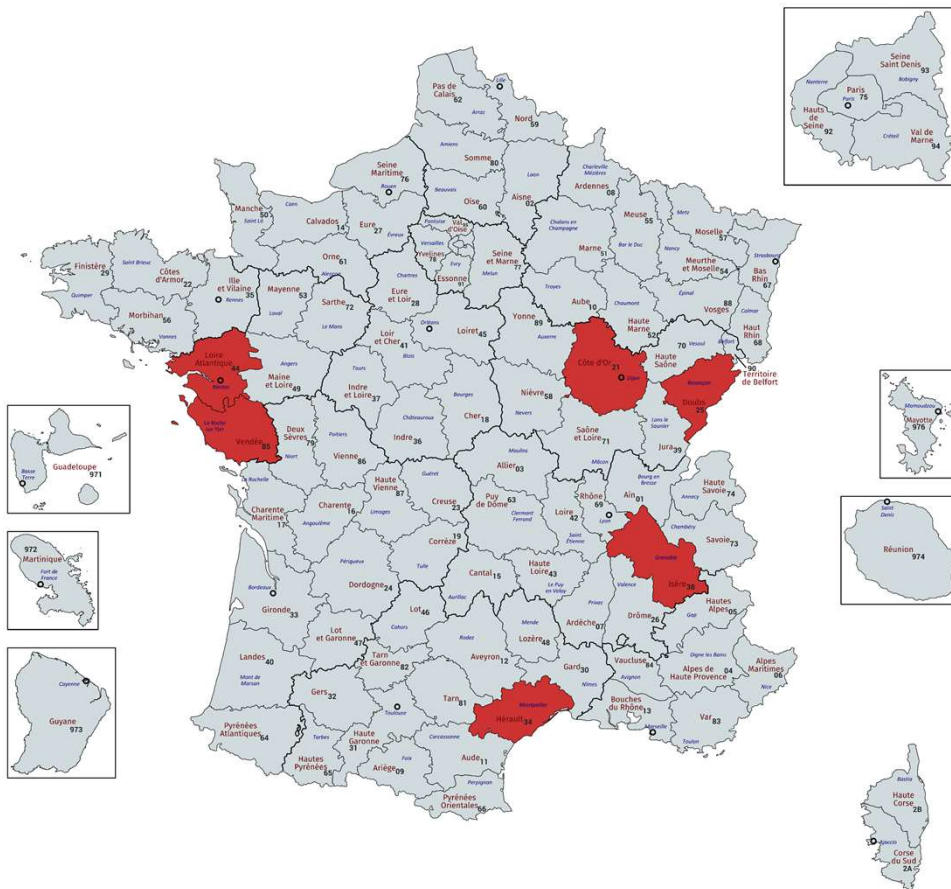
Explore the influence of area-based socioeconomic (SE) deprivation on stage-specific invasive BC incidence in France

Materials & Methods: Study population



Women

- Aged **15+ years-old (y/o)**
- Living in **six mainland French departments**: Loire-Atlantique, Vendée, Isère, Doubs, Côte d'Or, Hérault.
- Diagnosed with a **primary invasive BC** (excluding lymphoma and sarcoma).
- Year of diagnosis: **2008 – 2015**.



Materials & Methods: Data & Statistical Analysis



Data

- **Demographic and cancer variables:** Age, date of diagnosis, mode of detection, and stage at diagnosis (TNM classification of malignant tumors, 7th edition).
- **Geographic variables (based on residential address at diagnosis) :** Municipality, IRIS → smallest geographic unit (2000 people with similar socioeconomic characteristics) available in France defined by the French National Statistical Institute (INSEE).
- **Area-based SE deprivation:** 2011 French version of the European Deprivation Index (F-EDI) expressed as quintiles (Q1 most affluent – Q5 most deprived) and related to residential IRIS.
- **Rurality of the residence:** Rural vs urban classification of the residential municipality (source: INSEE).



