# Utilizing GIS to Construct a Community-based Geographic Health Profile to Identify and Address Health Disparities

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FORT WORTH
PUBLIC HEALTH
EPIDEMIOLOGY

**APHA 2007**

# Objectives

- Recognize the benefits of integrating GIS in community health program planning
- Describe the integration of various data sources at different geographic levels
- Creating a community health profile utilizing a GIS-based platform
- Describe mobilization of local health department activities to redirect programs and reallocate resources to serve specifically targeted high risk underserved population

# Defining a Geographic Information System (GIS)

**A Geographic Information System (GIS) is a relational database system that references a geographic location. This system is designed to efficiently capture, store, update, analyze, transfer, and display *spatial and attribute data*.**

- ***Spatial data*** **represent location, distance or area on the earth's surface.**
- ***Attribute data*** **are the non-spatial components of the database such as demographic or statistical variables.**

- Fort Worth GIS Training Committee

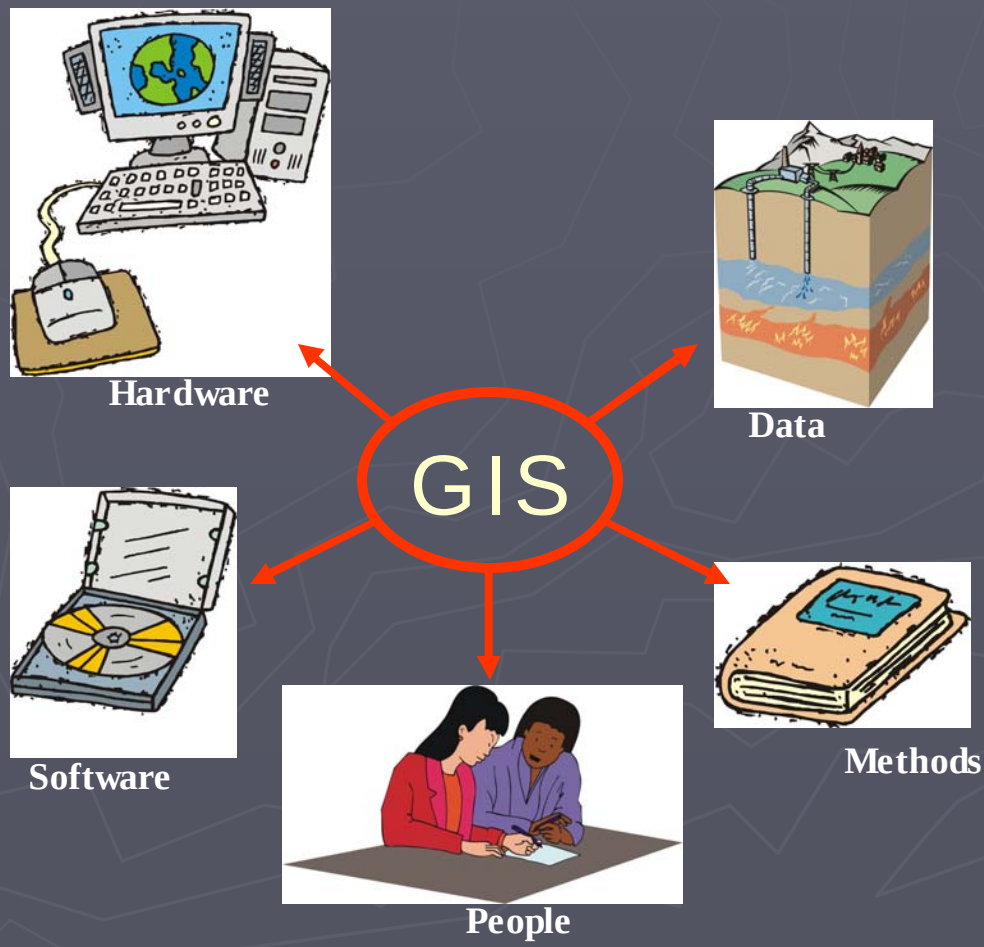
# Why GIS?

- 80% of local government activities are estimated to be geographically based.
- A significant portion of state government has a geographical component.
- Businesses use GIS for a wide array of applications (virtually error-proof method to optimize profits).
- Scientific research employs GIS → epidemiology, geography, geology, botany, anthropology, sociology, economics, political science, etc.
- Language of the future; description of today.

# Establishing a GIS-based platform

## Five Components:

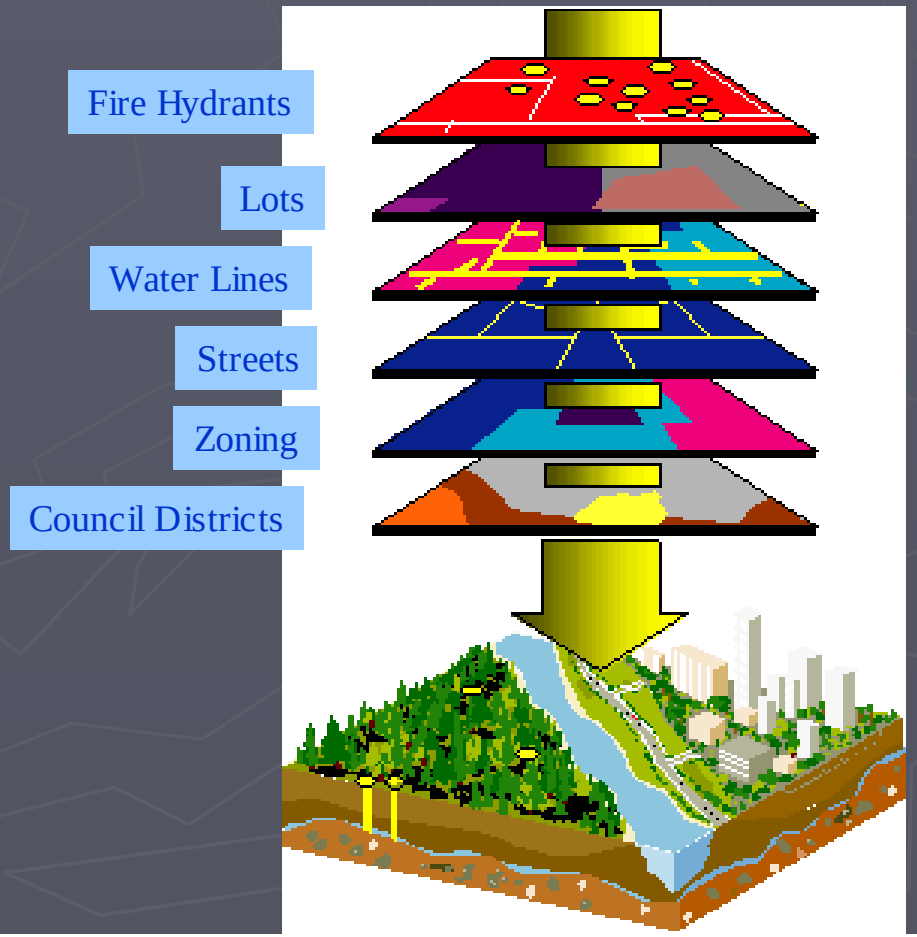
1. **People**
2. **Data**
3. **Software**
4. **Hardware**
5. **Methods**



