Racial and Socioeconomic Disparities in Industrial Air Pollution Burdens over the Life Course

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Four Advances in Environmental Justice Empirical Data and Analytic Methods

Distance-based Methods vs Unit Hazard Coincidence Method

With the wide-spread availability of geographic information systems (GIS), the move away from unit-hazard coincidence method to distance-based methods in proximity-based EJ analyses.

Cumulative Pollution Burden Analysis vs Proximity Analysis

Availability of pollution burden/risk-based (rather than proximity-based) environmental databases, such as the National Air Toxics Assessment (NATA) and the Risk Screening Environmental Indicators Geographic Microdata (RSEI-GM).

Survey Data vs Census Data

Use of survey (in addition to census) data in empirical environmental justice analyses.

Longitudinal Analysis vs Cross-sectional Analysis

Increased opportunities for conducting longitudinal environmental justice analyses as the result of improving TRI and RSEI-GM databases

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Racial and Socioeconomic Disparities in Residential Proximity to Polluting Industrial Facilities: Evidence From the Americans' Changing Lives Study

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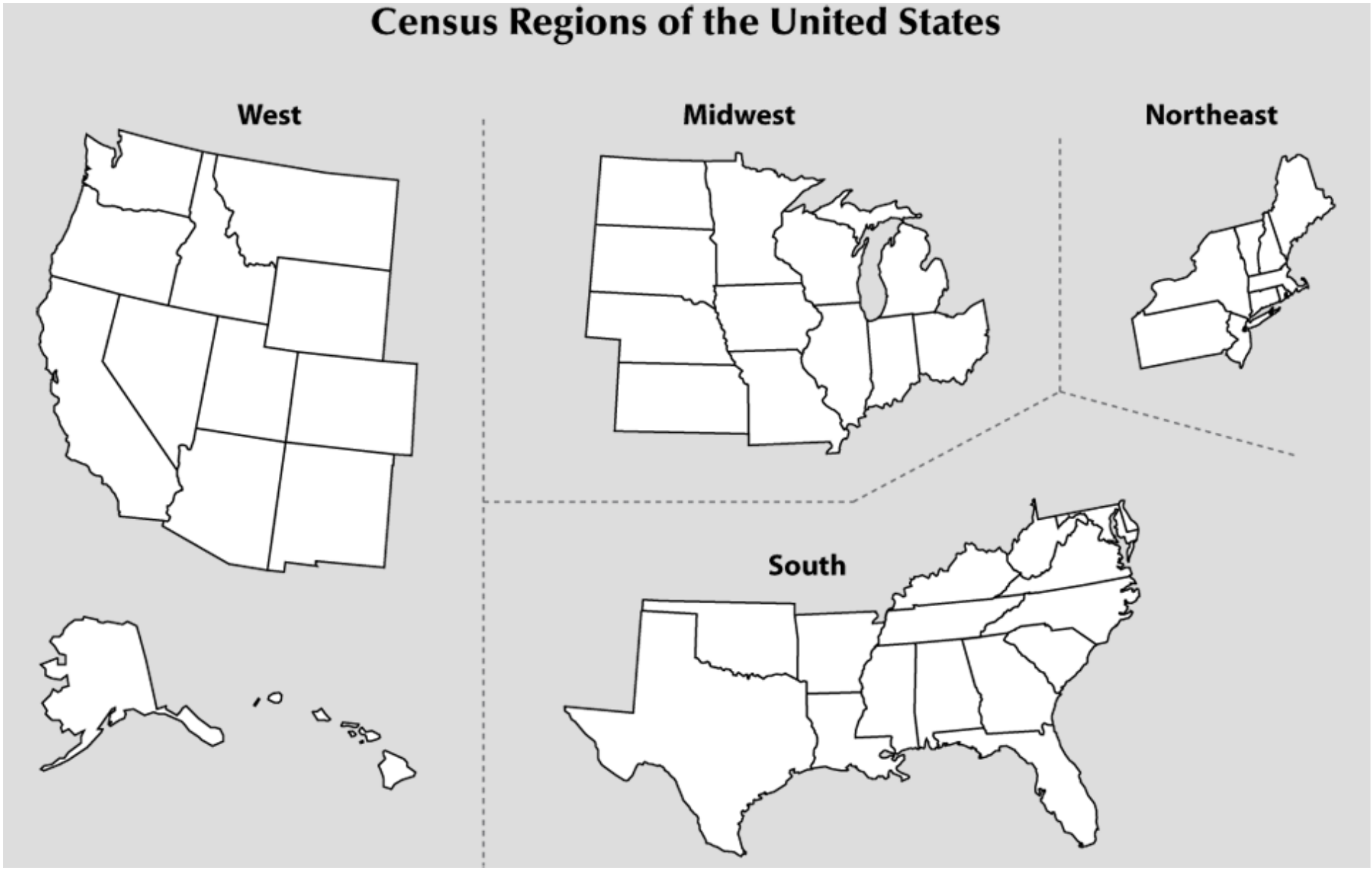
2009, Vol 99, No. S3 | American Journal of Public Health

The Americans' Changing Lives Survey (ACL) 1986-2001

The ACL is a nationally representative panel study of the American population. In the 1986 ACL baseline, face-to-face interviews were conducted with a stratified, multistage sample of 3617 non-institutionalized adults 25 years or older in the coterminous U.S. ACL respondents were re-interviewed in 1989, 1994, 2001, and 2011.


Census Regions of the United States
West
Midwest
Northeast
South

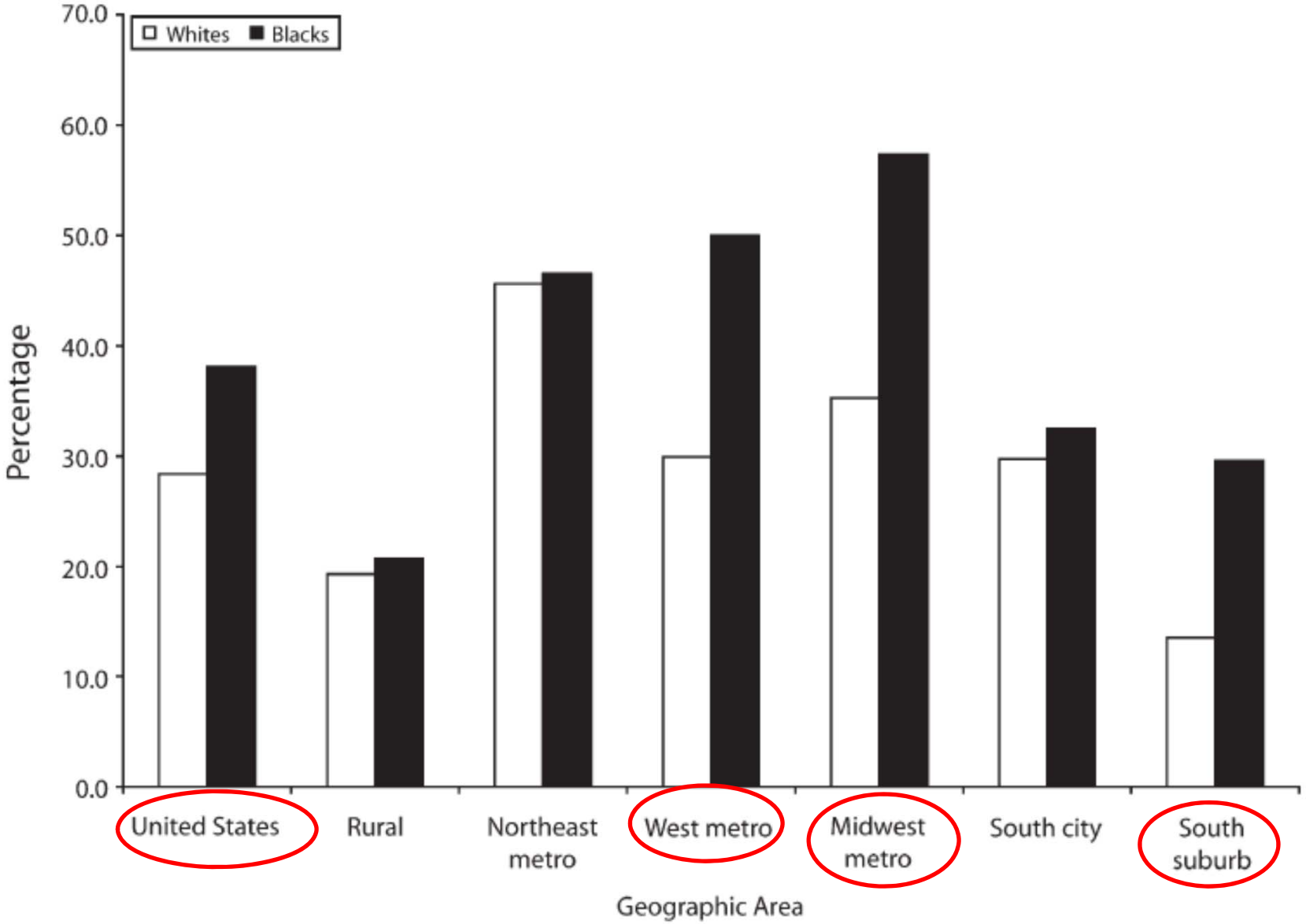


FIGURE 1—Percentages of people living within 1 mile of a polluting industrial facility, by race/ethnicity and geographic area: Americans' Changing Lives Study, 1986.

