Exposure Monitoring Component for Detroit Children's Health Study (DCHS)

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Background

- Conventional, regulatory-based air monitoring
  - Expensive
  - Few locations
- Passive diffusion sampling
  - Cheaper to deploy & portable
  - Appropriate for personal exposure & urban network monitoring
- Spatial analysis studies with passives
  - Europe & Canada
  - EPA – El Paso Children's Health Study
- Land-use regression modeling (Jerrett et al., 2005)
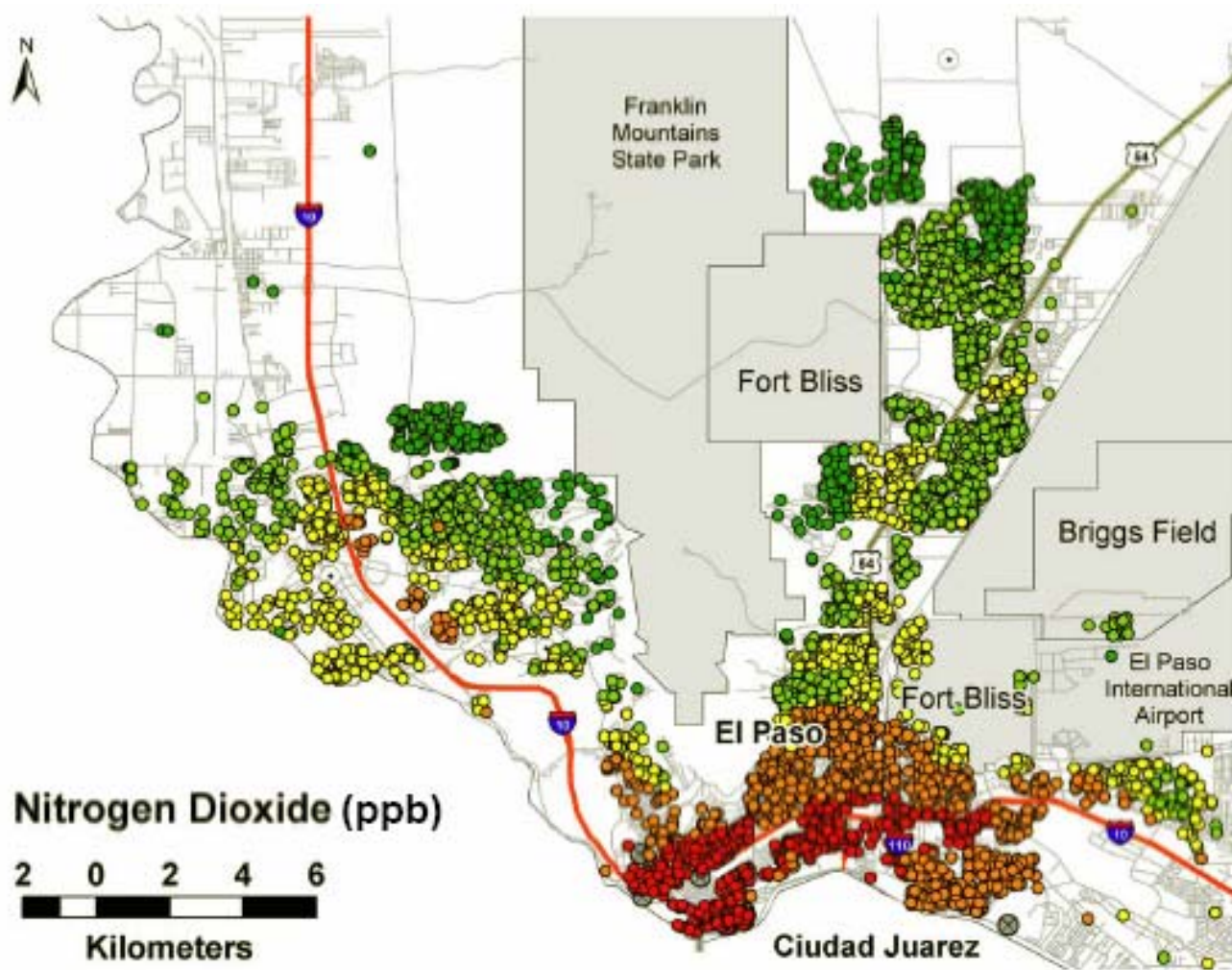 - Passive ambient measurements with GIS data