# People and Data Sources

- **City of Fort Worth**
  - **Over 350 ArcView Users**
  - **20 Departments**
- **IT Solutions Department acts as the coordinator for city-wide data sharing, data storage, and future planning**

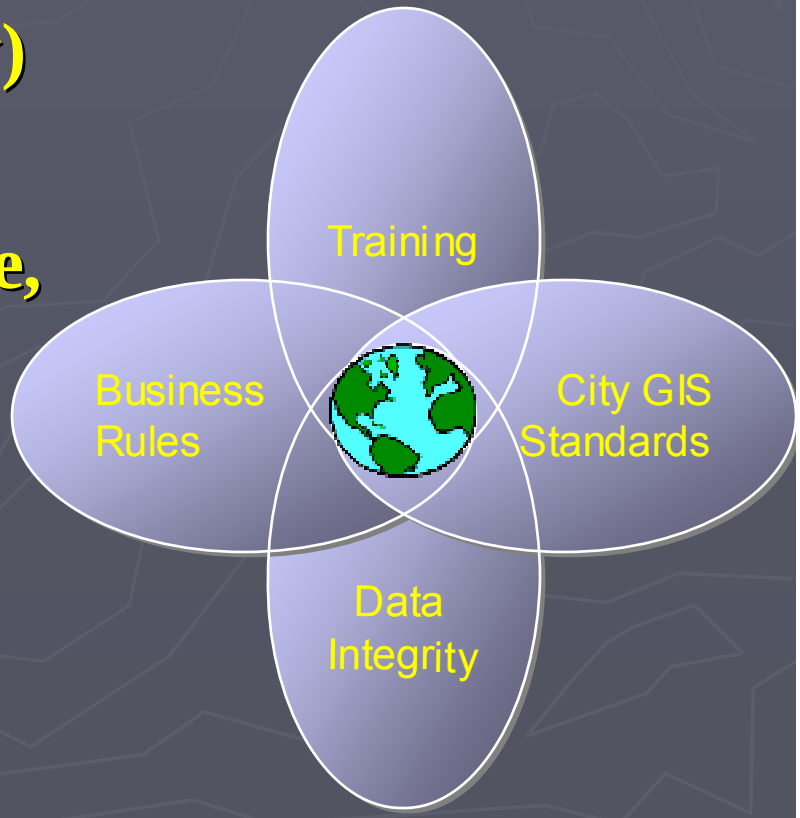
Different ***feature classes*** (geographic features)



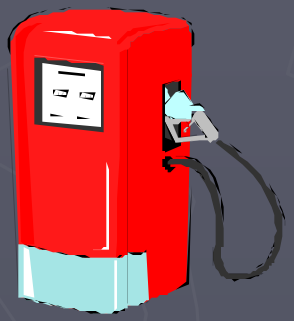
# Methods

**Elements of a Successful GIS:**

- **Training**
- **Data integrity (data must be current, accurate, multi-tiered, multi-disciplinary)**
- **Business rules (common GIS processes (i.e. data maintenance, documentation, etc)**
- **City GIS standards**



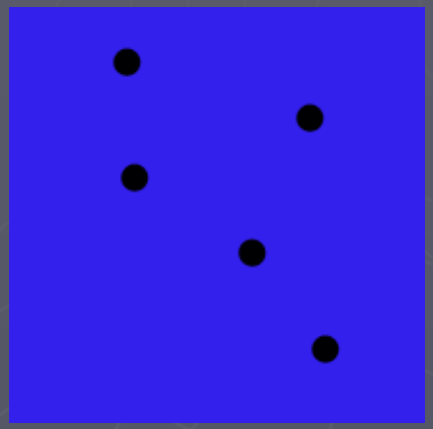
# Data Quality Assurance

| | Input | | Output |
|---|---|---|---|
| Quality Data |  | = |  |
| Bad Data |  | = |  |

# Data

## (Feature Types)

## Point Features



-All geo-coded data

- -Births
- -Deaths
- -All local needs assessment data
- -All local community assets

(i.e. schools, community centers, child care centers churches, fitness centers, all medical facilities, libraries, libraries, city facilities, etc)

- -Other surveillance systems data points

(i.e. West Nile, Animal Control Measures, etc)

# Data

## (Feature Types)

## Area Features (Polygons)

- Geographic boundaries
  - City/County
  - Council Districts/NPDs
  - Census-based layers
    (i.e. census blocks, block groups,
    census tracts, ZIP codes)

-Community Resources
  - Neighborhood Organizations
  - Housing development projects
  - Planning/Zoning sectors
  - Parcel/Lots jurisdictions
  - Mapsco related attributes
  - Parks, Lakes and others