Zwickl, K., Ash, M., & Boyce, J. K. 2014. "Regional variation in environmental inequality: Industrial air toxics exposure in U.S. cities." *Ecological Economics*

Fig. 1. Average exposure by poverty and minority status, national level. Note: Authors' calculations are based on Eq. (1).

Appendix Fig. A.1. EPA regions.

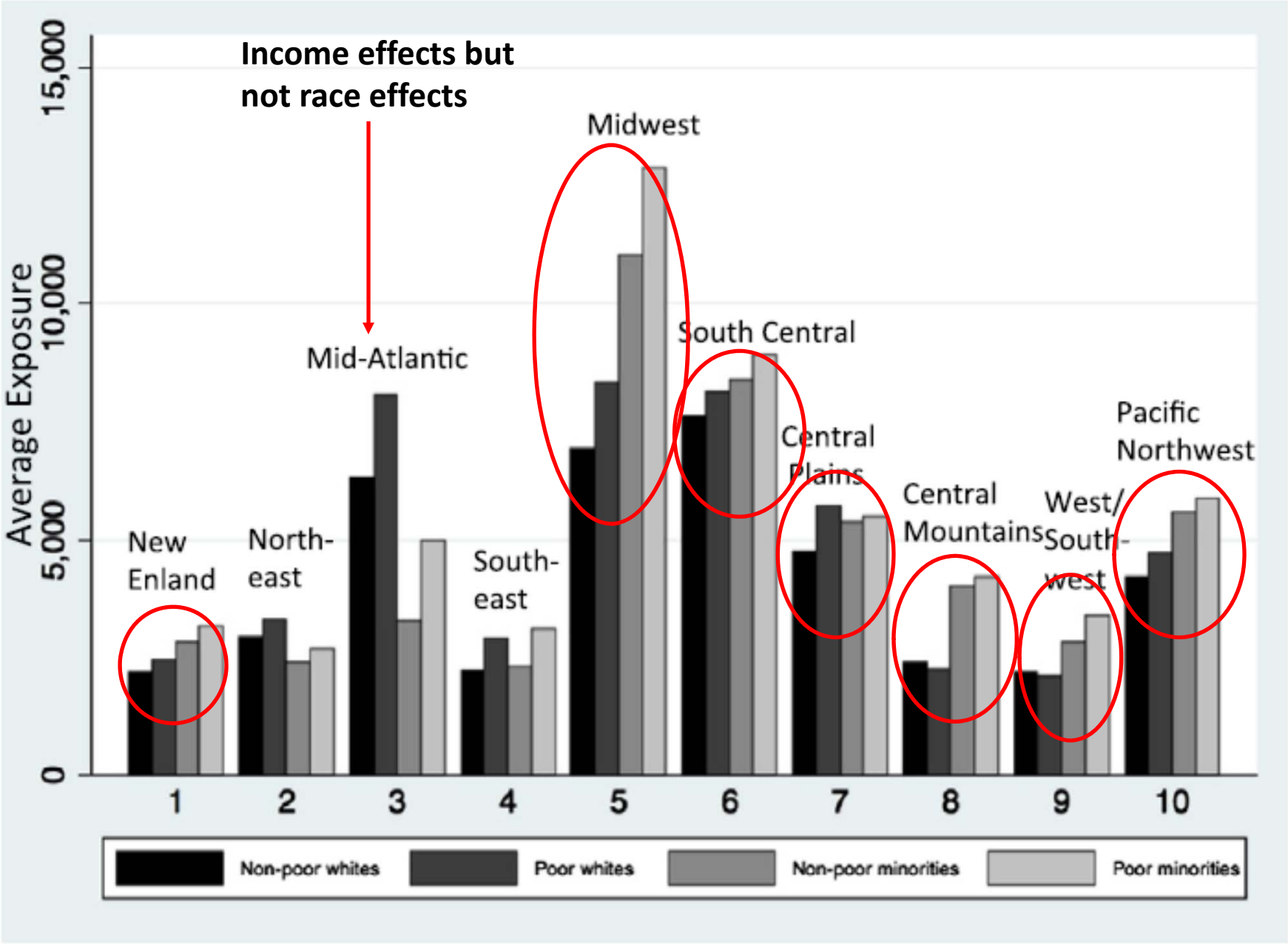


Fig. 4. Average exposure by poverty and minority status, EPA regions. Note: Authors' calculations are based on Eq. (1).

Collins, Mary , Ian Munoz and Joseph JaJa. 2016. "Linking 'toxic outliers' to environmental justice communities." ***Environmental Research Letters*** **11 015004**

5% of industrial facilities that report to the TRI produce 90% of the industrial air pollution in the U.S.

Are racial and socioeconomic disparities around these facilities greater than for the other 95% of TRI facilities?

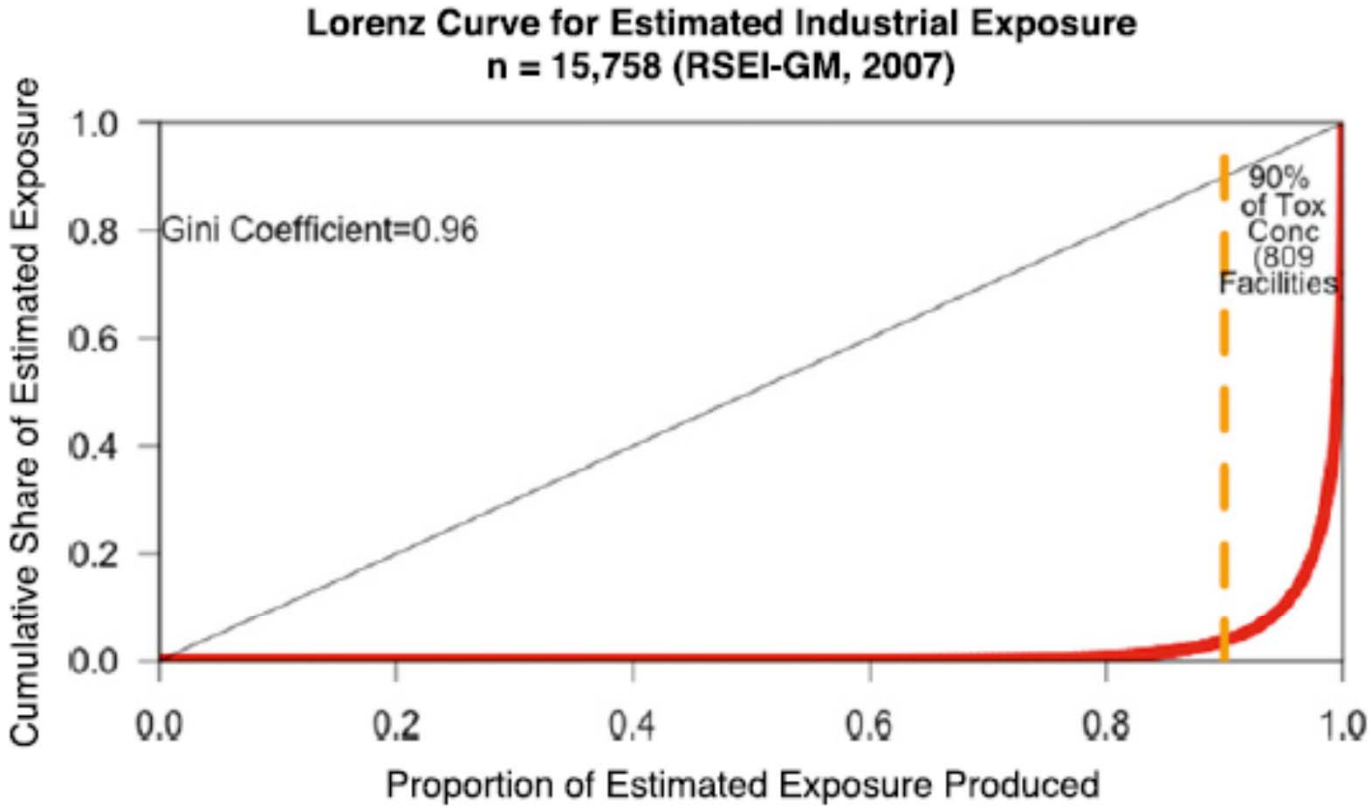


Figure 2. Disproportionality evaluation.

