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Mammography Facilities are Accessible, So Why is Utilization So Low?

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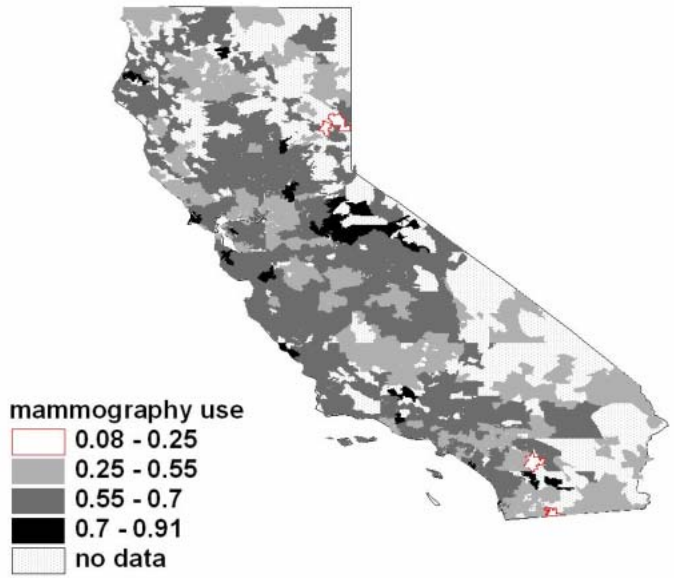
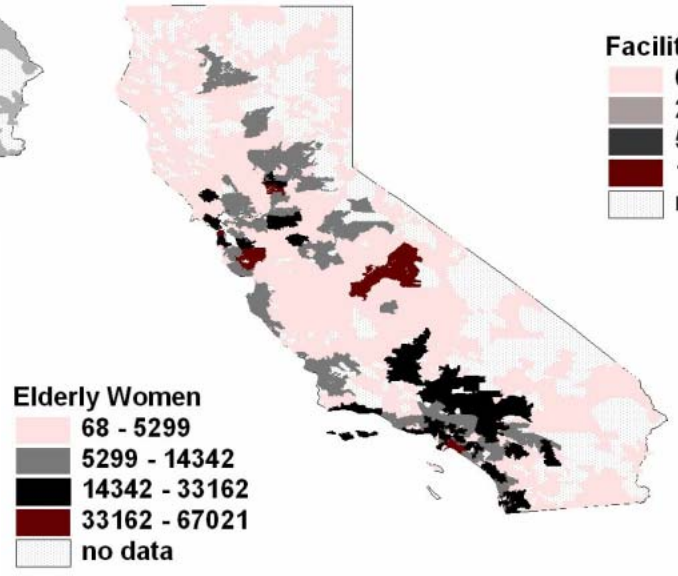
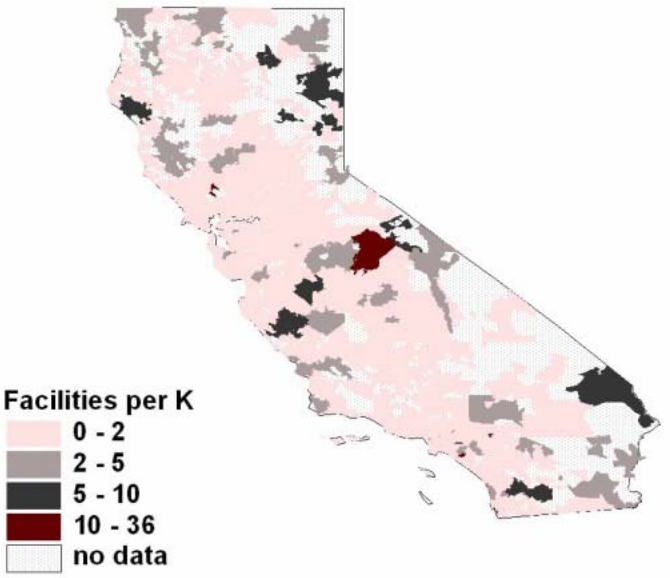
Objectives

- A lot of attention has been paid to whether mammography facilities are conveniently placed
- We study a large, culturally and ecologically diverse state with good density of mammography facilities but poor mammography use rates, to better understand other factors (besides proximity) that drive mammography use decisions

Geographic Accessibility of Mammography Facilities







Study Population

- The study population is 70,129 women (> age 65) in California from the SEER-Medicare linkage
  - About 33% have a breast cancer diagnosis
  - The remainder are a 5% random sample of women without breast cancer from Medicare FFS
- We excluded women < 65 years of age, those with HMO coverage or missing Part B coverage during the period 2002–2003, and any known deceased
- Over half the sample live in the same ZIP code as a mammography facility, and only 3% live in a ZIP code more than 10 miles from a facility, yet less than half the 5% sample used mammography during 2002–2003