Statistical analysis

- **Age-standardized incidence rates (ASIR) per 100,000 women-years:**
 - ✓ By age, stage at diagnosis, F-EDI quintiles, and rurality of the residence.
- **Incidence rate ratios (IRR):**
 - ✓ Calculated globally and in each age group to compare BC incidence between F-EDI quintiles (independently, quintiles from Q2 to Q5 vs. Q1).
 - ✓ Multivariate Poisson regression models adjusting for age and rurality of residence and adding a nested random effects at the municipality/IRIS level.
 - ✓ Statistical significance of the IRR social gradient was tested with an analysis of variance (ANOVA).

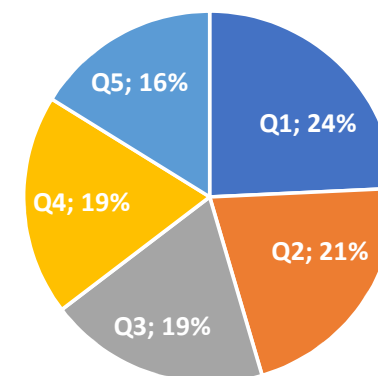
Results – Characteristics of the study sample



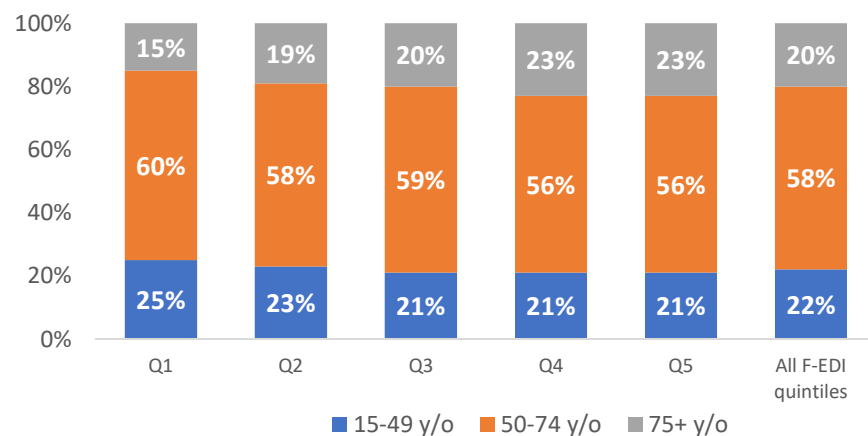
33,298 women included in the study

- 58% of women aged between 50 and 74 y/o.
- 79% of women lived in urban areas.
- Most common mode of detection:
 - ✓ Symptoms across all F-EDI (38-42%) and for women aged 15-49 & 75+ y/o.
 - ✓ Organized screening for women aged 50-74 y/o (53%).

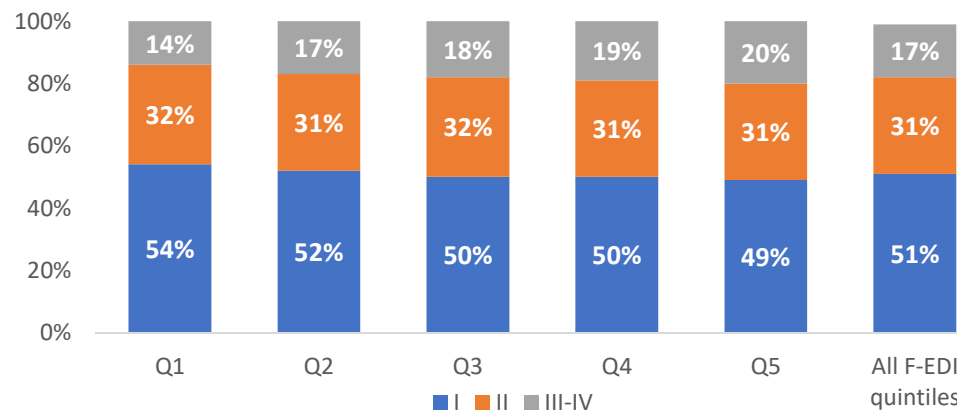
Distribution of women according to F-EDI of residential IRIS



