Synoptic Analysis of Space-time Activity Patterns

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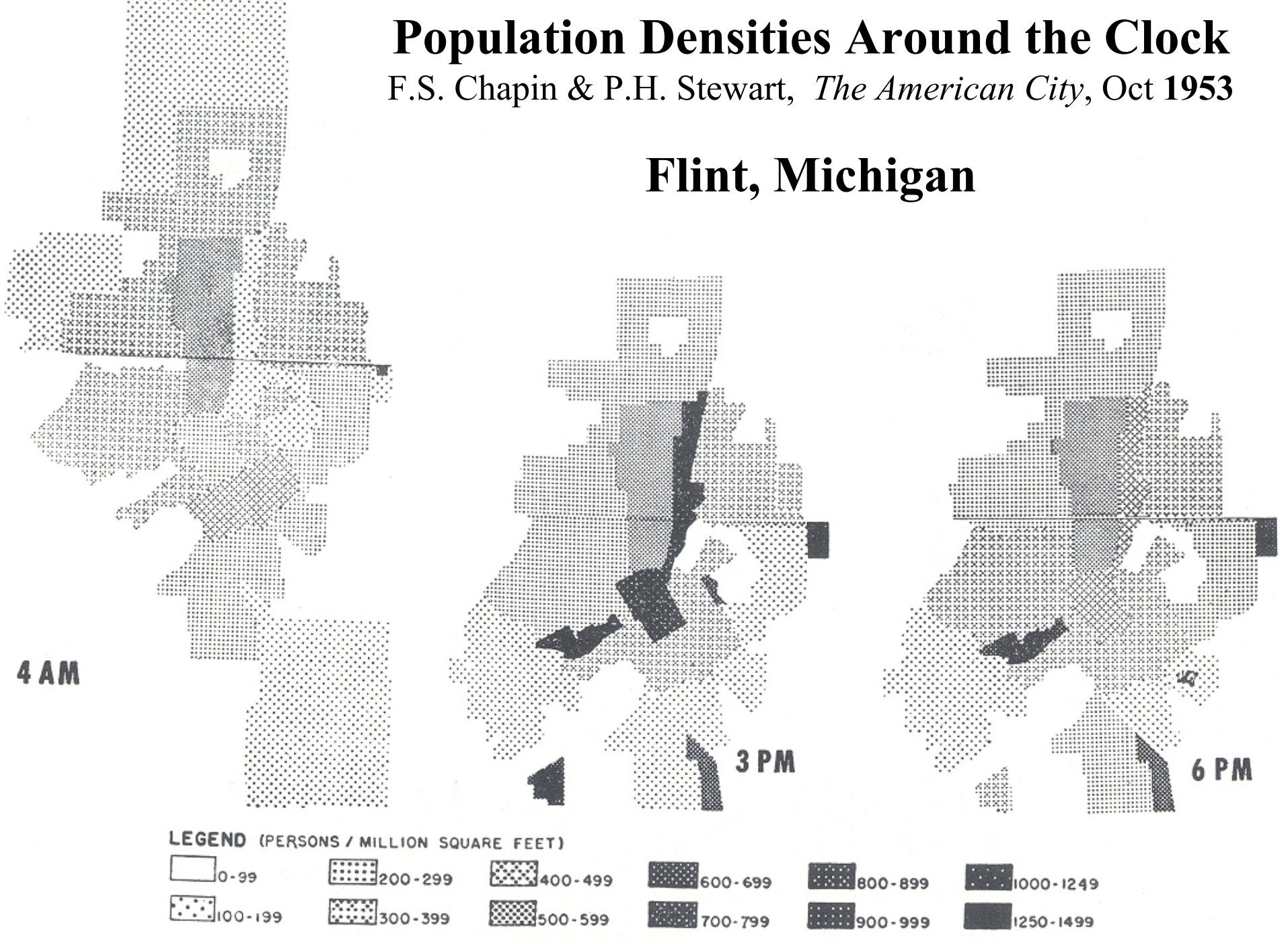
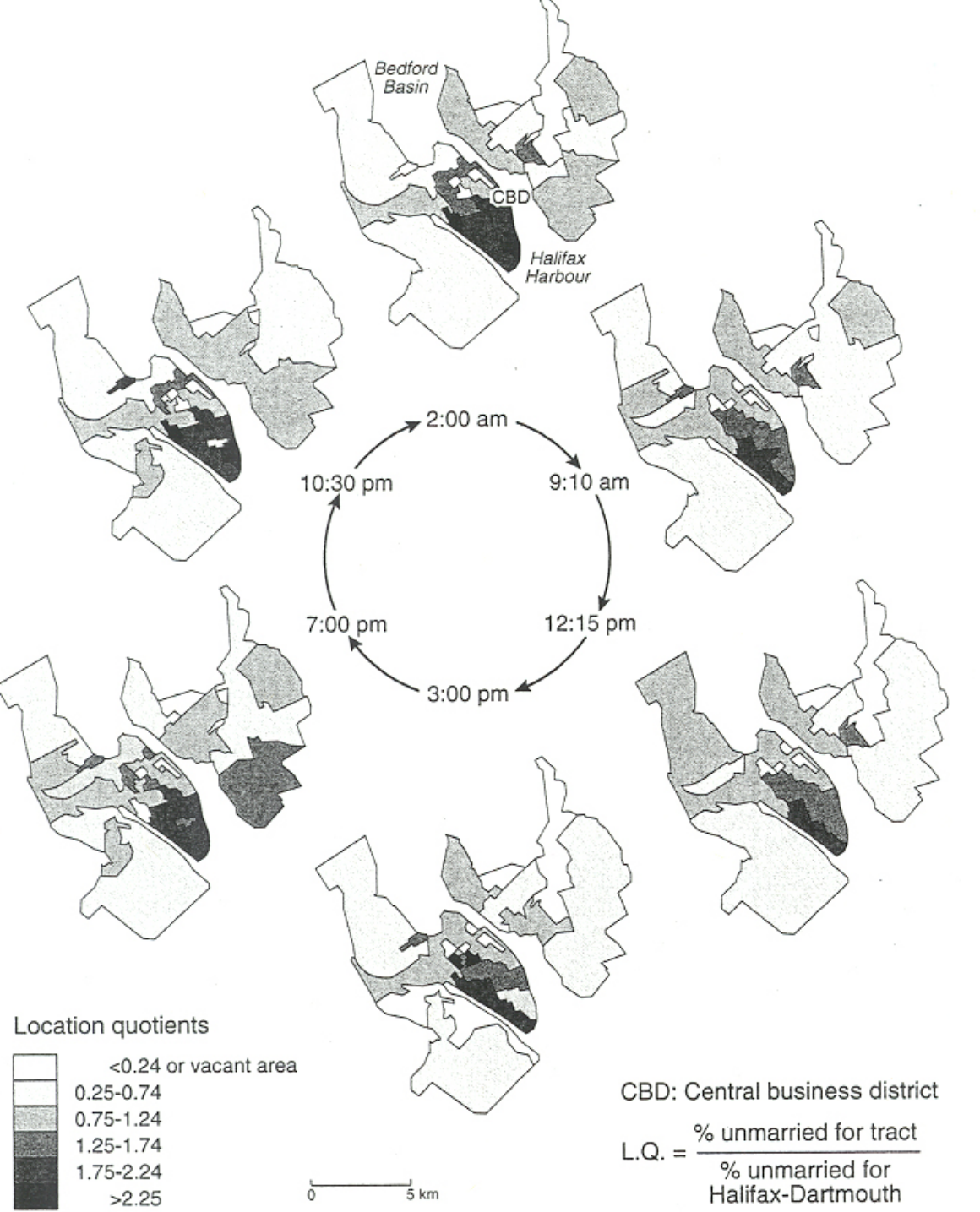
Population Densities Around the Clock