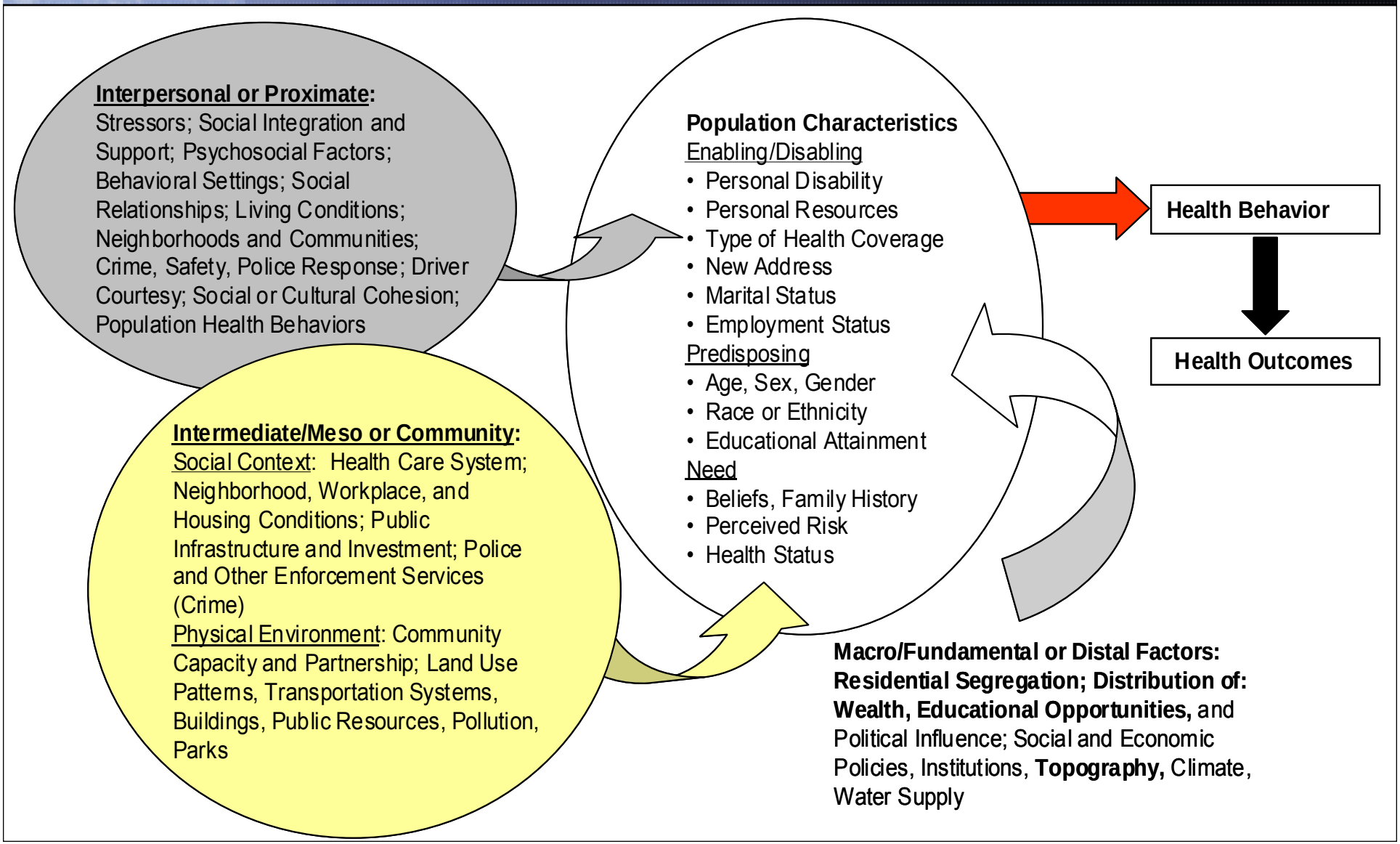
Background

- Our conceptual model is a spatial-interactions approach that recognizes the interplay between personal, social, and physical environments along the pathways to healthcare utilization
- Apart from service proximity, there are many other factors that might impact one's decision to use mammography
  - Person-level (demand)
  - Health care system (supply)
  - Environmental (spatial interaction with physical and social structures — barriers and facilitators)

Background

- We develop a hybrid model of healthcare utilization that blends features of the traditional Aday-Andersen behavioral model with the socio-ecological modeling perspective of Smedley and Syme/Schulz and the spatial interactions context of Khan and Bhardwaj (WHO)
- We use the model to conceptualize the various levels of influence expected from socio-ecological variables in individuals' mammography utilization decisions