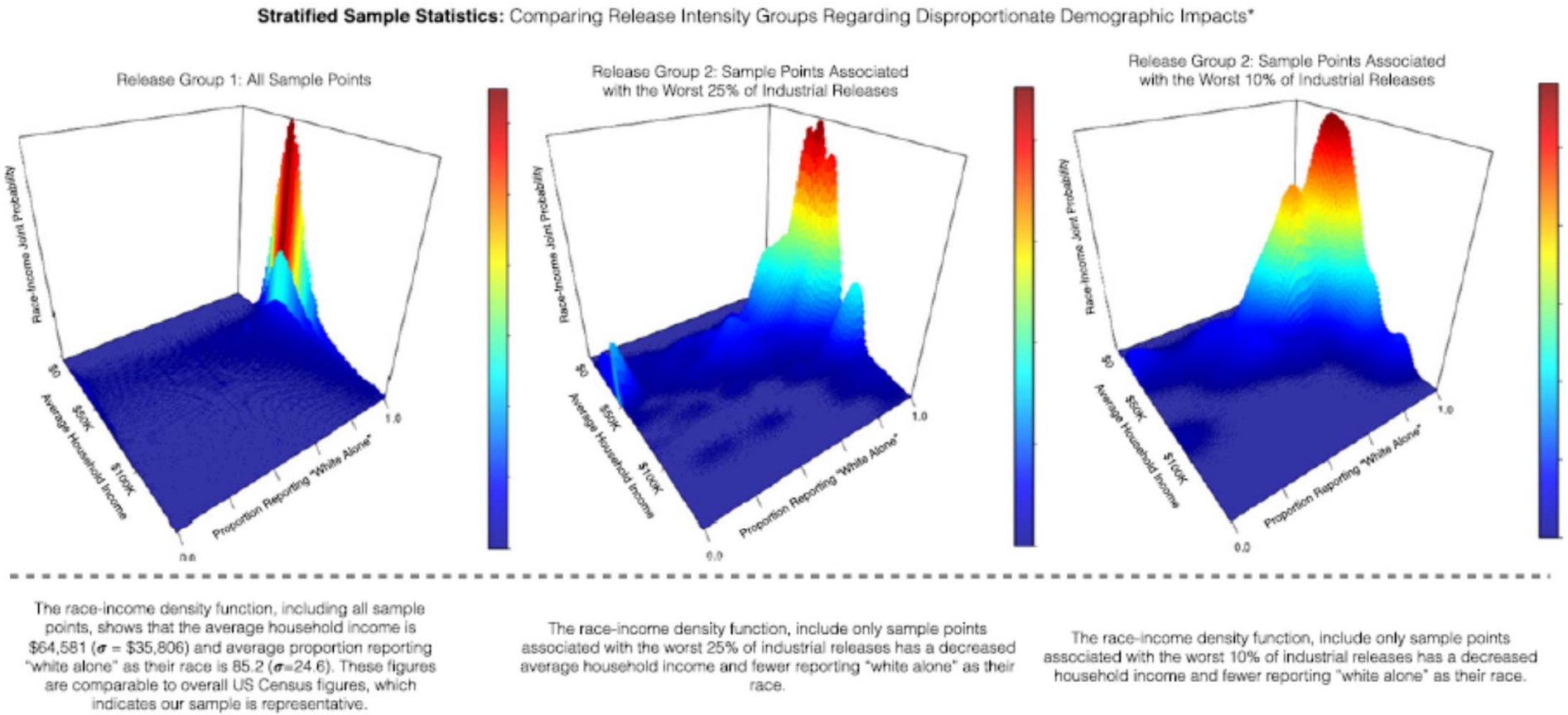


Figure 3. Stratified sample statistics: comparing release intensity groups regarding disproportionate demographic impacts.

Racial and Socioeconomic Disparities in Industrial Air Pollution Burdens over the Life Course

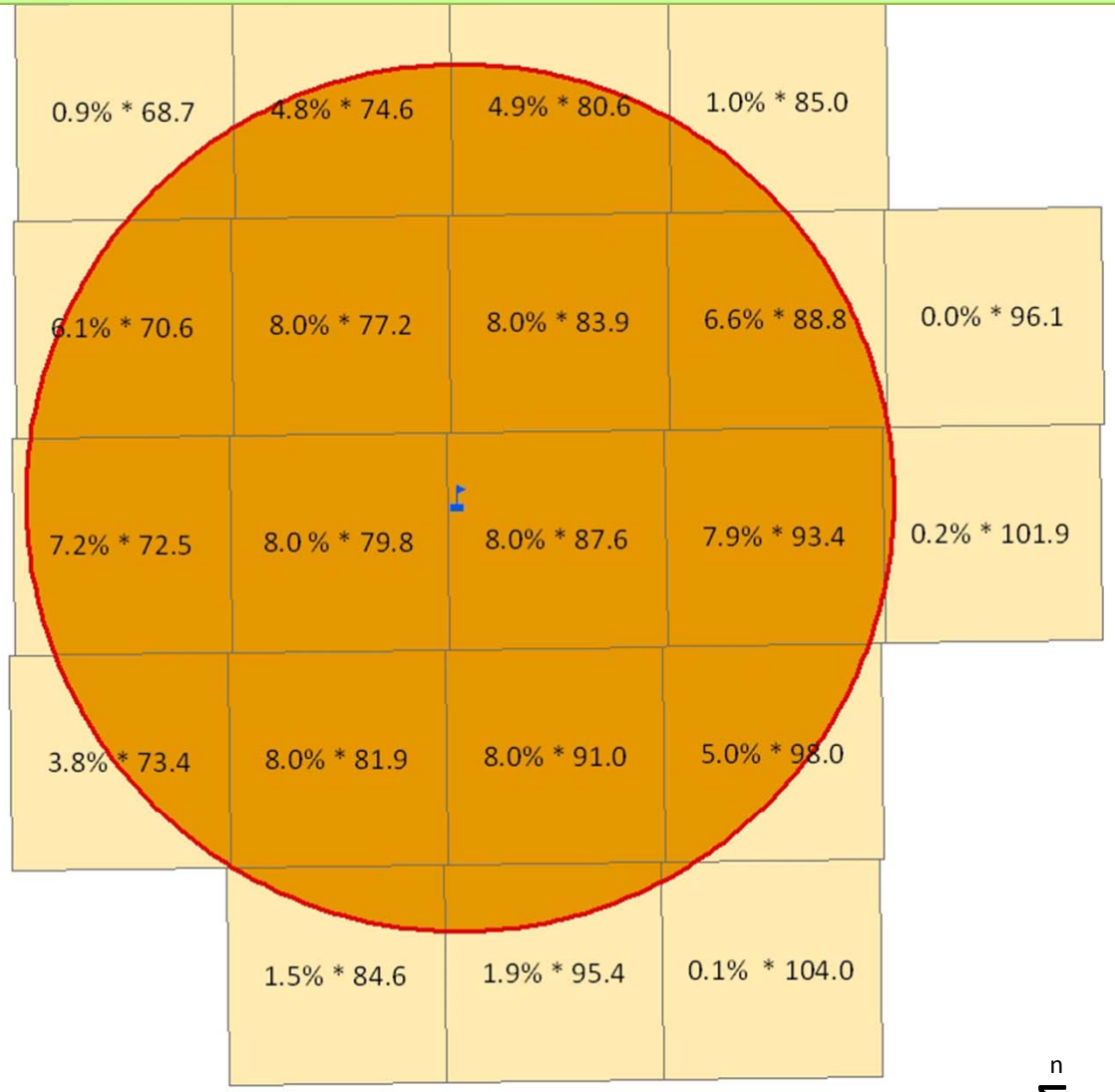
1) We wanted to determine how total air pollution burdens from industrial sources change over the life course.
2) We also wanted to determine whether patterns in these changes are different for African American and white individuals.