F.S. Chapin & P.H. Stewart, *The American City*, Oct **1953**

Flint, Michigan





Location Quotients – Concentration of Unmarried Respondents by time of day

Space-time measures for subpopulations:

- densities
- segregation indices

From **space-time paths**:

- activity times & spaces, durations, sequences, fragmentation
- average trip speeds
- activity dispersal, range

Janelle & Goodchild

Synoptic Analysis

Climatology, meteorology, and oceanography

- use synoptic approaches for **analyzing processes** of both short and long-term duration over geographical space.
- draw on a large sets of **distributed information sensors** that provide continuous coverage over space and time.
- employ **modeling** procedures and tools for **visualizing** changes in patterns and for **rendering results on demand** (e.g., the weather map; hourly, daily and seasonally adjusted forecasts)
- use **integrated data archives** for aggregation at a variety of spatial scales and for **longitudinal investigation**.

Dynamic Maps of Urban Social Synoptic Patterns

- Measure across space from many observations simultaneously to **identify space-time patterns and to forecast changes**
- Link GPS dense tracking data for **dynamic conversion into mapped patterns and index measures**
- **Model changing patterns** over space based on refined temporally-sensitive data streams about locations and activities of the population

Some Possible Dynamic Maps of Urban Social Synoptic Patterns

- Diurnal, weekly, seasonal shifts in population densities by subpopulation categories
- Traffic density changes and type (cars/trucks) by road segments, neighborhoods
- Proportions of within-region to pass-through traffic,
- Surface representations of average travel speeds, congestion indexes,
- Weekend to weekday ratios by neighborhood or road segment
- Temporal variations in social group integration and spatial concentration by regions and small areas
- Assessing risk exposures to geographically distributed hazards and to mobile hazards

Challenges to Dynamic Urban Social Ecology

- **Managing data**
- **Designing synoptic measures** and mapping tools
- **Demonstrating applications** that make this worthwhile, e.g.:
  - Permitting transportation synchronization to changing needs
  - Promoting social capital at neighborhood levels
  - Evaluating temporal policies on work schedules / service provision
  - Enhancing responsive emergency services
- Adding **theoretical understanding of process rules / testing hypotheses** in a dynamic world
- Designing data collection, analysis, and display systems that **recognize the individual's rights** to shield their identities and that honor their rights to privacy, including **locational privacy**
- **Avoiding intrusive and unsafe demands** on willing respondents

Conclusions

- The tools are at hand for integrating space-time concepts with the realities of documented dynamic behavior
- We have opportunities to demonstrate dramatically new ways of portraying the dynamics of ever-emergent social geographies
- Understanding of dynamic social ecologies can yield refined theory and modeling for applied uses
- We are entering new territory that will test the ethical bounds of space-time analyses in geography and the social sciences