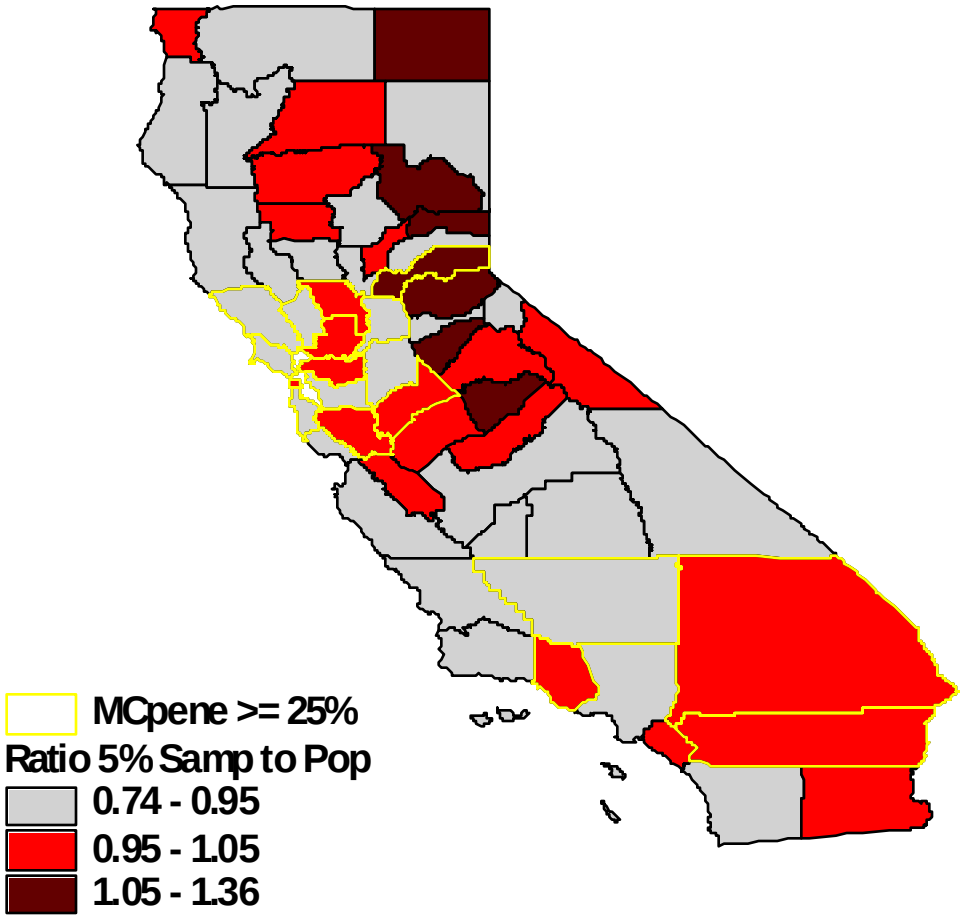
Conceptual Model of Multilevel Factors Influencing Utilization of Mammography



SEER-Medicare Data Considerations

- The 5% random sample of Medicare data are drawn annually and added in a quasi-snowball-fashion to the existing SEER-Medicare data
- Over time, women from the Medicare files who die or otherwise leave FFS Medicare (join Medicare HMOs, etc.) are not removed from the SEER-Medicare data
- Women without Part B (outpatient services) coverage are included in the SEER-Medicare data; monthly codes are provided
- The Medicare data must be cleaned before use; over half of the available observations were trimmed in creating our study population

The 5% Medicare FFS Reference Sample is Not a Spatially Representative Sample



Methods

- We use multilevel modeling with logistic regression to estimate individual choice of whether or not to use mammography in 2002–2003, joining demand, supply, and contextual factors
- A spatial regression model is not appropriate when sample is not spatially representative
- We use GEE modeling (SAS) to adjust model standard errors for redundancy in the contextual variables for multiple women in same areas
- HLM is not appropriate because the second 'level' is defined by the spatial market definition, not a meaningful structural grouping

Definition of Relevant Market Units for the Multilevel Analysis

- There are several competing current health market definitions available for the *Interpersonal* or *Proximate* level contextual effects: PCSA (n=333), MSSA (n=519); ZCTA (n=1,450)
- PCSAs and MSSAs are both derived based on economic principles; PCSAs derived for elderly
- Findings are quite robust to whichever market unit is chosen for the Interpersonal context
- We use PCSA here for Interpersonal and county for Intermediate/Community levels