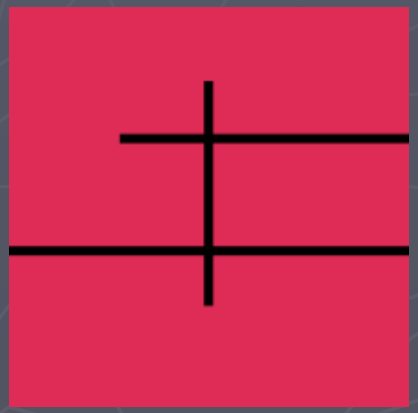
# Data

## (Feature Types)

## Line Features

-Streets
- -All primary/secondary streets
- -Major streets
- -Highways
- -Bike trails/routes

-Water
- -Rivers
- -Streams
- -Drainage



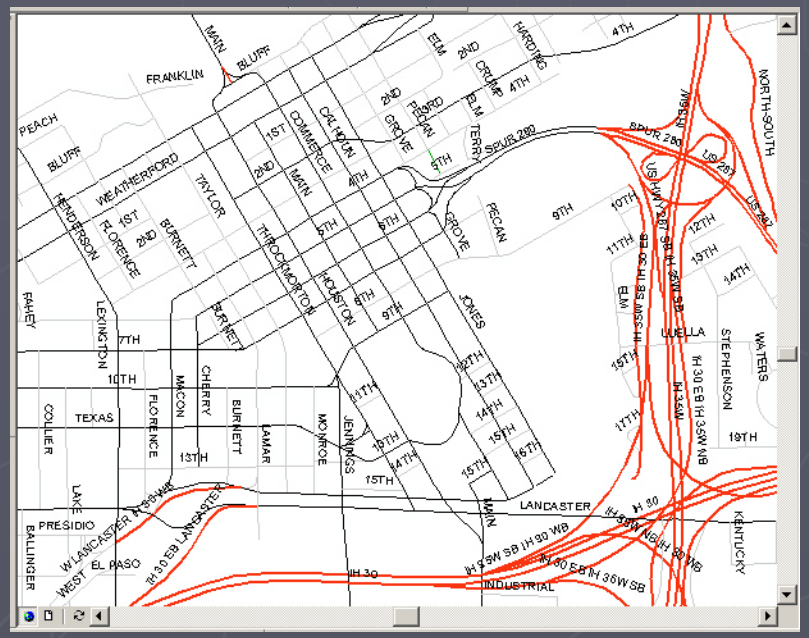
# Data:
# Components of Geographic Data

## Attributes

Attributes of SDE.SDE.Street_Centerlines

| PREFIX | TYPE | SUFFIX | SCODE | ST_NAME | KEY_ |
|---|---|---|---|---|---|
| E | AVE | | L6740 | LONG | 6671 |
| N | BLVD | | A0300 | ACADEMY | 13868 |
| | ST | | K3520 | KENT | 28526 |
| | ST | | W2825 | WENTWORTH | 33592 |
| | ST | | H0150 | HALBERT | 21561 |
| S | AVE | | J4200 | JENNINGS | 26730 |
| | CT | E | W5077 | WILDBRIAR | 11909 |
| S | ST | | H4400 | HENDERSON | 19644 |
| E | ST | | L7010 | LORAINE | 8475 |
| | CT | | E3725 | ELM CREST | 35463 |
| | DR | | | TRAILRIDGE | 1697 |
| | RAMP | | | NORTHWEST LOOP 820 EB MAIN NB | 4857 |
| | TRL | | S7508 | STONE RIVER | 43168 |
| S | ST | | C6150 | COLLARD | 24905 |
| | AVE | | S6636 | STANLEY | 30283 |
| | LN | | S7511 | STONEWALL | 38873 |
| | ST | | M8730 | MUSE | 15851 |
| | ST | | M8730 | MUSE | 17957 |
| | RD | | R5850 | ROCKDALE | 36988 |
| N | ST | | | HAMPSHIRE | 3369 |
| | DR | | | BLUE BONNET | 9979 |
| | CIR | | S7045 | STERLING TRACE | 40808 |
| | RAMP | | | OLD DECATUR NW LOOP 820 EB | 5176 |
| | CT | | R3060 | RICHARDSON | 27065 |
| | DR | | R9200 | RYAN PLACE | 28193 |
| | ST | | R8850 | RUTAN | 29957 |
| | ST | | B6080 | BOURINE | 25235 |
| | CT | | I4180 | INMAN | 32107 |