The Americans' Changing Lives Survey (ACL) 1986-2001

Sample Sizes

	Wave 1: 1986 Interviews	Wave 2: 1989 Interviews	Wave 3: 1994 Interviews	Wave 4: 2001 Interviews
	1988 TC	1989 TC	1994 TC	2001 TC
Whites	3015	2396	1993	1502
Blacks	397	299	236	177

Estimating toxic air concentrations from industrial sources (RSEI-GM) within 2 km of ACL respondent using areal apportionment

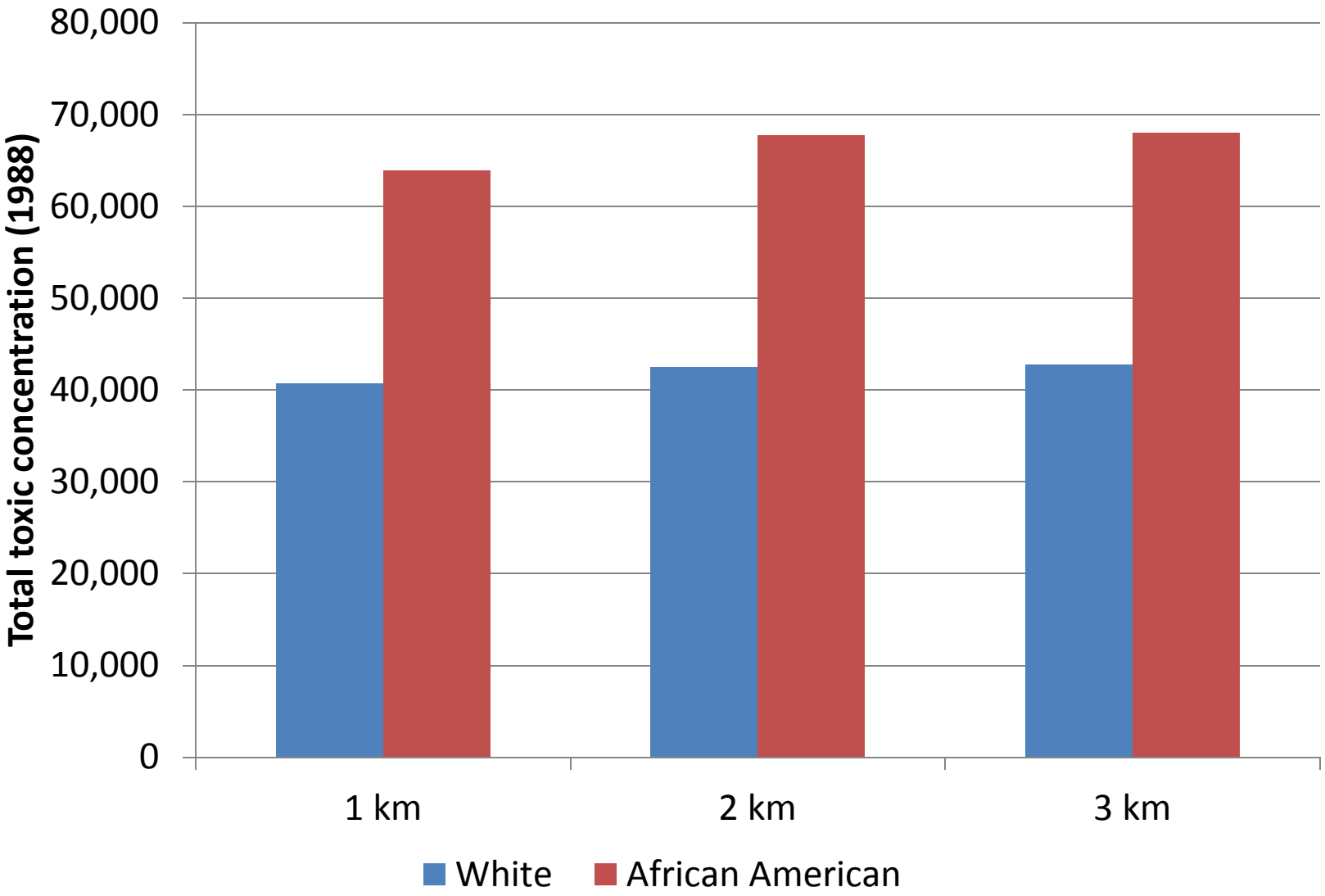


Mean air toxic concentration within 2 km of ACL respondent = $\sum_{i=1}^{n} \%CG_i * TC_i$

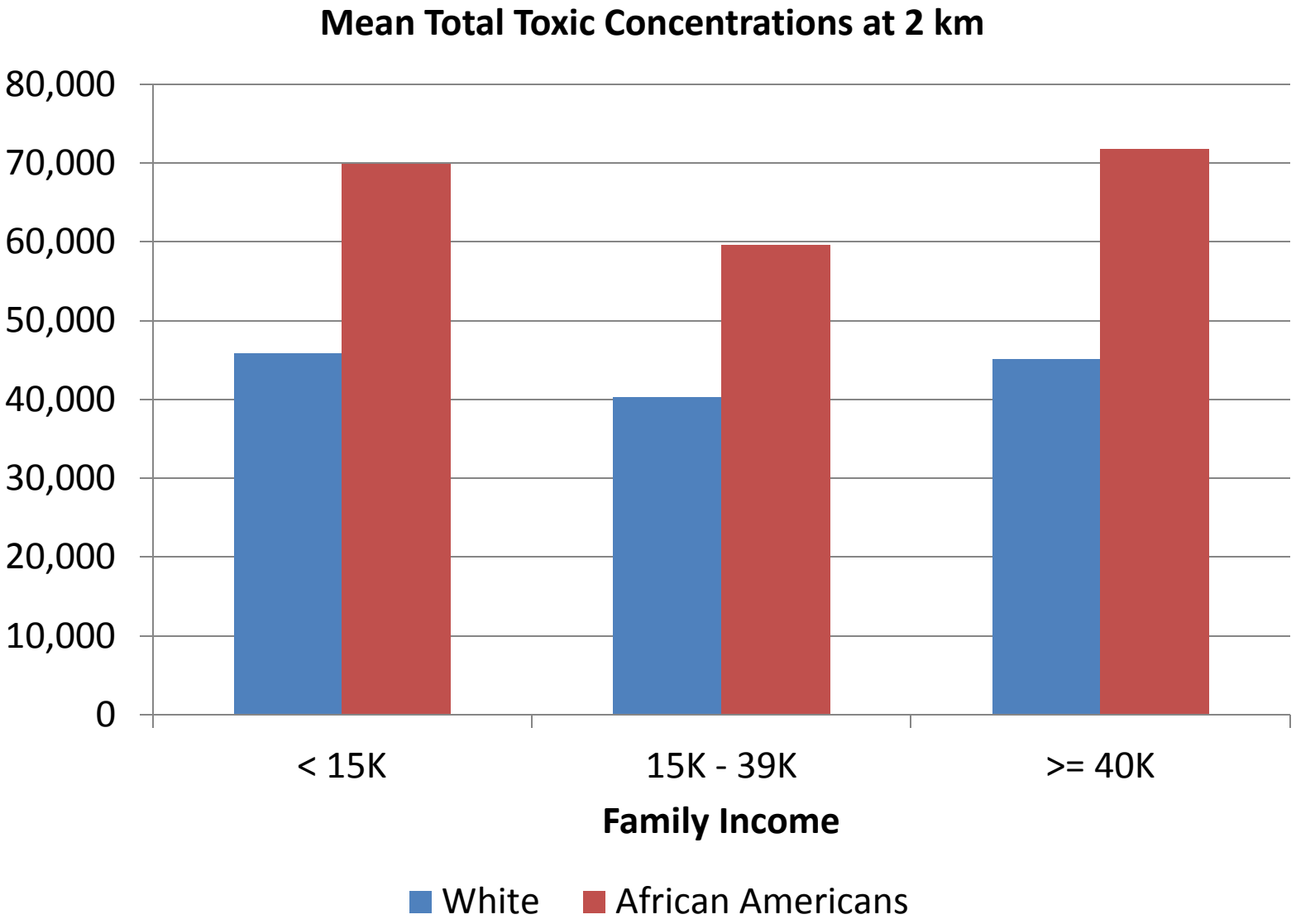
$\%CG_i$ = Percent of area of the 2 km circle captured by grid cell$_i$