Age at diagnosis according to F-EDI quintile



BC stage at diagnosis according to F-EDI quintile



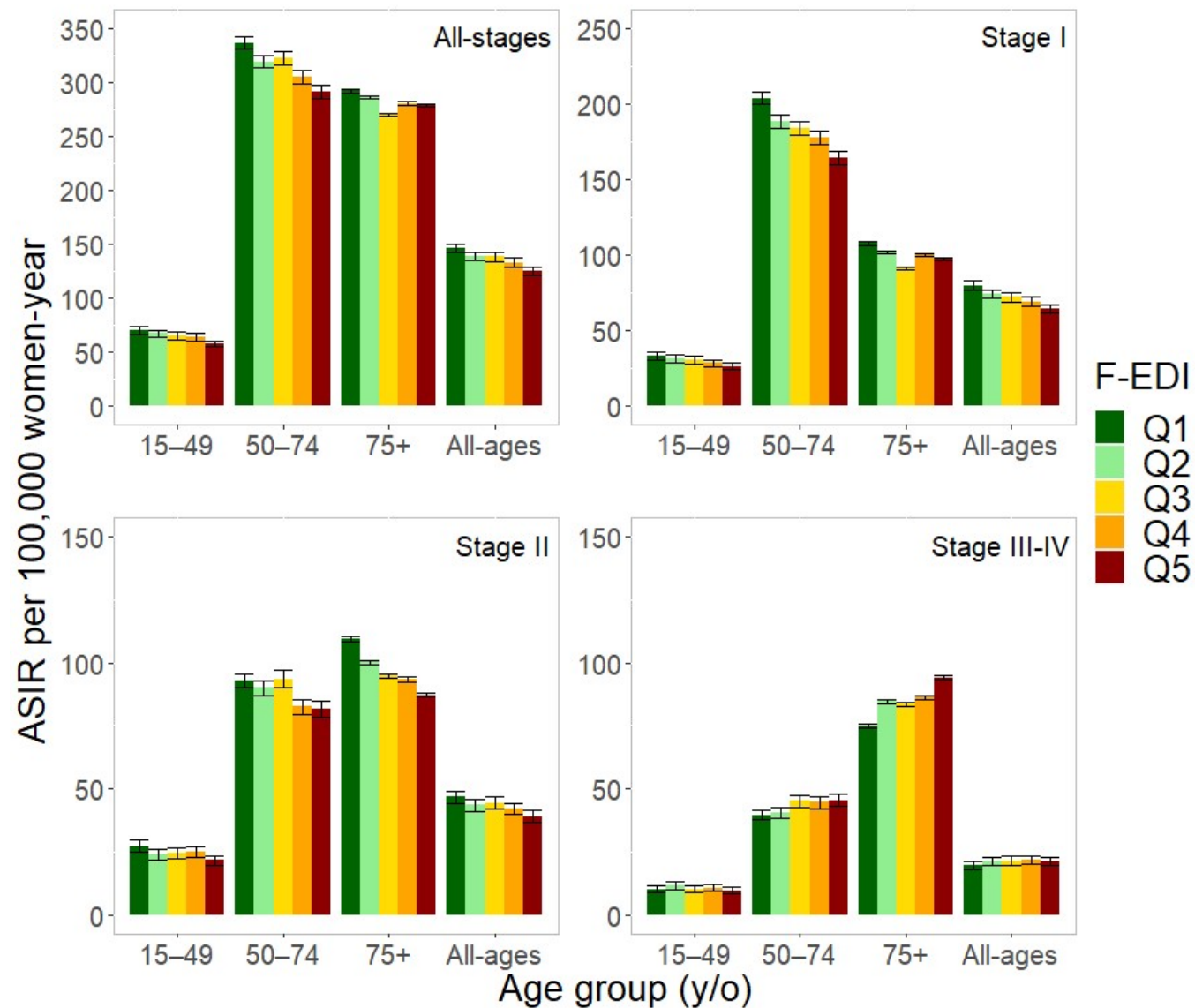
Results: ASIR according to F-EDI quintile