Record: 0 Show: All Selected Records (0 out of *2000 Selected.) Options

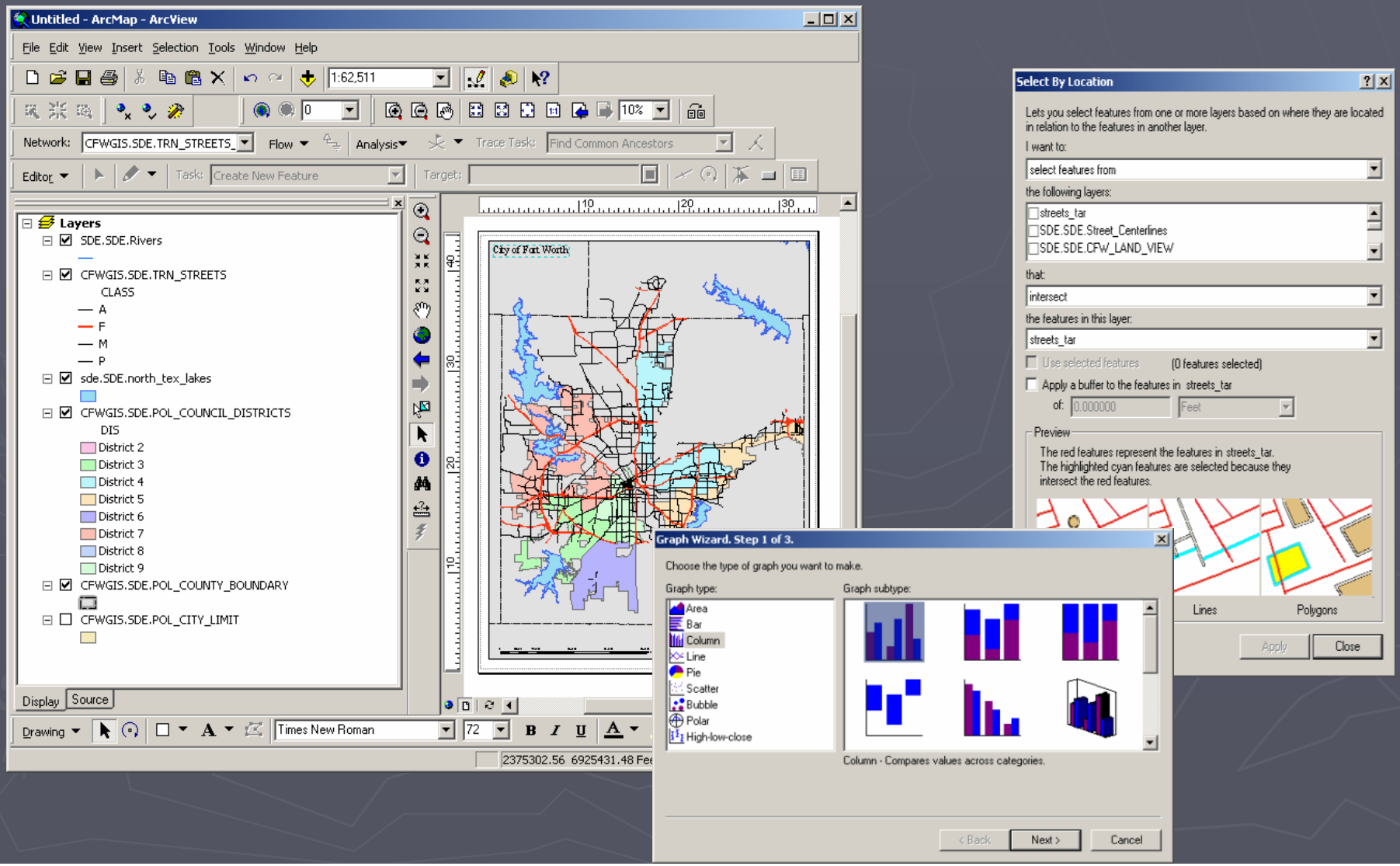



## Geometry

# Mapping Local Data

# Displaying Data

# Tools and Example: ArcMap



# GIS Application in Public Health

- Adopted as an integrated tool to monitor the health of the community
- Very useful for health surveillance practices, community health assessments and the allocation of health resources
- Enhances analysis capabilities and stratification at any geographic level
- Spatial representation of data that is used to drive programming and resource allocation

# Fort Worth Epidemiology & Assessment Division

- **Monitor the health status of Fort Worth citizens through periodic assessments, analyzing vital records data**
  **(Geocoding of all health data is conducted periodically)**
- **Diagnose and investigate health problems and hazards in the community**
- **Determine the significance of community health problems**
- **Evaluate effectiveness, accessibility and quality of population-based health services**
- **Research for new insights and innovative solutions to health problems**

# AND…!

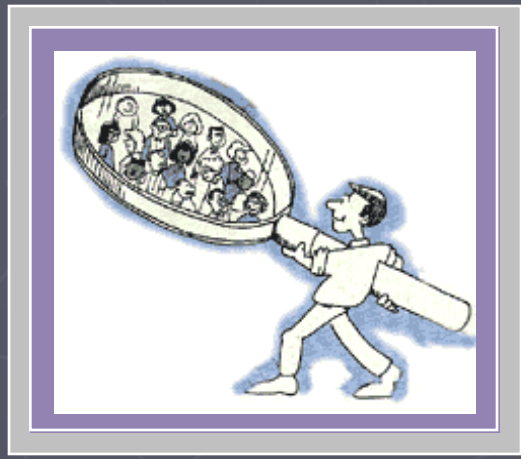
**Justify funding!!!**

# FWPHD E&A Ongoing Activities

- Regular analysis of vital statistics (birth and death data)
- City-wide community needs assessment, once every 5 years (1998, 2003, 2008-coming up!)
- West Nile Virus surveillance – human and animal cases, dead bird reports, nuisance mosquito reports, and mosquito sampling (target educational and larvaecide interventions)
- Citizen and agency requests for health data
- Reporting on demographic data and trends
- Other studies as mandated or requested

