Assessing Income Inequality as a Predictor of Head and Neck Cancer Outcomes

Kiran Marla, BS[1] , Jason Semprini, PhD, MPP[2], Nitin A Pagedar, MD, MPH[3]
Carver College of Medicine, University of Iowa[1], Des Moines University, College of Health Sciences, Department of Public Health[2], Department of Otolaryngology – Head and Neck Surgery, University of Iowa[3]

Introduction

- It is widely recognized that socioeconomic disparities play a critical role in shaping head and neck cancer (HNC) outcomes across diverse patient populations
- Although traditional SES markers—such as income, education, and poverty levels—are useful for assessing individual risk profiles, they may not fully capture the social and economic heterogeneity within counties that also affects HNC outcomes
- We hypothesize that community-level income inequality might offer a more comprehensive explanation for HNC disparities than variations in individual SES alone

Methods

- We analyzed patients with upper aerodigestive tract cancers using data from 17 SEER registries comprising 609 US counties
- Variables
  - 5 year observed survival
  - Income inequality - Gini index
  - Median household income - per year
  - Poverty level - Percent of population less than 150% Federal poverty level (FPL)
  - Education level - Percent of population with less than high school education
- Data were stratified by initial cancer stage - local, regional, and distant
- Regression analyses were conducted breaking each SES marker into quintiles
- Scatter plots were reported to visualize the relationships between Gini index and each SES marker

Results

- Income inequality appears to have stronger association with survival among those diagnosed at the latest cancer stages
- Household income alone does not consistently predict survival disparities 4th quintile counties
- Gini identified a 9.5% and 11% lower survival among 3rd and 4th quintiles, respectively
- Combined model indicates that Gini identifies significantly worse survival among middle-lower SES counties and household income did not
- Income inequality quintiles categorize completely different counties as high vs low SES compared to traditional markers

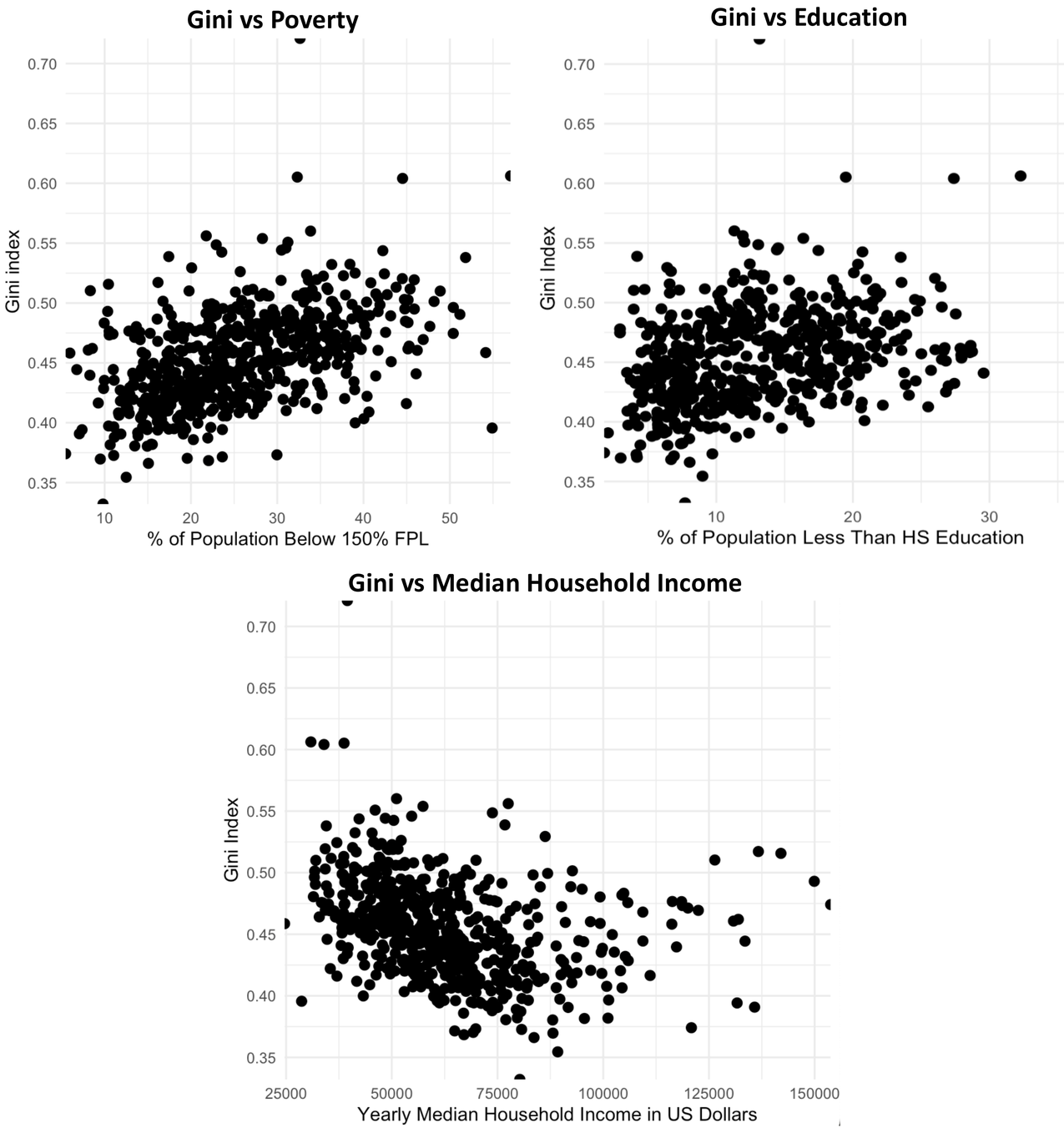

Figure 2 Scatter plots correlating Gini index with each traditional SES marker - each county represented as an individual data point