TC_i = Total toxic concentration in grid cell$_i$

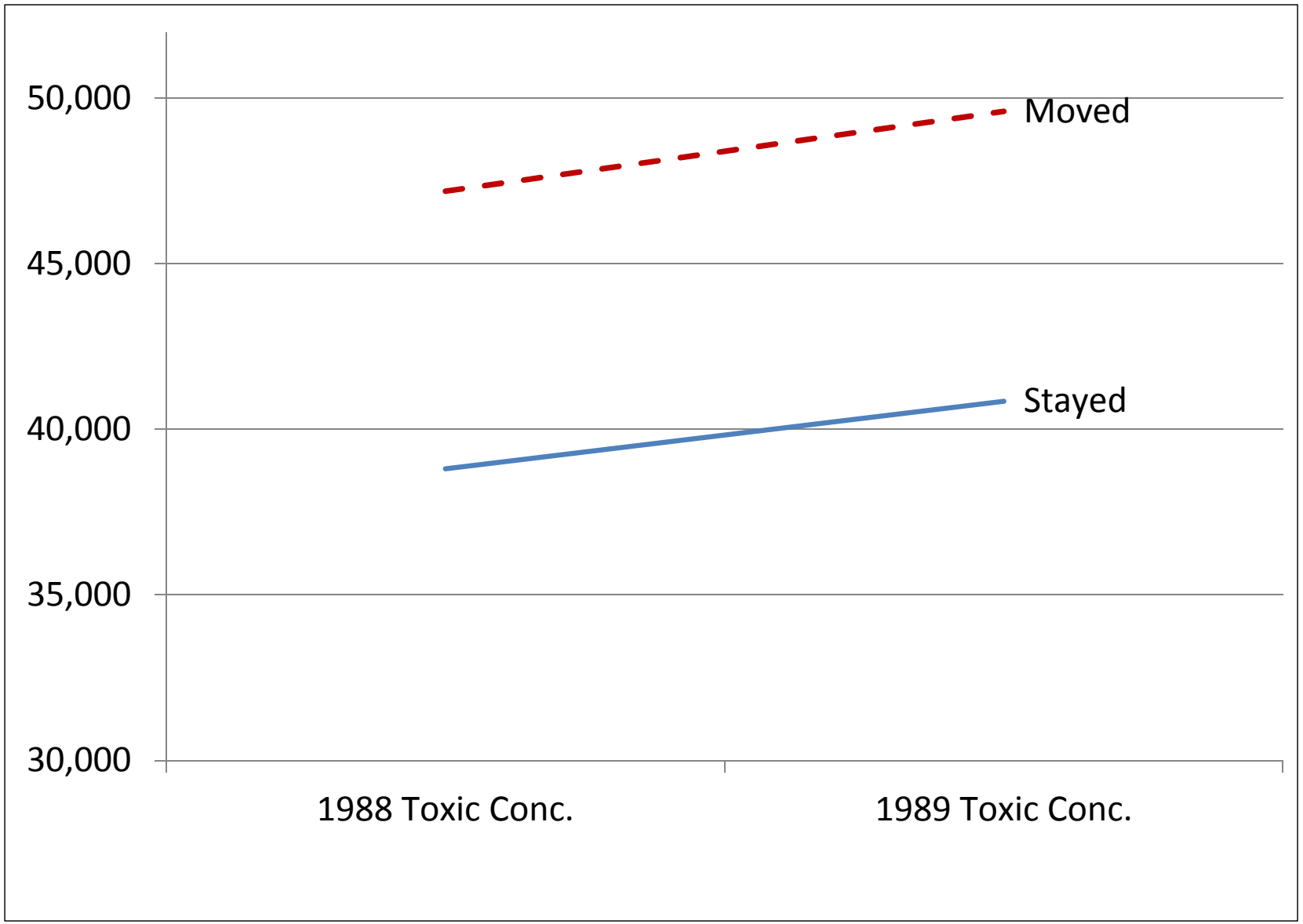
Mean Total Toxic Concentrations for ACL Respondents at Wave 1 by Race



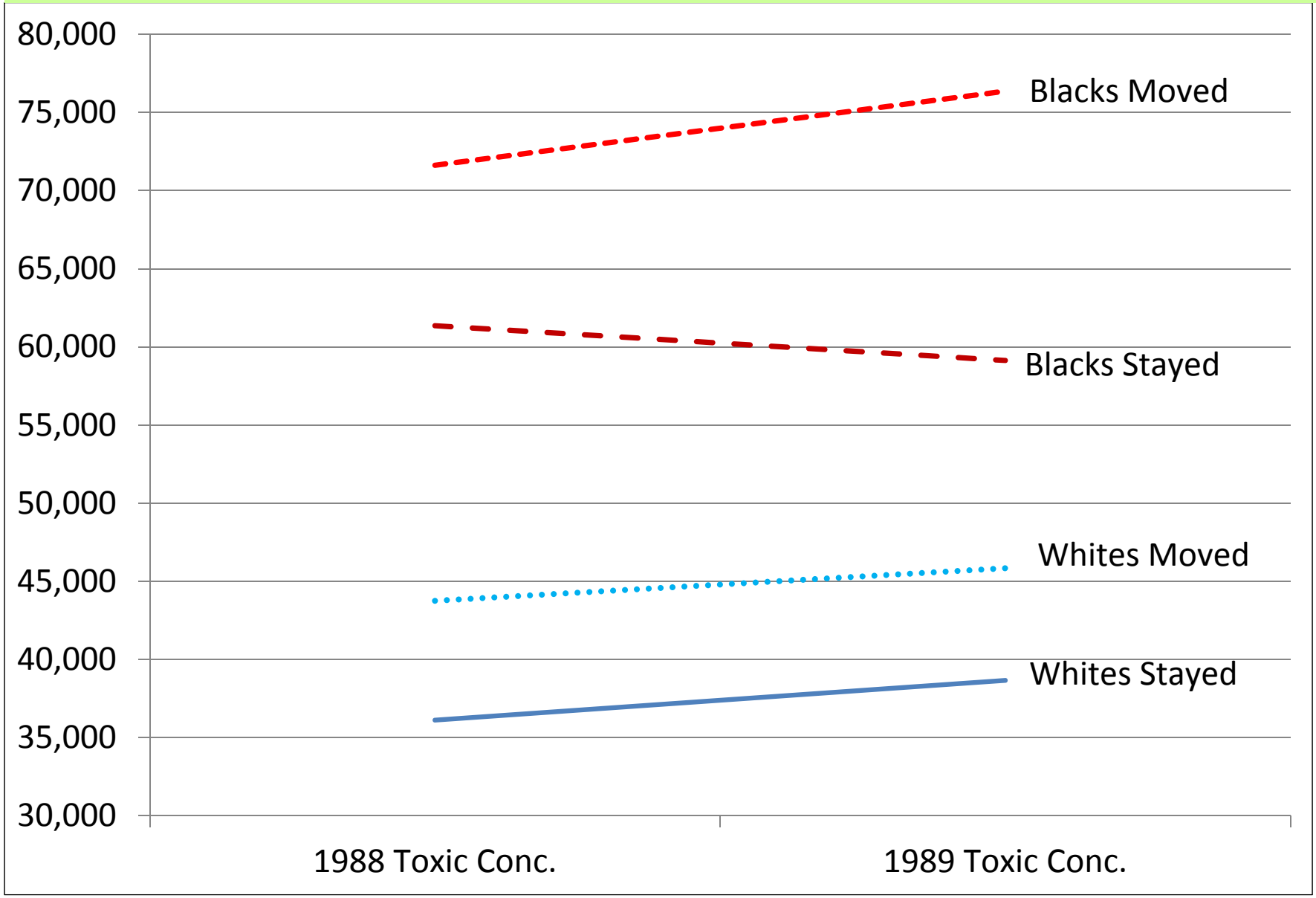
Mean Total Toxic Concentrations for ACL Respondents at Wave 1 by Race and Income



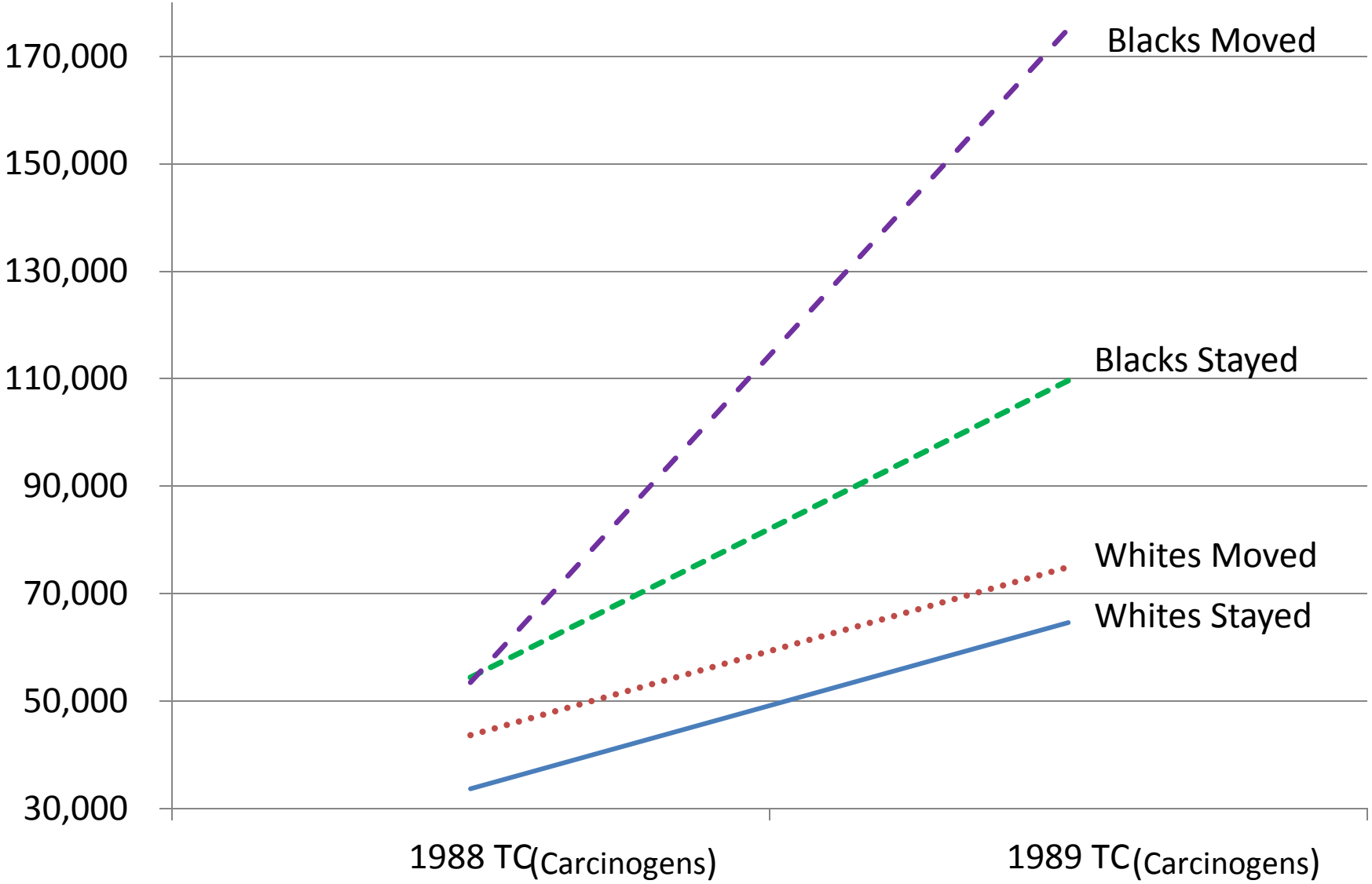
Change in mean total TC for <u>all chemicals</u> for ACL respondents between waves 1 and 2 by moves (common facilities in 1988 and 1989)