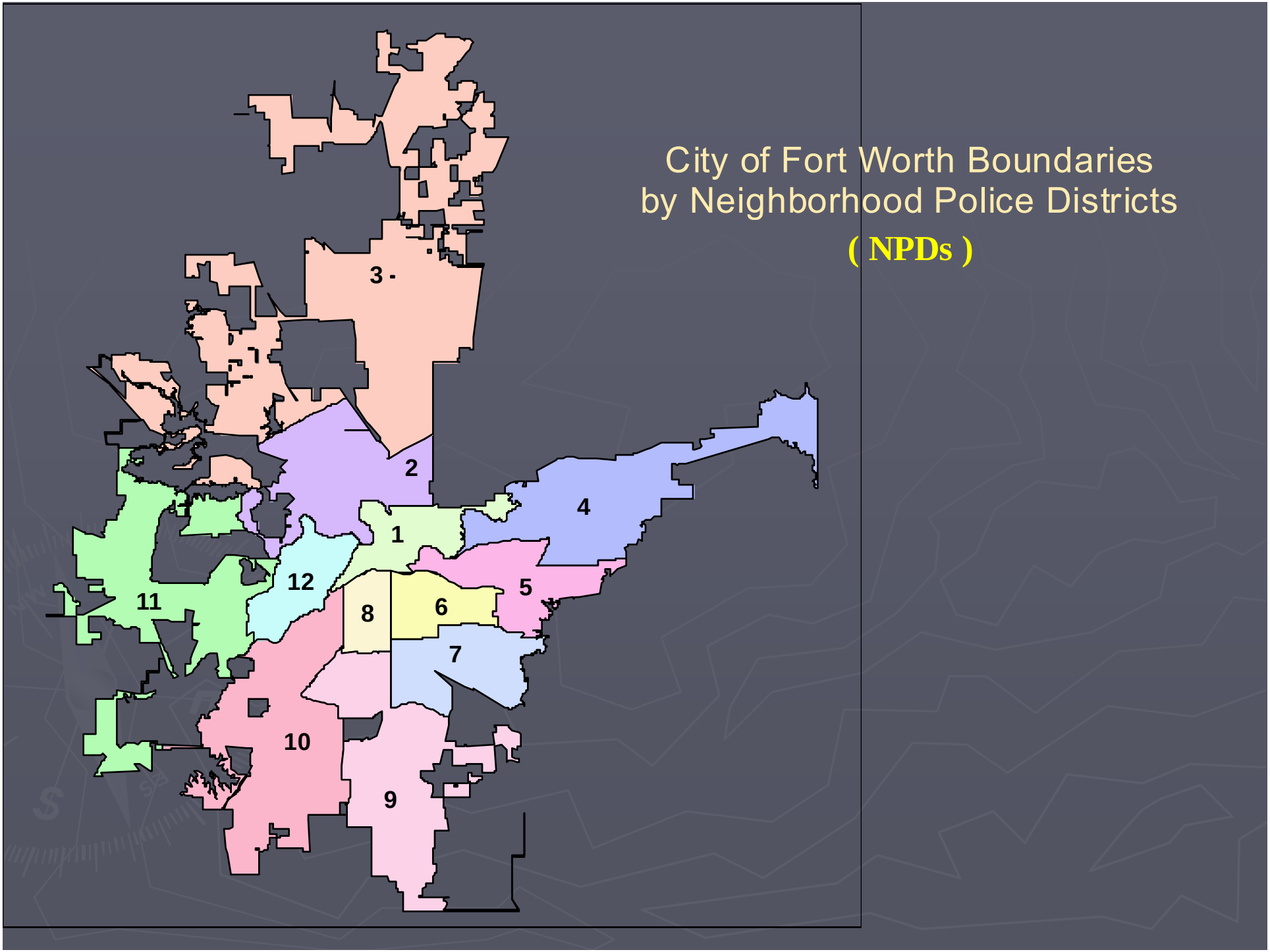
# Determining Highest Risk Groups to Target Intervention

- Geographically determine areas with greatest disease burden
- Socio-demographically characterize population
- Analyses of risk behaviors by race/ethnicity
- Survey available resources/community partners
- Intervention design and implementation
- Allows integration of local community assets, census-derived data, etc.