Spatial Analysis Approach
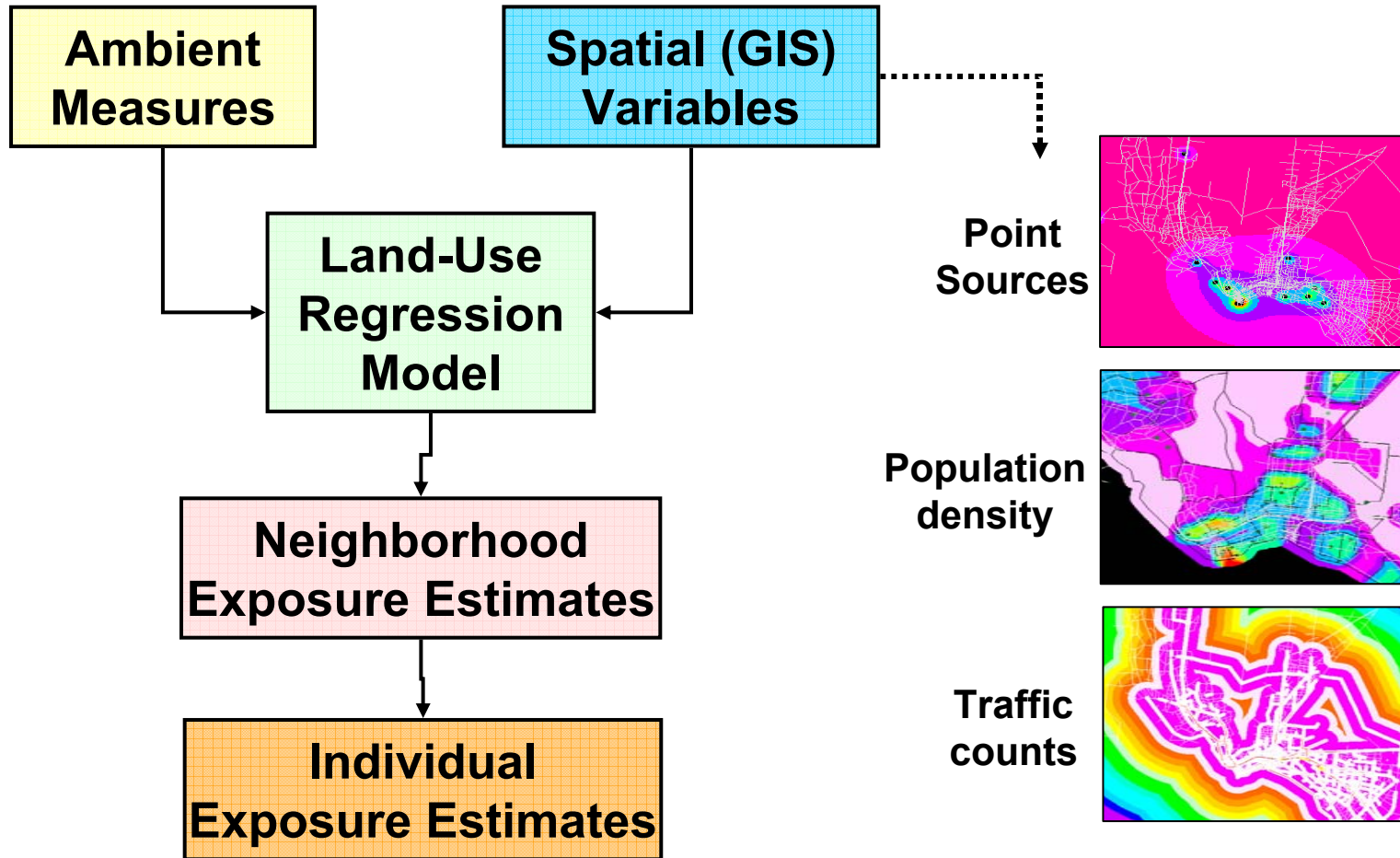
Adapted from Neas, Detroit Children's Health Study Presentation, 09/13/04

Individual Exposure Estimates

Neas et al. Epidemiology 2004; 15:S66.

Exposure Methods

- Ambient monitoring

  - 25 local elementary schools in Detroit & Dearborn Public School systems

  - 2 MDEQ sites for field methods evaluation

- Passive Sampling Technology for VOCs & NO_2 – same as DEARS.

  - Carbopack X tubes – VOCs

  - Ogawa badges - NO_2

- Sampling for 6 weeks in Summer '05 (stable air masses, low winds) & concurrent with DEARS

- Week-long sampling integrals to mimic chronic exposures
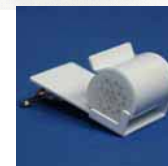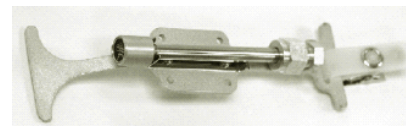
Passive Monitor Locations at Schools

Monitors installed under protective shelters outside of schools (stainless steel for Carbopack X tubes & Ogawas, Plastic/PVC for PM samplers). All sites checked for immediate VOC influence.