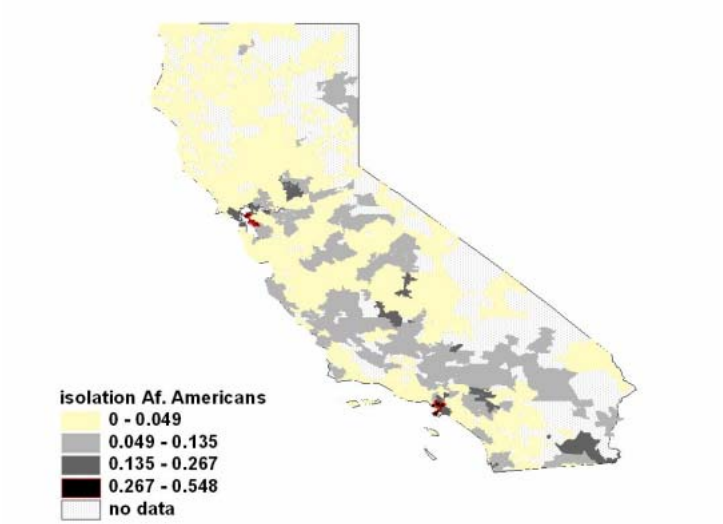
Person-level Effects

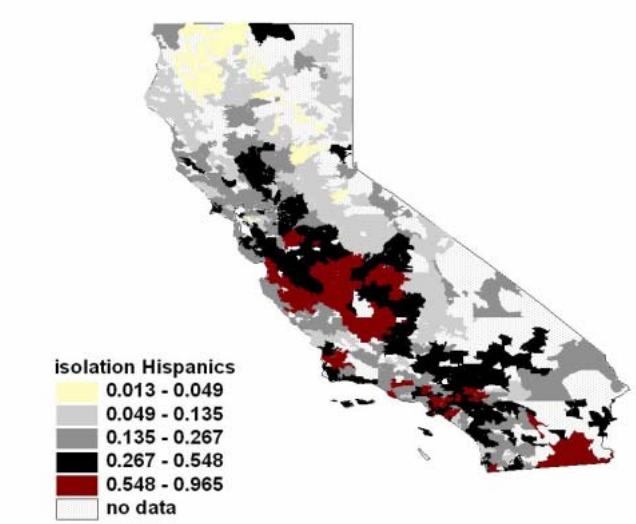
- 'Obtained flu shot from doctor' increases probability of mammography use by 17%
- There is a 1.4% decline in probability of use with each year of age
- Women who changed residence in the past year are 6% less likely to use mammography
- Persons with disabilities are 5% less likely, dually eligible are ½% less likely with each month of eligibility (maximum is 12% less likely)

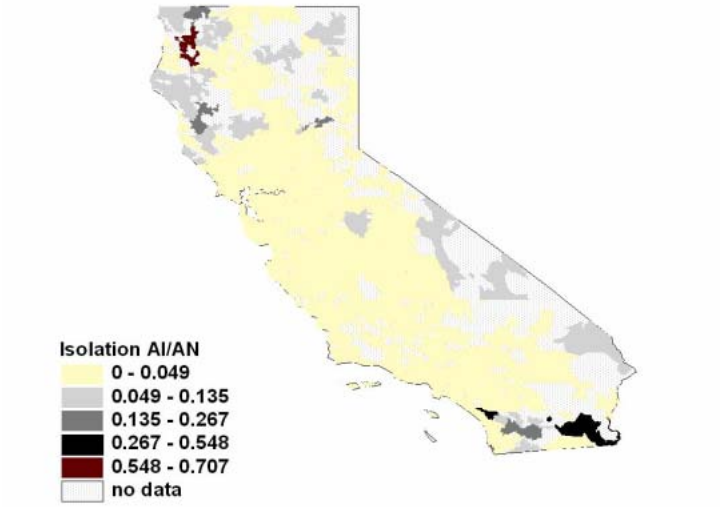
Disparities by Race or Ethnicity

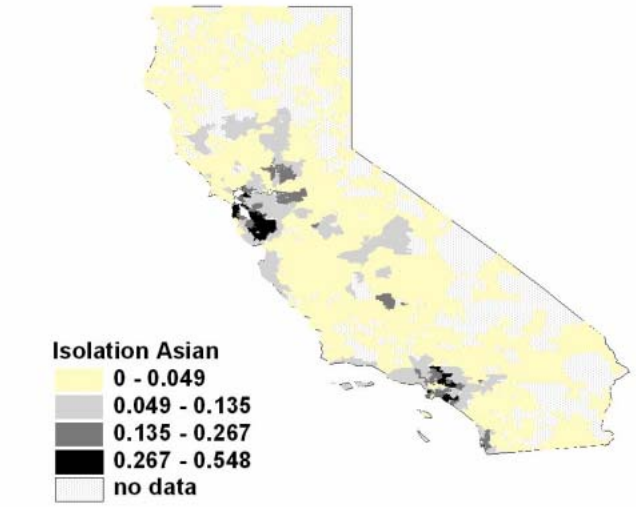
- We use Massey and Denton's isolation index as a measure of racial or ethnic residential segregation
- At the person level, when accounting for residential segregation by race, Asians, AI/ANs, and 'other' are 7% less likely, while African Americans are 3% less likely (than whites) to utilize mammography; there are no significant Hispanic effects
- Residential segregation indices are significant and negative for Hispanics (3% lower probability) and African Americans (4% lower probability), and significant and positive for AI/ANs (16% higher)