All-stages, stage I, and stage II

- Decreasing ASIR with lower SE deprivation in all-ages analysis.
- The trend persisted after stratification by age, although less clear in older women (75+ y/o) for all-stages and for stage I.

Stages III – IV

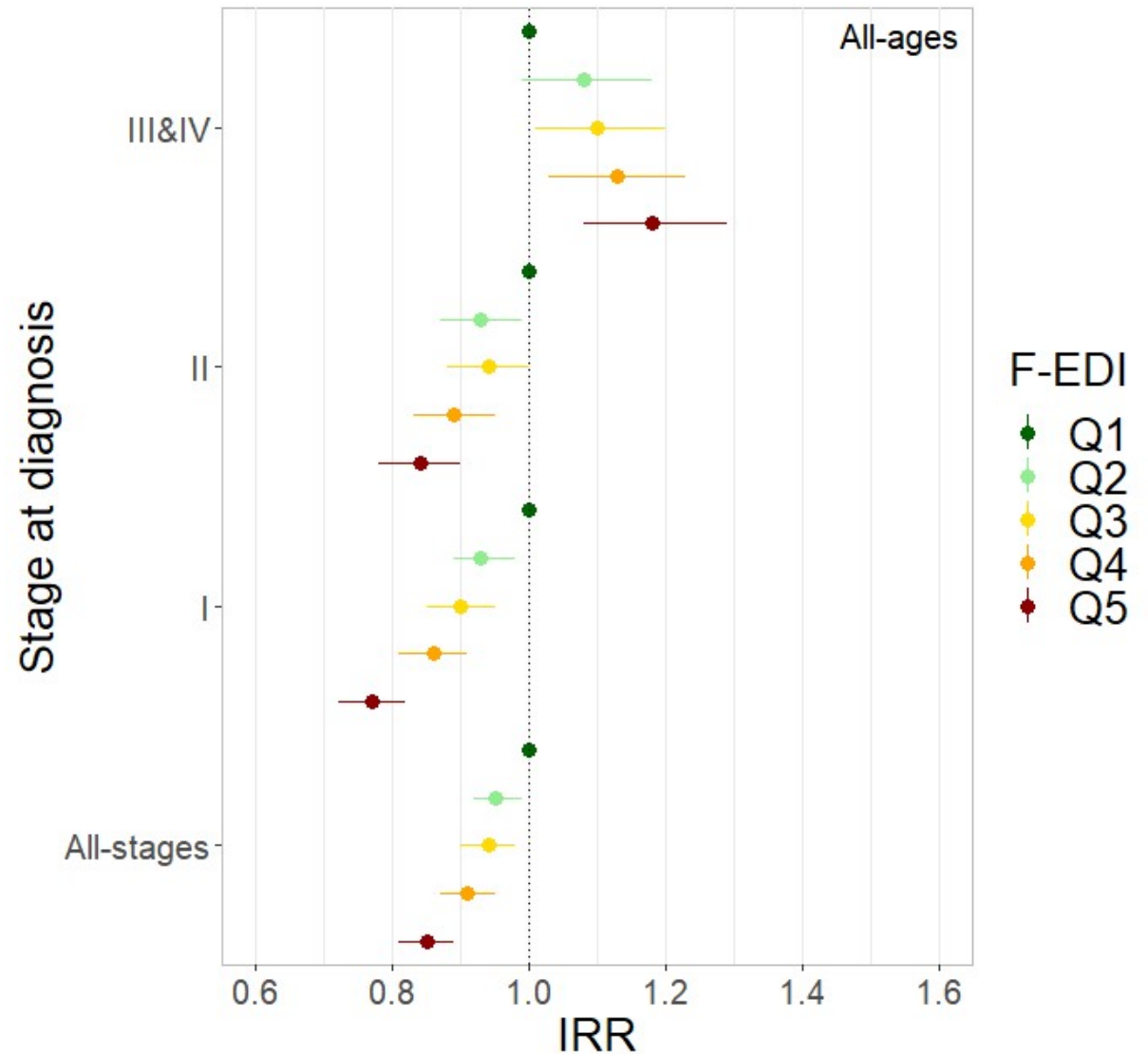
- Increasing ASIR with higher SE deprivation in women aged 50+ years and older.
- No clear trend in women aged 15-49 y/o.