Distant Stage	Quintiles	Gini + Household Income	Gini + Poverty	Gini + Education
Gini	Gini Q2	-5.6893	-4.8773	-5.109
	Gini Q3	-7.4671*	-6.1507*	-6.279*
	Gini Q4	-8.2893**	-6.7643*	-7.700*
	Gini Q5	-8.9296**	-7.6444*	-9.078**
SES Marker	Q2	-0.4945	-0.8471	-4.711
	Q3	-1.2462	-4.5699	-4.938
	Q4	-3.8732	-6.6016*	-8.674**
	Q5	-7.9154*	-9.6739**	-11.515***

Table 1 Multivariate regression analysis for distant cancer stage data - Gini index combined with each SES marker
*p<0.05 **p<0.01 ***p<0.001

For each SES measure, quintile 5 corresponds to most deprivation/inequality and quintile 1 is the least

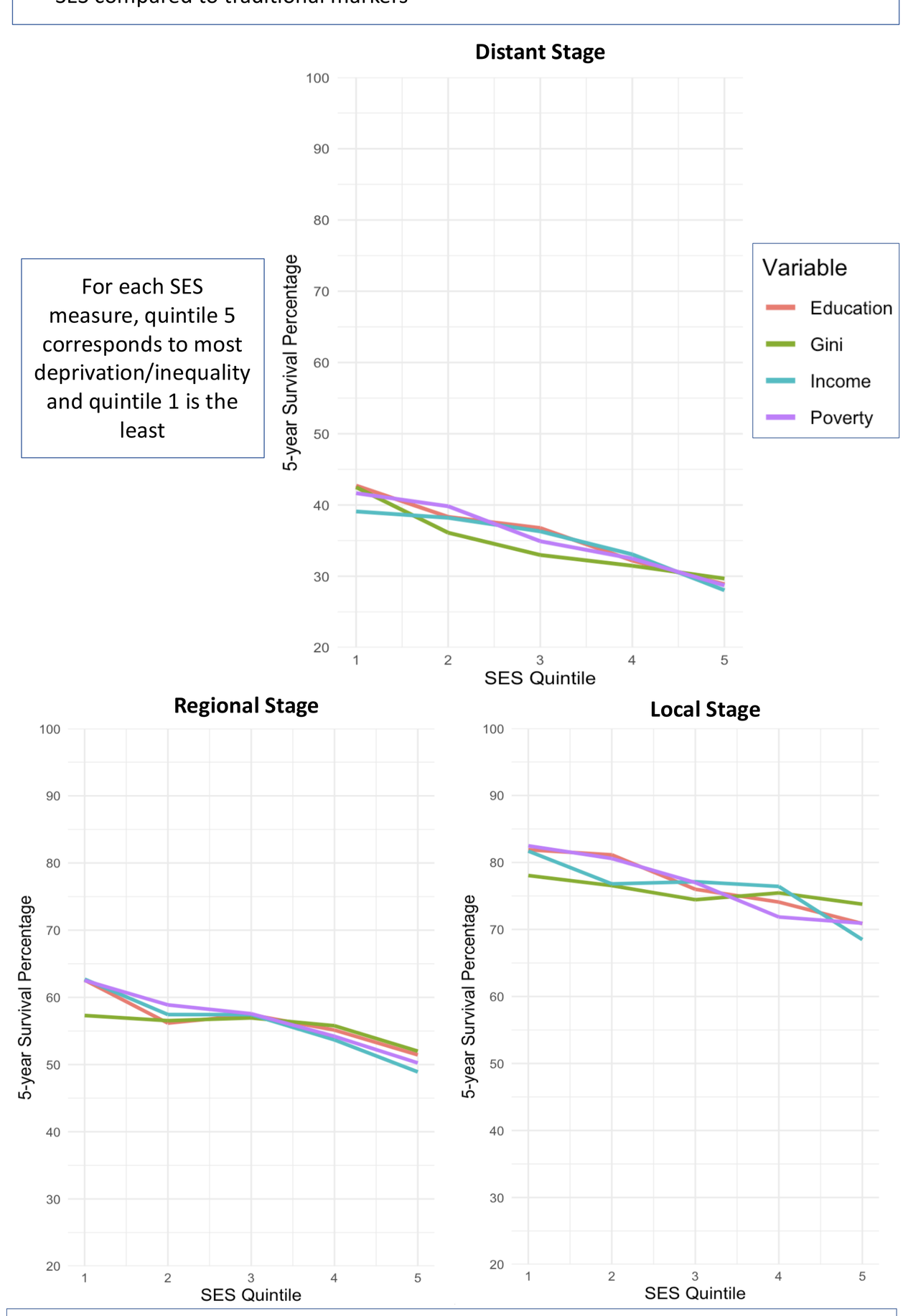

Figure 1 Stage-stratified line plot regressions between 5-year survival and SES quintile for each SES indicator

Conclusions

1) Household income does not identify survival disparities among middle-low SES counties with populations diagnosed at the latest stage

2) Income inequality should be considered alongside education and poverty to identify at-risk populations

3) County-level analyses of disparities may offer more practical geographic intervention strategies compared to individual-level analyses

4) Income inequality may identify intra-county resource disparities that traditional individual-based SES markers overlook

5) Future research could analyze characteristics among counties with differential risk stratifications between income inequality and traditional SES markers