Location of Residential Segregation Varies by Race and Ethnicity



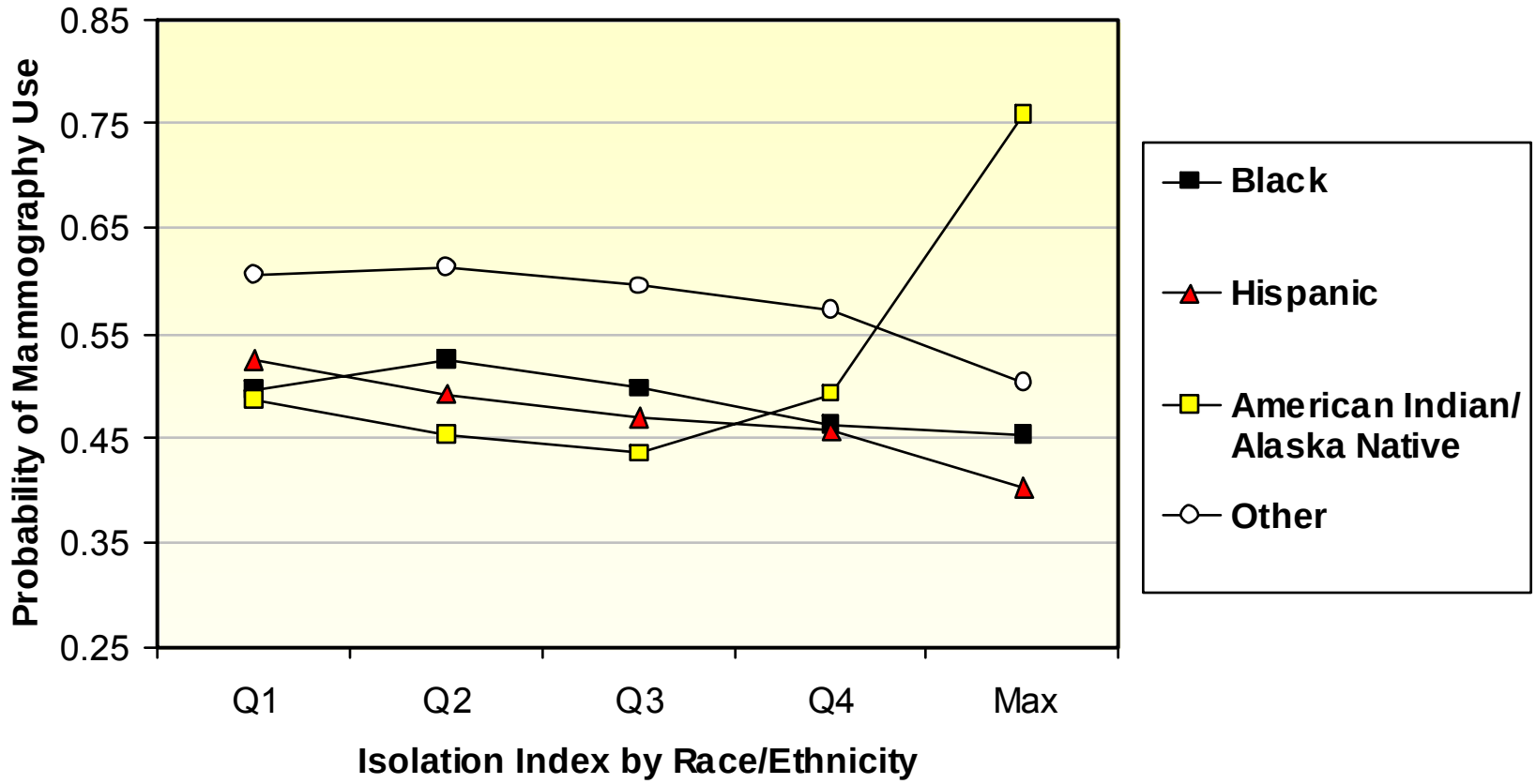






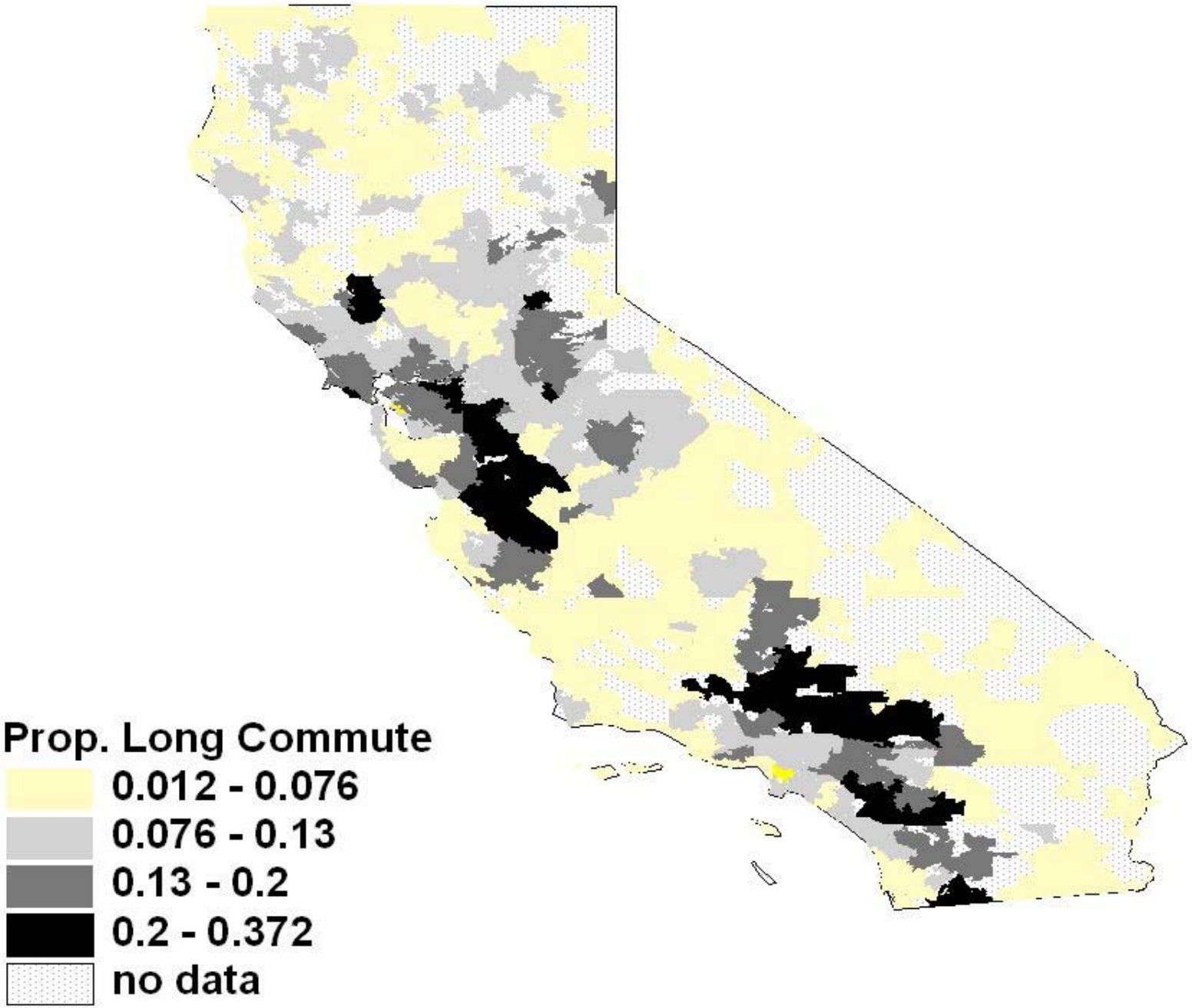
Disparities in Residential Segregation Effects