Results: IRR according to F-EDI quintile

→ All-ages analysis

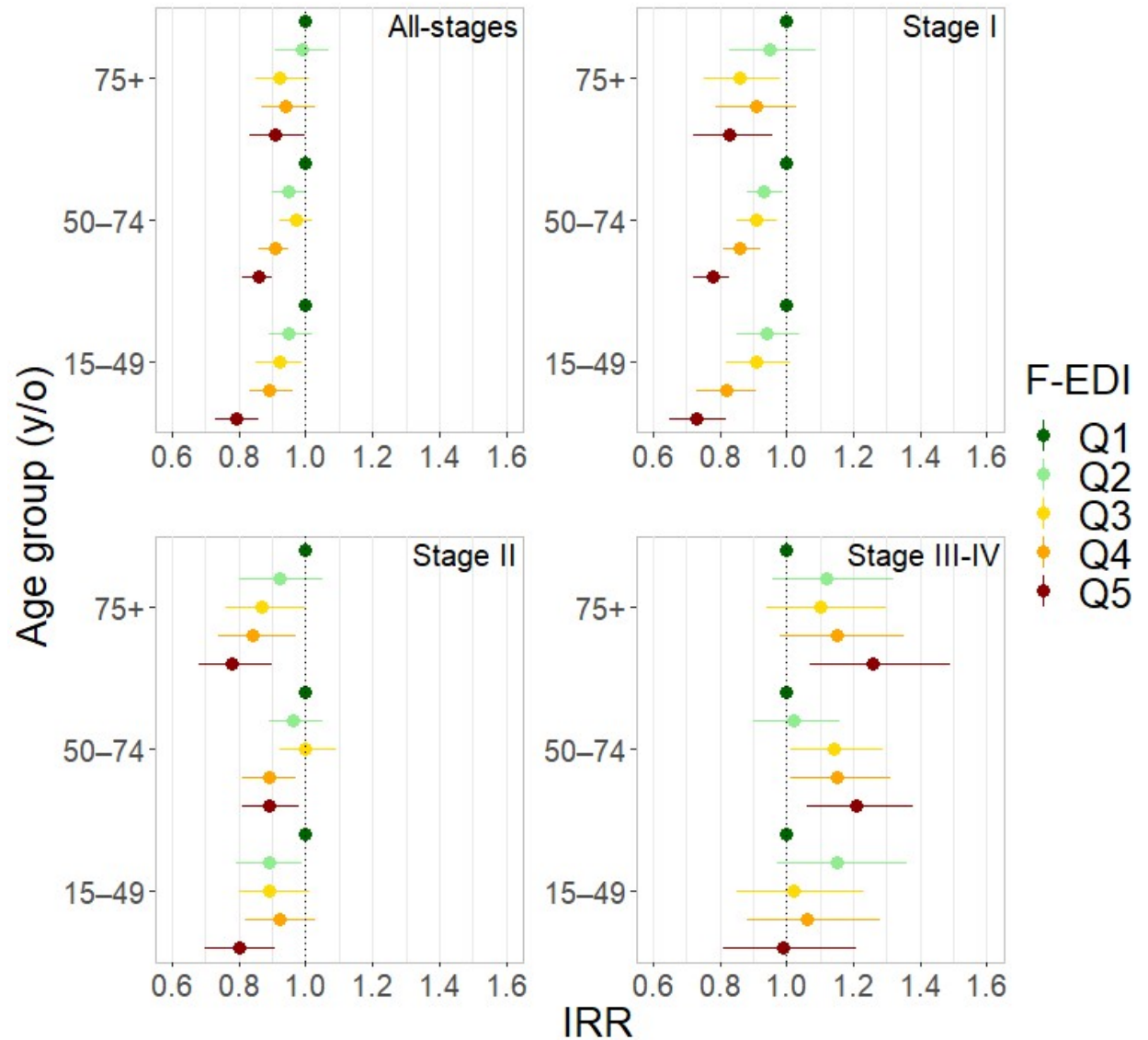
- IRR significantly decreased as SE deprivation increased from Q1 to Q5 for:
 - **All-stages -15%**
 - Early BC:
 - **Stage I -23%**
 - **Stage II -16%**
- IRR significantly increased with higher SE deprivation from Q1 to Q5 for:
 - **Stages III-IV +18%**