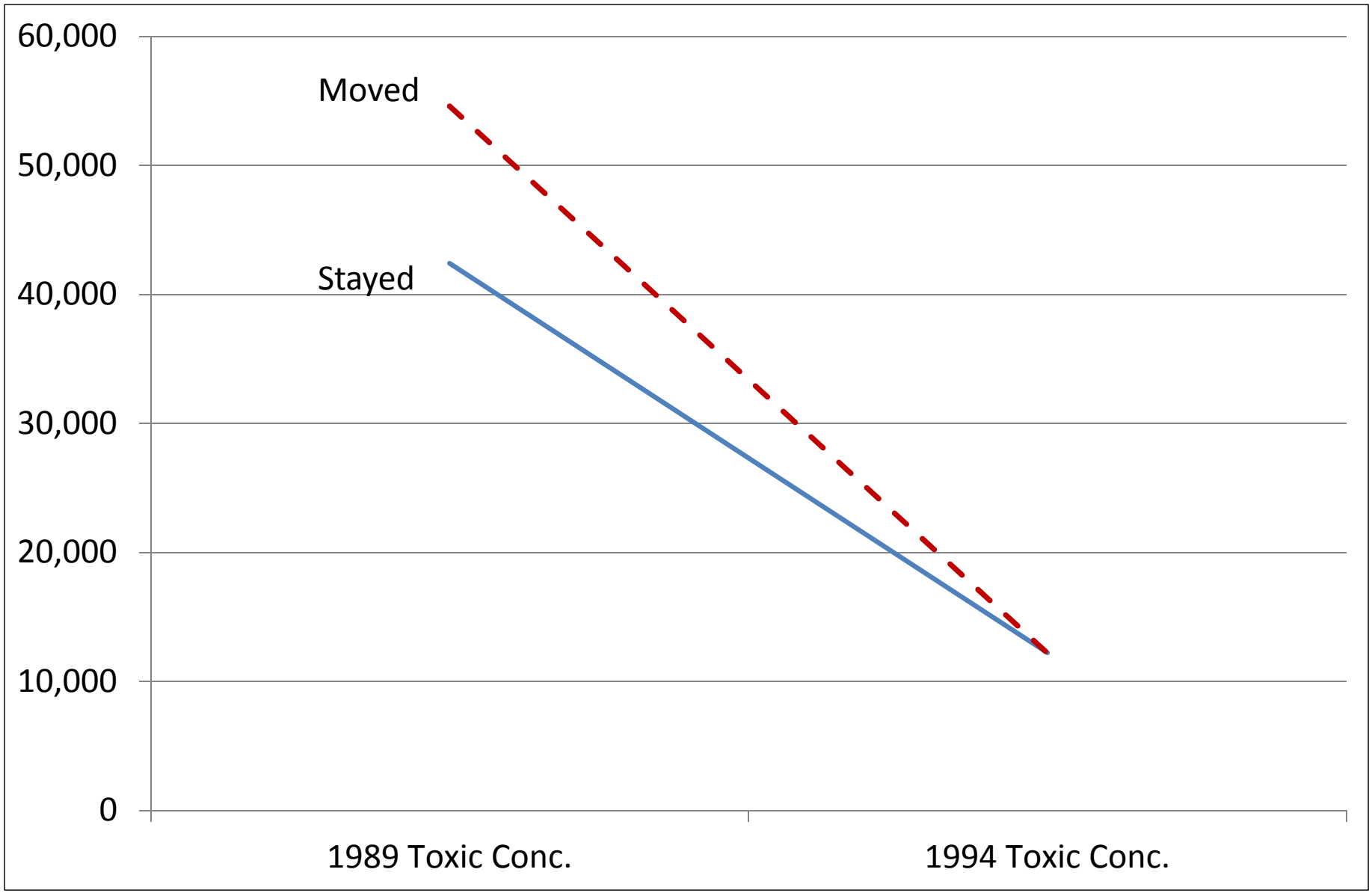
Change in mean total TC for <u>all chemicals</u> for ACL respondents between waves 1 and 2 by moves and race



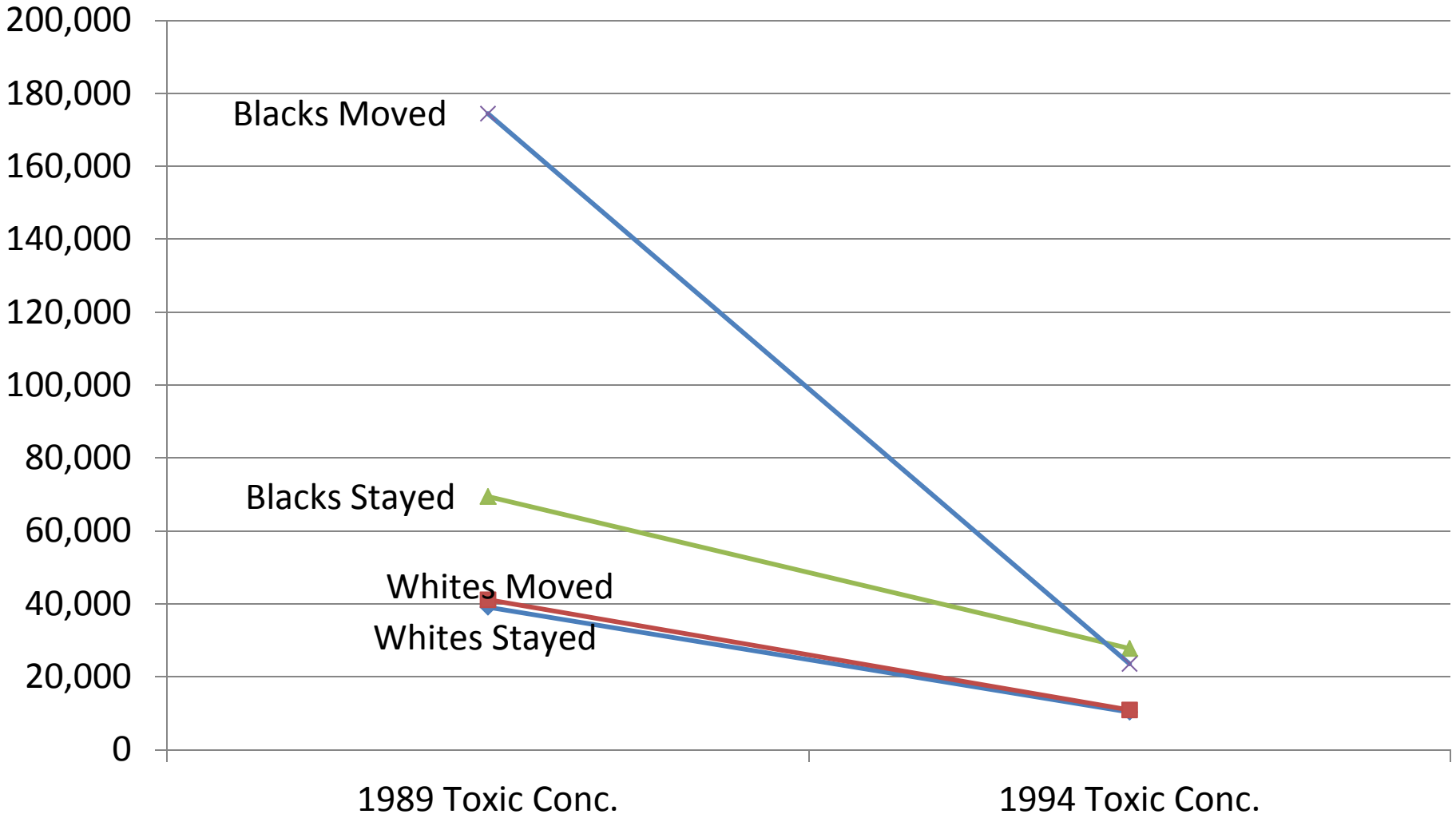
Change in mean total TC for carcinogenic chemicals for ACL respondents between waves 1 and 2 by moves and race



