

## Summary Patterns of Population Redistribution in Pennsylvania 1990-2000

by

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### The Data

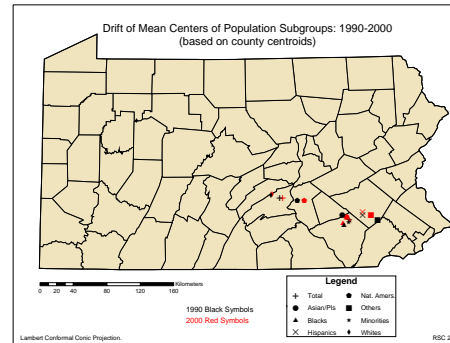
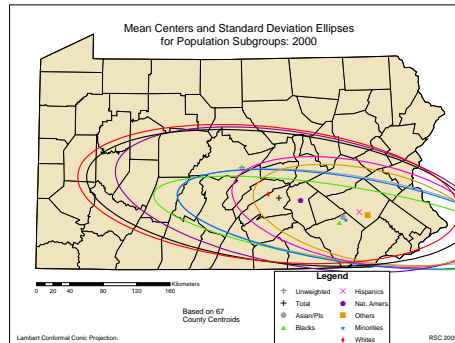
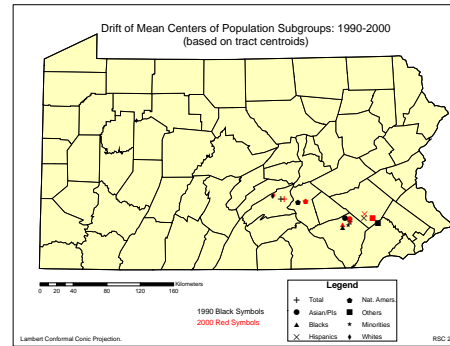
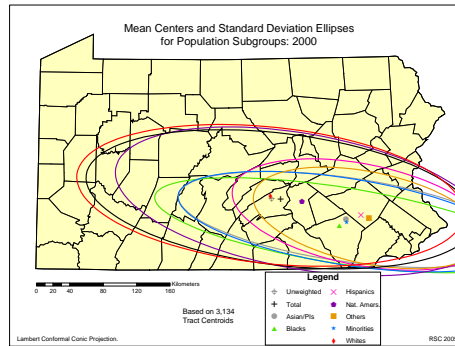
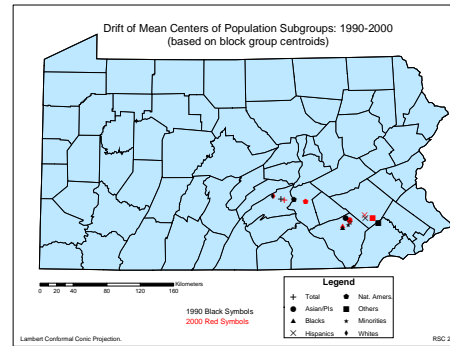
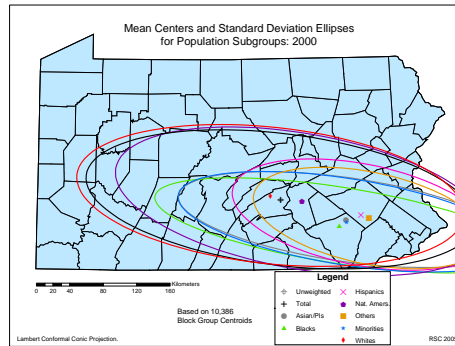
- 1990 data: *ESRI Data Disk and Maps disk 4 1998*
  - Counties: 67
  - Census Tracts: 3,167
    - Error correction: Census tract data for Native Americans and Asian/Pacific Islanders were transposed on the disk.
  - Block Groups: 11,865
- 2000 data: *ESRI Data & Maps (CD) 2003*
  - Counties: 67
  - Census Tracts: 3,134
  - Block Groups: 10,386
- Centroids generated for each spatial unit
- Projection of units and centroids
  - 1990 files NAD27 to NAD83 (ESRI NADCON)
  - Lambert Conformal Conic Projection for both data sets

- Subgroup Formation
  - Asian/Pacific Islanders (Asian/Pis)
  - Blacks
  - Hispanics
  - Native Americans
  - Others
  - Minorities: Asian/Pis, Blacks, Native Americans, and Others
  - Whites

- Summary Measures Based on Unit Centroids
  - Mean Centers
  - Standard Deviation Ellipses
  - Using CrimeStat II
    - Ned Levine, *CrimeStat II: A Spatial Statistics Program for the Analysis of Crime Incident Locations*. Ned Levine & Associates, Houston, TX, and the National Institute of Justice, Washington, May 2002.

### Notes on Summary Measures

- Mean Centers
  - The average of weighted X and Y coordinates of unit centroids. Subgroup populations are used as weights.
    - Mean centers may be viewed as *centers of gravity* of the various distributions of population subgroups.
    - Changes, or drift, in mean centers through time indicate general patterns of population redistribution.
- Standard Deviation Ellipses
  - The graphic portrayal of the distribution of a population subgroup about its mean center.
    - If no directional bias exists, the "ellipse" would be a circle around the mean center. Circle size denotes concentration.
    - Directional bias, anisotropy, and the relative concentration of groups is revealed by the orientation and eccentricity of the standard deviation ellipse.



### Significance<sup>†</sup> of Drift of Population Subgroup Mean Centers: Block Group Centroid Analysis

	Significant Changes in Latitude	Significant Changes in Longitude	Significance Levels
Total Population		East	0.05
Asian/Pacific Islanders	South	East	Blue
Blacks	North		0.01
Hispanics	North		Green
Native Americans	South	East	0.001
Others	North	West	Purple
Minorities in Total	North		0.0005
Whites			Red

<sup>†</sup>Student's *t*-tests for difference in means performed at SISA (<http://home.clara.net/sisa/t-test.htm>). Since direction of change may be inferred from the maps of mean center drift, one-tail *t*-tests were performed. Equal variance not assumed.

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### Assessment

- Standard Deviation Ellipses
  - The "Others" subgroup consistently shows the greatest directional bias (toward Philadelphia) and the highest levels of spatial concentration (smallest ellipse areas).
  - Whites show the least directional bias (the semi-major axis is closest to horizontal) and the lowest levels of spatial concentration (least elliptical eccentricity).
- Mean Centers
  - The significance of patterns of drift is related to the spatial unit of the centroid used.
    - Block Groups and Census Tracts are directly related to population density and yield significant results.
    - Counties are not related to population and yield insignificant results. Significant results would require substantial redistribution of the subgroups across county boundaries.