Results: IRR according to F-EDI quintile

→ Age-stratified analysis

- Significant trends in women under 75 y/o, except for women aged 15–49 y/o for stages III–IV.
- For women aged 75+ y/o, a significant trend was recorded only for stage II. However, significant individual Q1 vs. Q5 IRR differences for all-stages, stages I and III-IV.



Discussion of results & study limitations


Key Findings

- Significant effect of SE deprivation on invasive BC incidence in France.
- The direction of this social gradient changes based on the stage at diagnosis:
- As SE deprivation increases,
 - Significant reduction of all-stages and early BC incidence
 - Significant increase in advanced BC incidence

Interpretation of key findings

- ❖ Higher incidence of early BC (stage I and II) incidence rates in SE affluent areas:
 - Co-exposure to some BC risk factors ¹.
 - Higher screening uptake (organized & opportunistic) ²⁻³.
- ❖ Higher advanced BC (stages III–IV) incidence rates in SE deprived:

- Increased difficulty in accessing healthcare.
 - Lower awareness of the disease.



Lower screening uptake⁴⁻⁷
- ❖ Raising questions on stages III-IV:
 - Significant difference in Q1 vs Q5 IRR in 75+ y/o
 - Absence of social gradient in 15-49 y/o women

Study limitations

- Risk of underestimating the social effect due to the use of an ecological index.
- Potential misclassification of deprivation: 2011 version of the F-EDI used across the study timeframe 2008-2015.
- Grouping of stages III-IV due to limited statistical power.

1. Menvielle, G.; et al. *Am. J. Epidemiol.* 2011
 2. Smith, D.; et al. *Cancer Epidemiol.* 2019
 3. Trewin, C.B.; et al. *Acta Oncol.* 2020

4. Peek, M.E.; et al. *J. Gen. Intern. Med.* 2004
 5. Ferrat, E.; et al. *Fam. Pract.* 2013
 6. Robb, K.; et al. *Br. J. Cancer* 2009

7. Duport, N.; et al. *Eur. J. Cancer Prev.* 2008

Conclusions



Overall lower invasive BC incidence in disadvantaged women due to lower early BC incidence



Higher advanced invasive BC incidence among people living in deprived areas



Higher mortality rates observed in deprived areas could be potentially explained by the social gradient switch in advanced BC incidence, as later diagnosis is related to higher fatality



Reasons for the social gradient shift in stages III-IV incidence may include socioeconomic inequalities in BC risk factors and healthcare access, including screening



Potential solutions: targeted interventions in deprived areas to increase knowledge about BC and related risk factors + removing barriers to access to healthcare services



Thank you for your attention

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Article

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