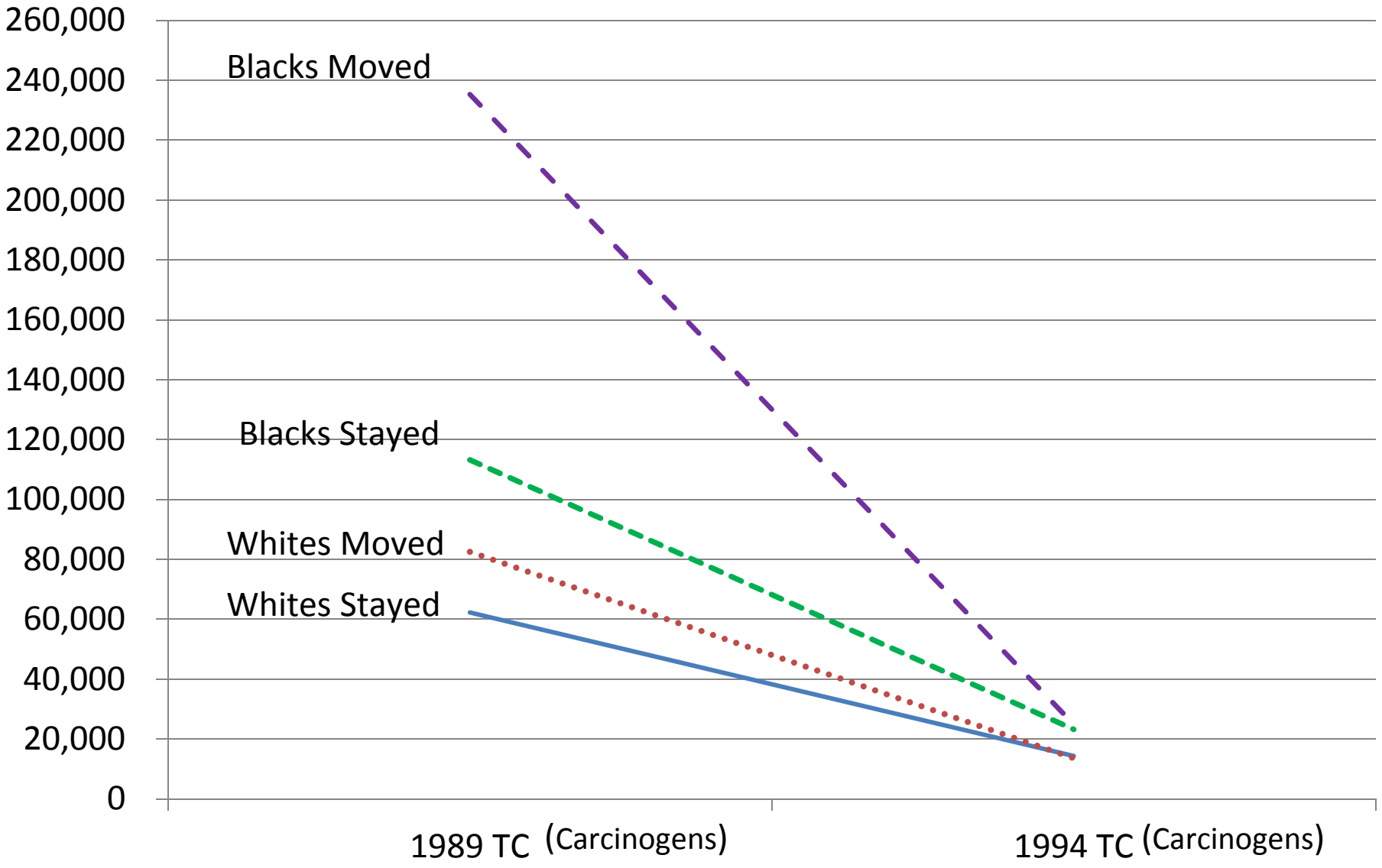
Change in mean total TC for <u>all chemicals</u> for ACL respondents between waves 2 and 3 by moves (common facilities in 1989 and 1994)



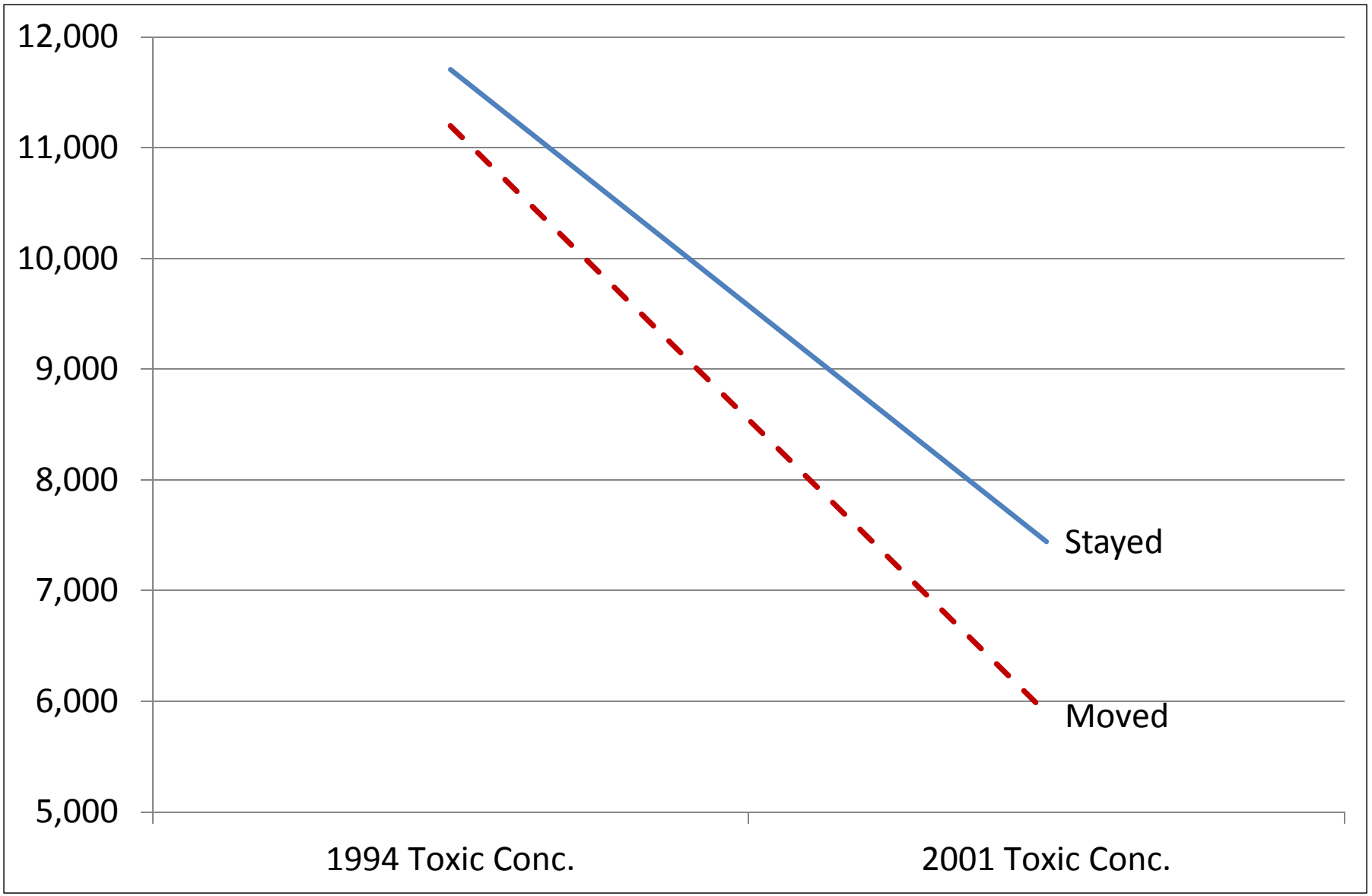
Change in mean total TC for all chemicals for ACL respondents between waves 2 and 3 by moves and race