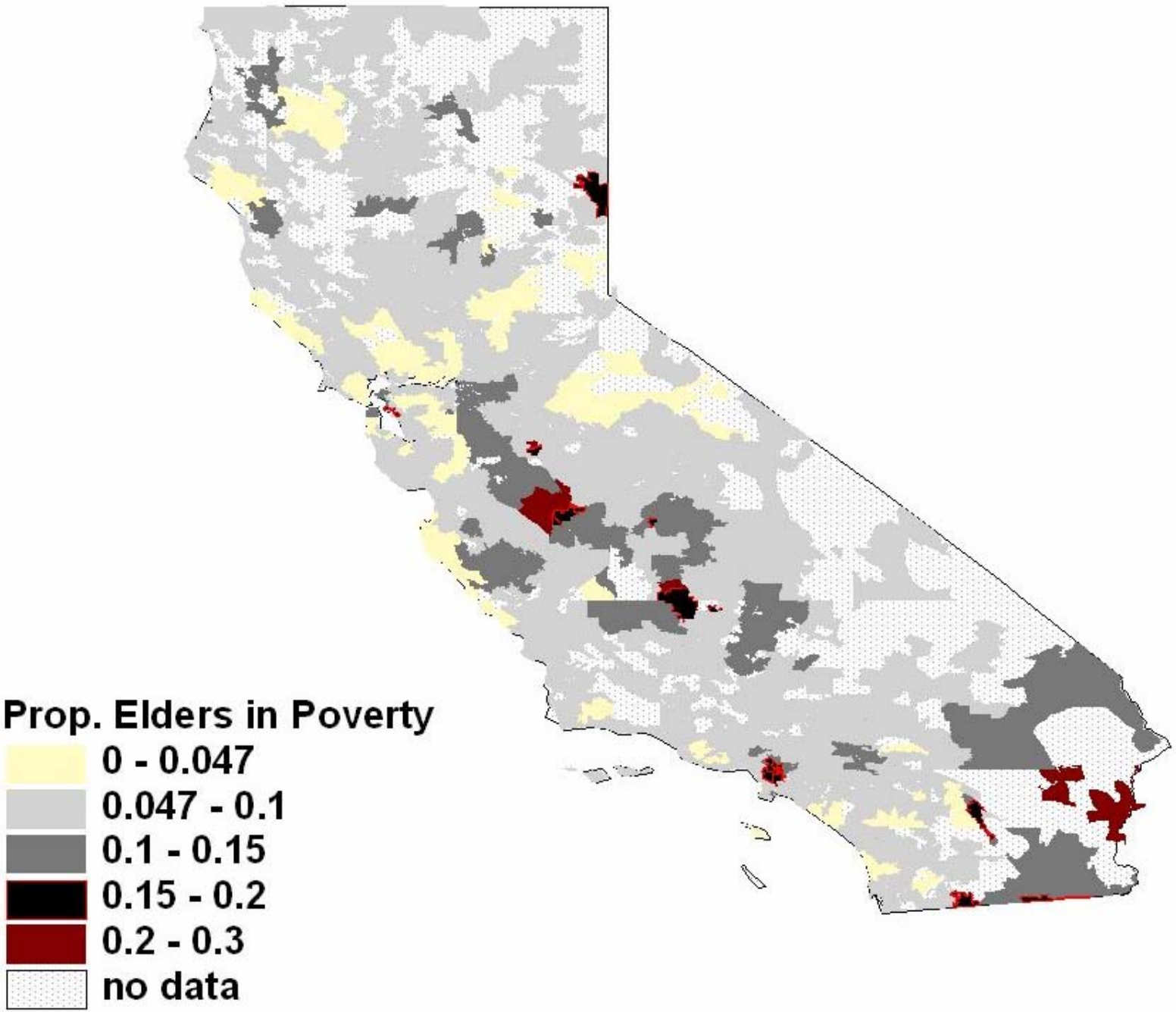
(Interaction Effects: Race/Ethnicity and Segregation Index)