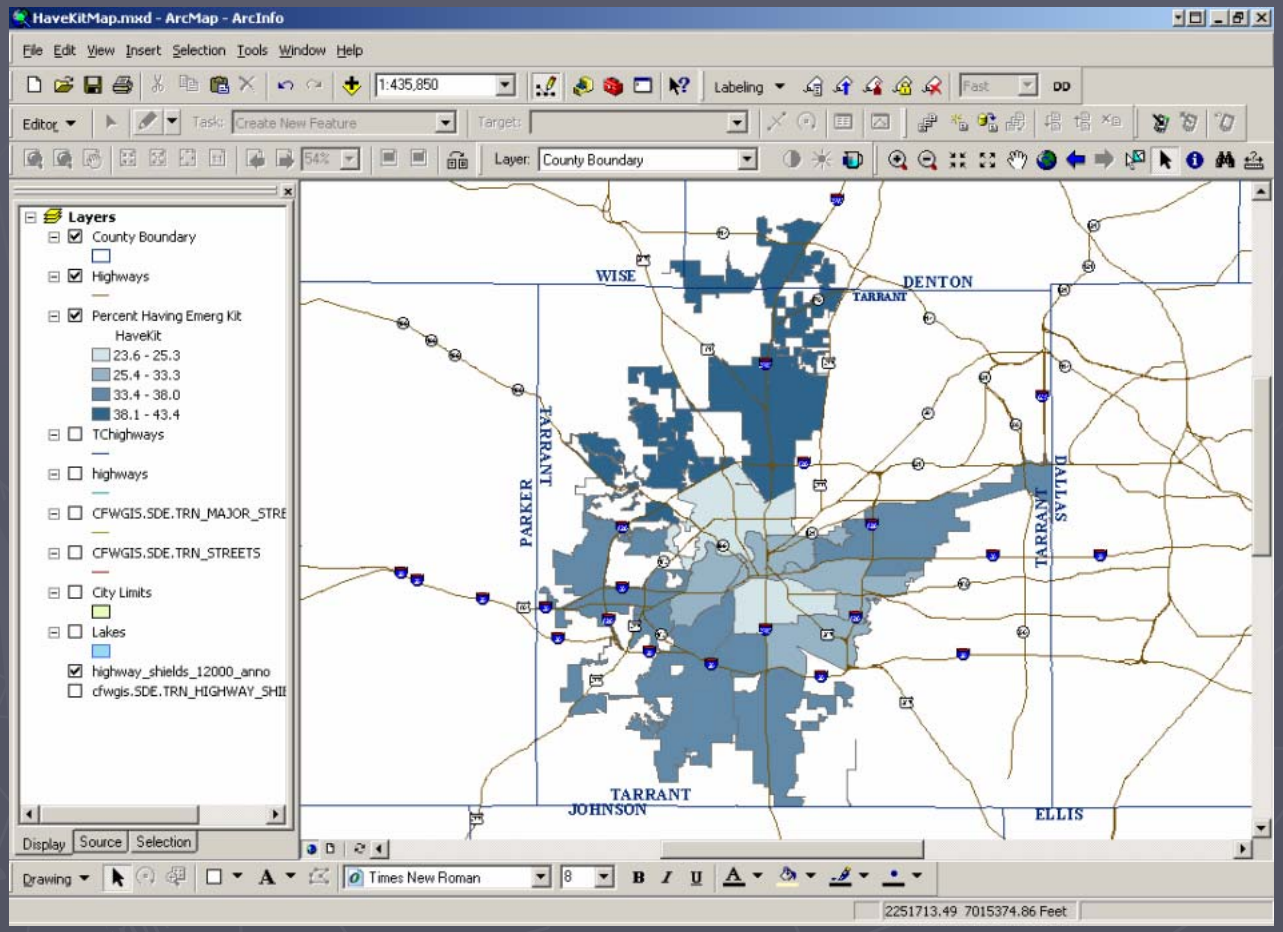


# City of Fort Worth Boundaries by Neighborhood Police Districts

**( NPDs )**



# Quantitative Values




**Graduated Color Scales or Symbols are commonly used to demonstrate differing rates, frequencies, percentages, etc.**

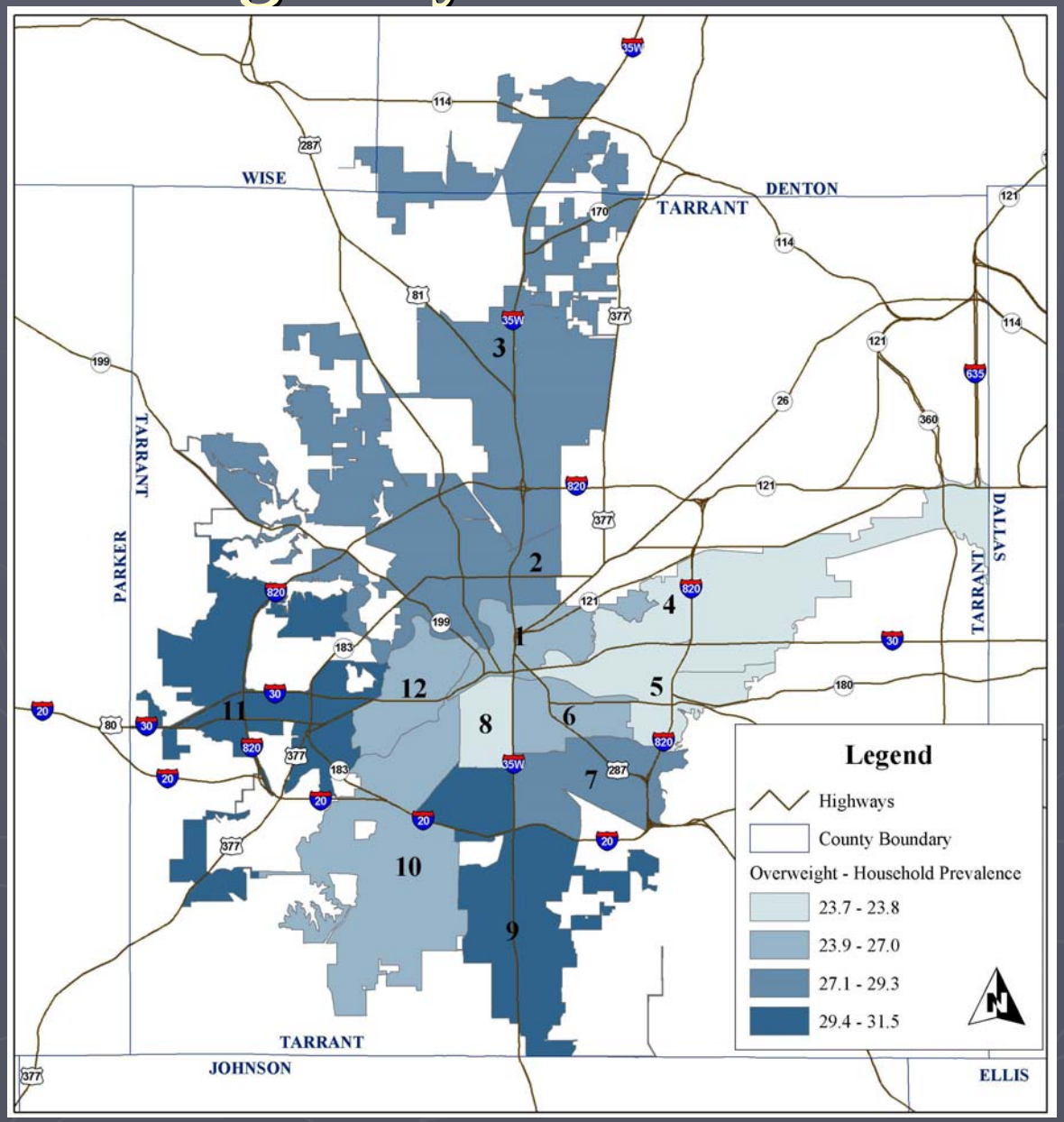
…by ZIP code, Council Districts, Census Tracts, Police Beats, etc.