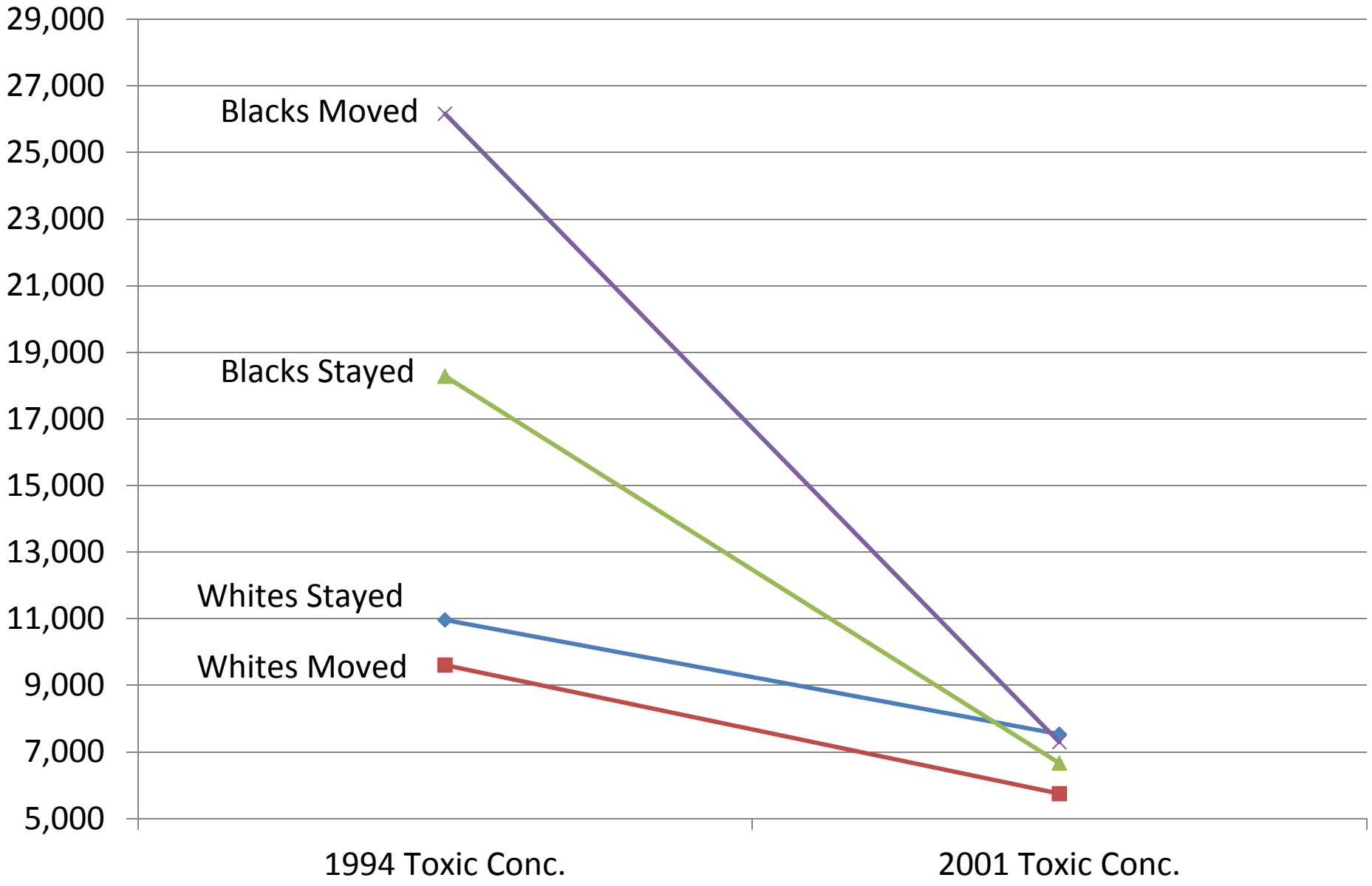
Change in mean total TC for carcinogenic chemicals for ACL respondents between waves 2 and 3 by moves and race



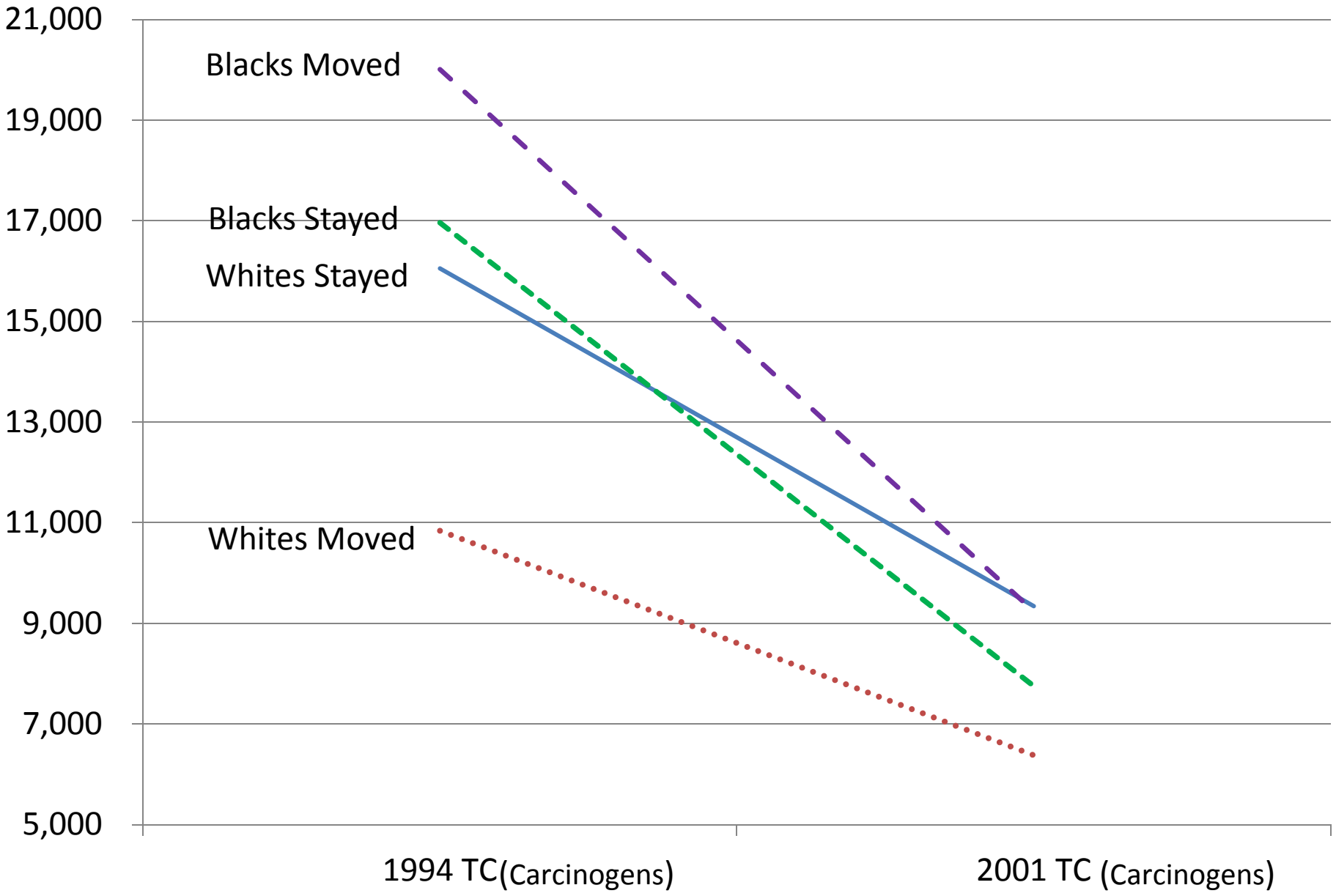
Change in mean total TC for <u>all chemicals</u> for ACL respondents between waves 3 and 4 by moves (common facilities in 1994 and 2001)



Change in mean total TC for all chemicals for ACL respondents between waves 3 and 4 by moves and race



Change in mean total TC for carcinogenic chemicals for ACL respondents between waves 3 and 4 by moves and race



Summary of Key Findings and Conclusions

1) Pollution burdens are generally greater for people who have moved than for people who have stayed.
2) Pollution burdens in late 1980s (from waves 1 to 2) for everyone increased, but decreased from the 1990s through 2001 (from waves 2 to 3 to 4)
3) Pollution burdens for African Americans have tended to be greater than for whites
4) No apparent pollution disparities based on income were found
5) Pollution burdens for African Americans who moved between waves 1 and 2 increased more greatly than for whites who moved
6) However, from waves 2 to 3 to 4 pollution burdens for African Americans who moved decreased more greatly than for whites who moved
7) The pollution burdens for African Americans who stayed also decreased more greatly than for whites who stayed.
8) Although African Americans and whites were closing the gap in pollution disparities, racial disparities still persisted in 2001 (wave 4)

Next Steps/Questions

- What has driven the decreasing air pollution gaps between African Americans and whites over time?
- To what extent are racial disparities in pollution burdens over time related to racial disparities in health outcomes and mortality over time?

Thank You!