Choice of Predictor Variables

- Sources
    - SEMCOG modeled traffic counts (2000)
    - NCES
    - U.S. Census (2000)
    - TRI (2000 & 2002)
    - NEI Criteria Pollutant database (1999)

- Variable types (relative to the schools) from GIS
    - Traffic intensity (vehicles per day/km) within set distances
    - Distance (m) to nearest road of various traffic volumes
    - Housing unit density (units/km^2 in census block)
    - Population density (people/km^2 in census block)
    - Distance (m) to point sources
    - Distance (m) to nearest border X-ing

- Correlation analysis
    - Same correlation structure desired - monitored & un-monitored schools
    - Wanted to avoid strong correlation among chosen predictor variables

Schools Chosen for Monitoring from Pattern Analysis of Predictor Variables

Elementary Schools
- ▲ Chosen
- ▲ Alternate
- ● Not Chosen

4   0   4   8 Kilometers
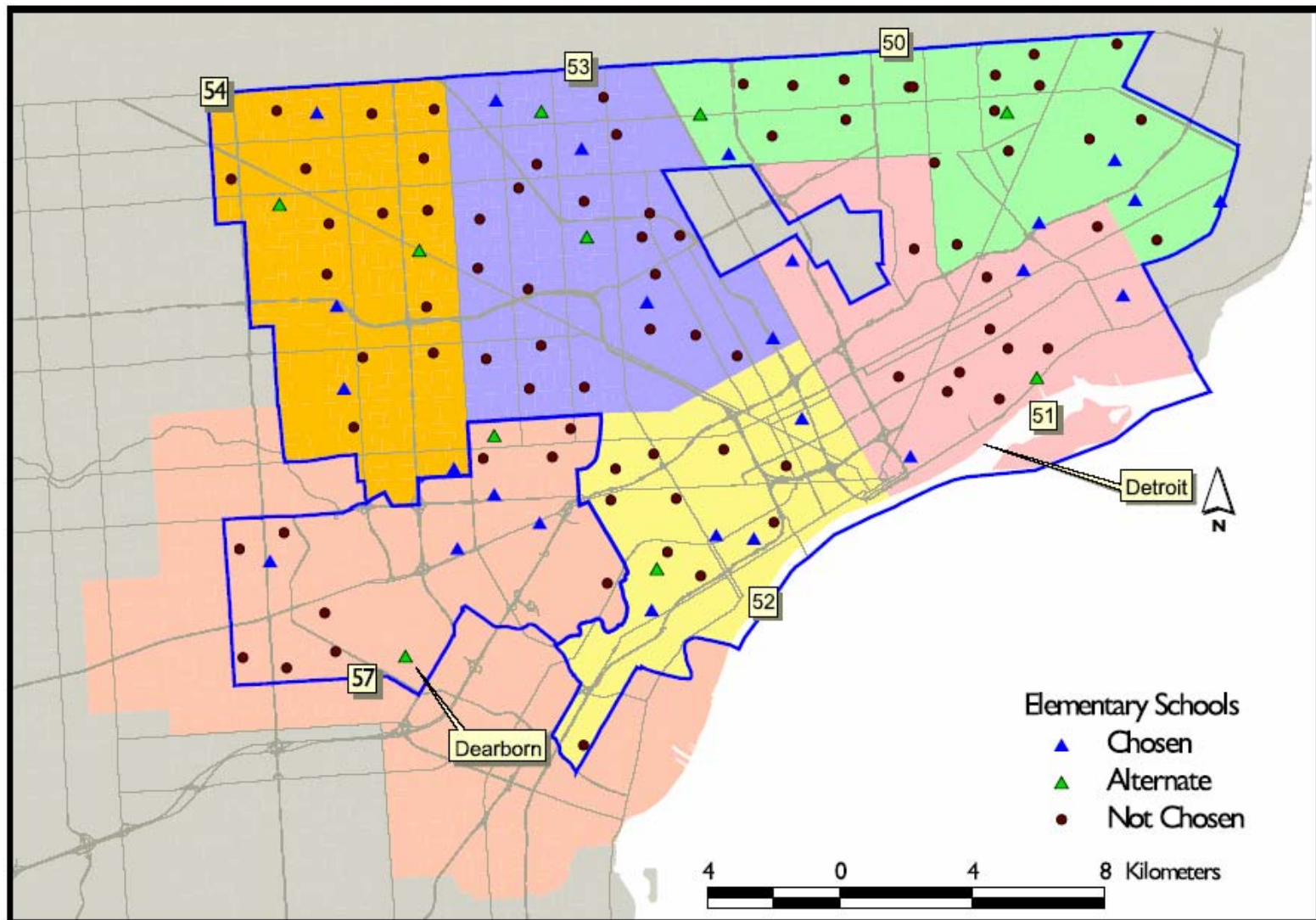
Future Research

- Development of land-use regression model for Detroit & Dearborn for VOCs & NO_2.

- Field methods evaluation of passives at MDEQ sites.

- Possible passive PM monitoring effort in Summer 2006.

- Possible joint-border land-use regression model – need same spatial variables as used in DCHS with the ambient data.

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Disclaimer-Although this work was reviewed by EPA and approved for publication, it may not necessarily reflect official Agency policy.