# Overweight by NPDs - 2003

**Household prevalence of overweight (self-reported).**

**Fort Worth: 27.3**

**Range: 23.7 to 31.5%**

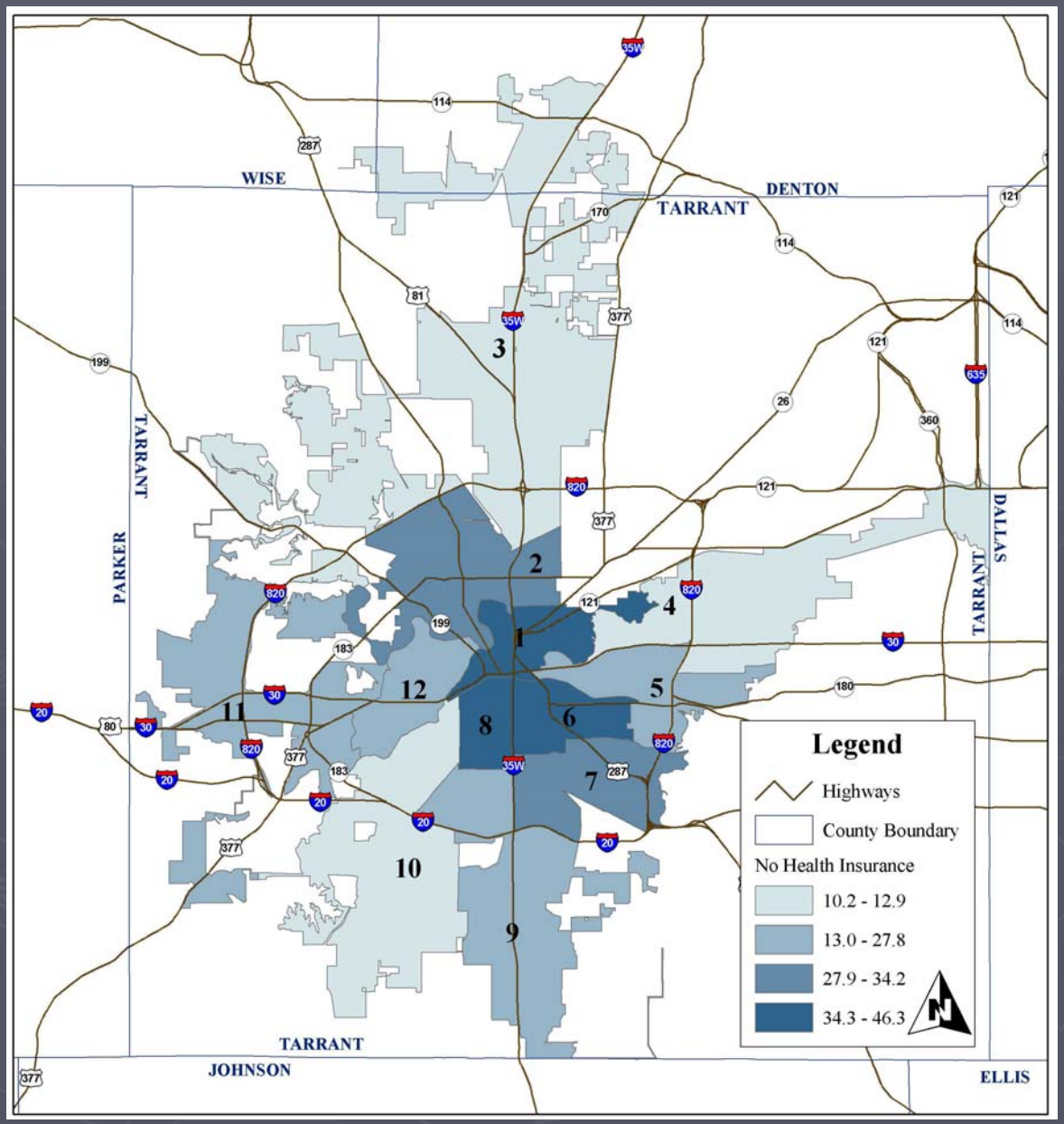



Source: 2003 City of Fort Worth Community Needs Assessment, City of Fort Worth Public Health Department.