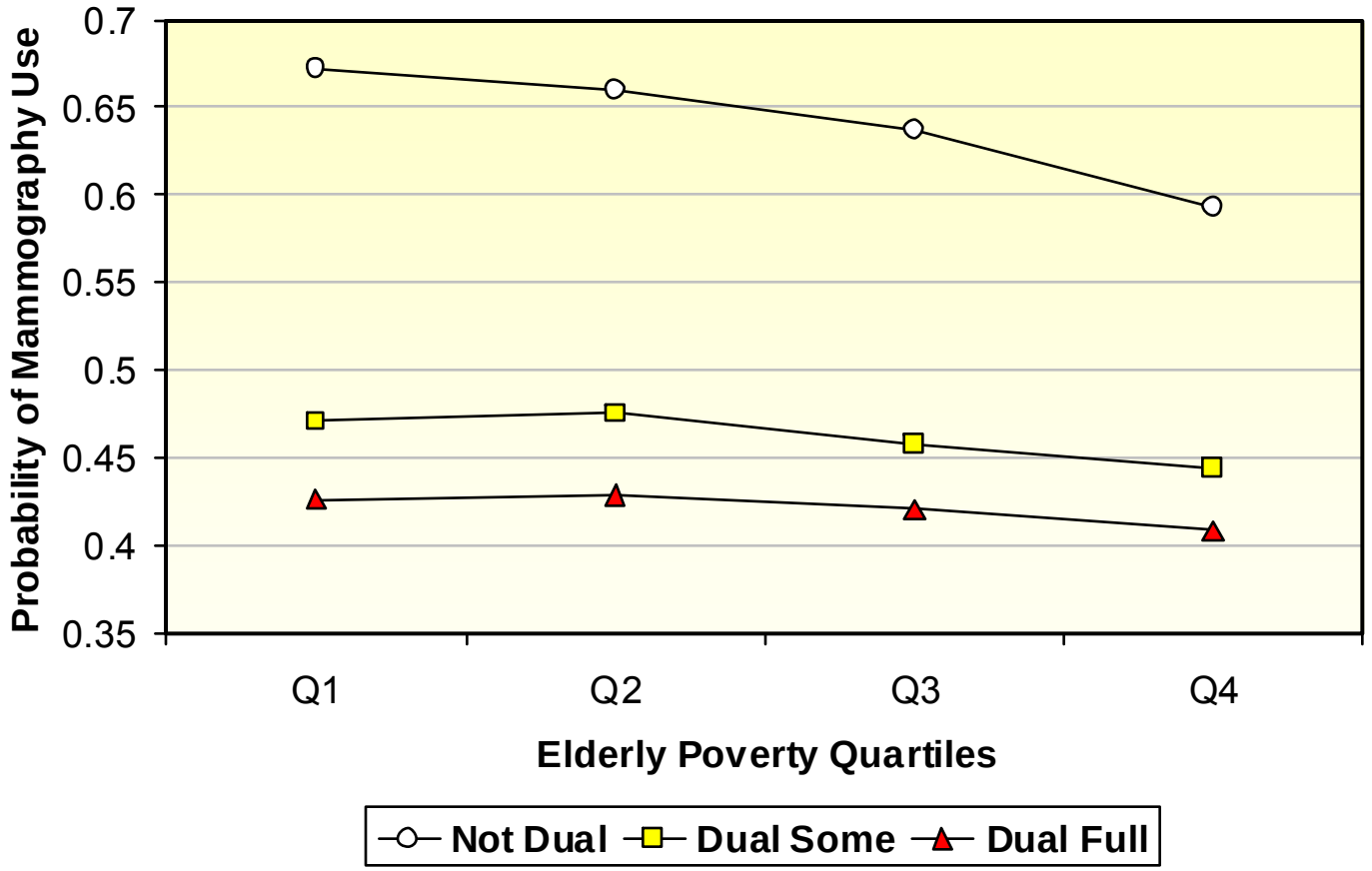
Other Contextual Effects (on average, from living in places where…)

- The ‘commuter intensity’ variable reduces the probability of use by 14% (defined as % of workforce in PCSA who commute more than 60 minutes each way to work on a daily basis)
- ‘Elderly poverty’ reduces the probability of use by 33%
- We consider interactions between personal disability and road rage, or dual eligibility status and elderly poverty

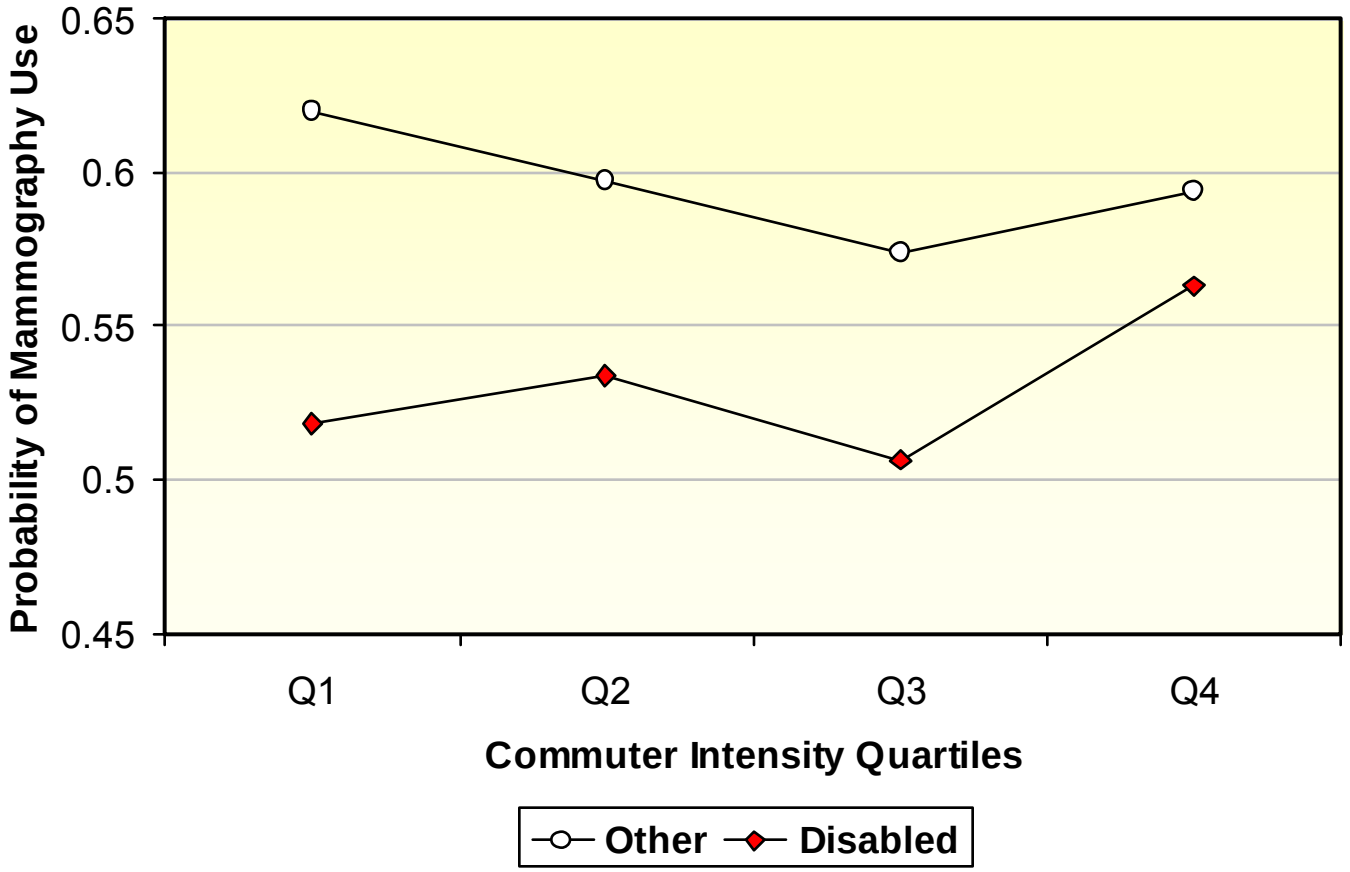




Personal Dual Eligibility and Community Elderly Poverty Interaction



Personal Disability and Commuter Intensity Interaction



Tiny Effects from Physician or Other Provider Availability

- Bucket approach: # per thousand
  - No significant impact for generalists, OBGYNs
  - No significant impact for nursing, NPs, PAs
  - No significant impact for oncologists
- Tiny but significant impact from distance to closest: The probability falls 1% per 10 mile increase to closest provider (quite small with average distance 1.9 miles)
- No significant impact from number of facilities in area per K women (crowding)
- **Less than 50% of the 5% sample used mammography**

Model Assessment

- Prediction success rates are good
  - Sensitivity (correct YES) = 80%
  - Specificity (correct NO) = 60%
  - Overall = 71%
- The vast majority of predicted probabilities are in the middle of the distribution, so a linear probability model produces essentially the same findings as the logit model (with much simpler interpretation of interaction effects)

Summary and Conclusions

- Community contextual factors have different effects on different people
- This heterogeneity emphasizes the importance of spatial and multilevel modeling
- Targeting interventions to communities with especially low screening rates and specific community profiles may be facilitated by spatial and multilevel modeling methods

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