# Percent reporting no health insurance

**Fort Worth: 24.1%**

**Range: 10.2 to 46.3%**



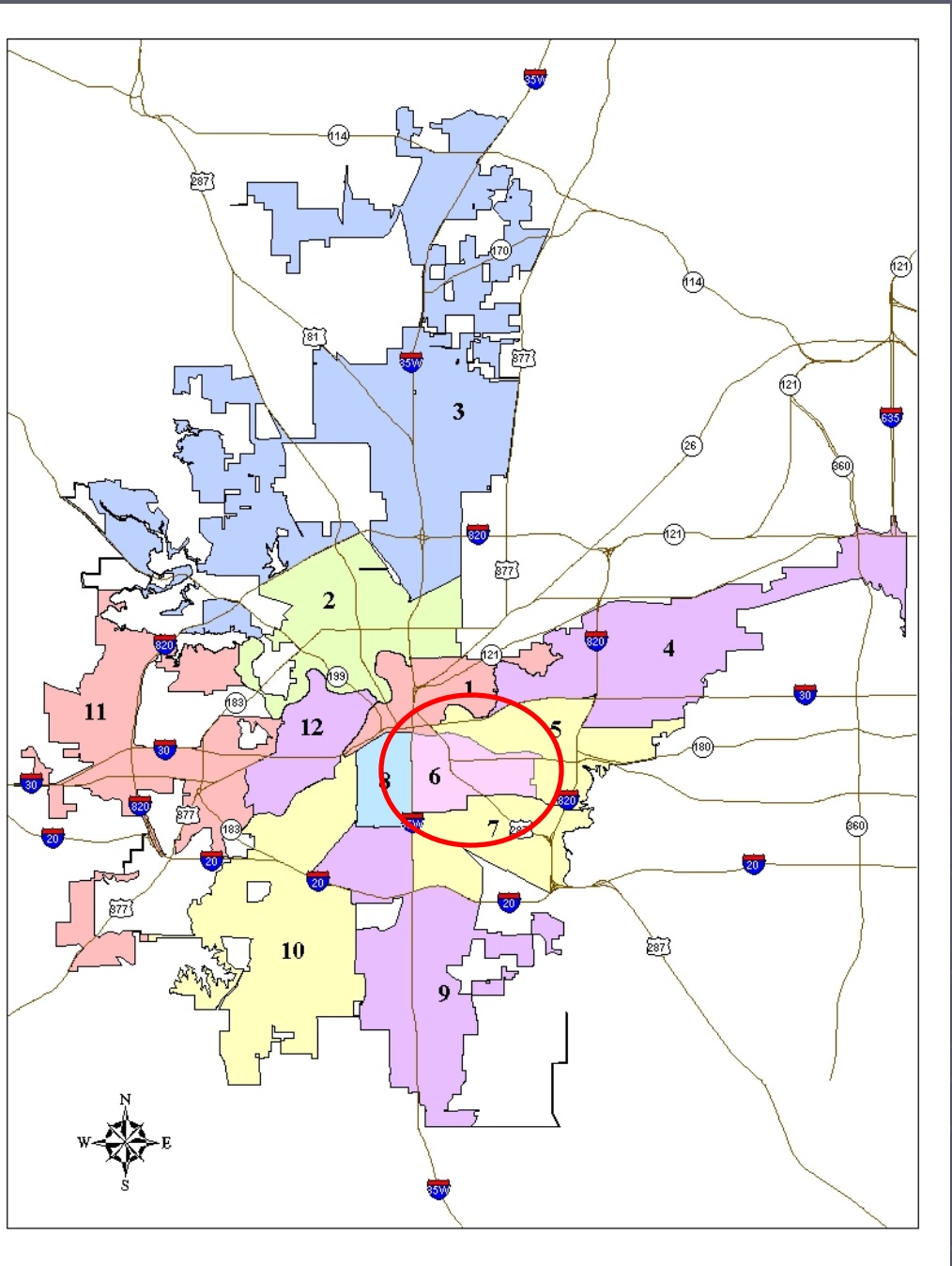

Source: Fort Worth Community Needs Assessment, City of Fort Worth Public Health Department

# Targeting Interventions

## NPD 6

**Ranks among the highest three NPDs for most CVD measures.**

**Reporting high infant mortality and highest number of births to women <18.**



# NPD 6 Demographic Data*

- **56% Non-Hispanic Black**
- **35.3% Hispanic**
- **6.9% Non-Hispanic White**
- **51% Female, 49% Male**
- **70.7% English speaking households (CFW – 80.6%)**
- **Average Education – 10.5 years (CFW – 12.5)**
- **41.5% married/in partnership (CFW – 57.6%)**
- **Average household size –3.4 (CFW – 2.9)**

**From incorporated US Census data for each NPD*

# NPD 6 Health Measures

- **For example, CVD related disease burden is evident among African-American respondents**

  **(Citywide measures provided in parentheses)**

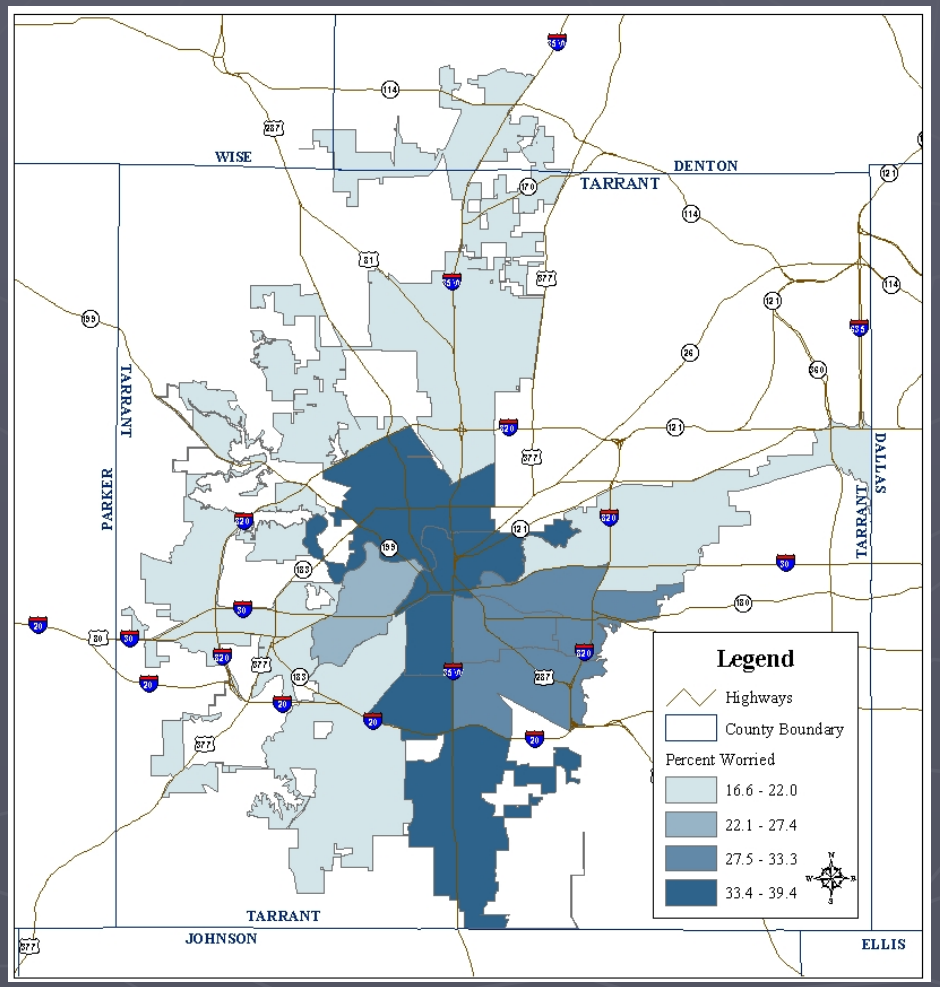
  - **45.8% High blood pressure in home (vs. 29.5%)**
  - **29.2% Diabetes in home (vs. 15.9%)**
  - **15.6% Heart problems in home (vs. 11.7%)**
  - **28.1% Overweight in home (vs. 27.3%)**
  - **29.2% Report not exercising (vs. 28.9%)**
  - **30.2% Report smoking (vs. 21.8%)**

# Emergency Preparedness

## -Percent worried to extremely worried that a terrorist attack will occur in Fort Worth

**Fort Worth: 26.8%**

**Range: 16.6 to 39.4%**

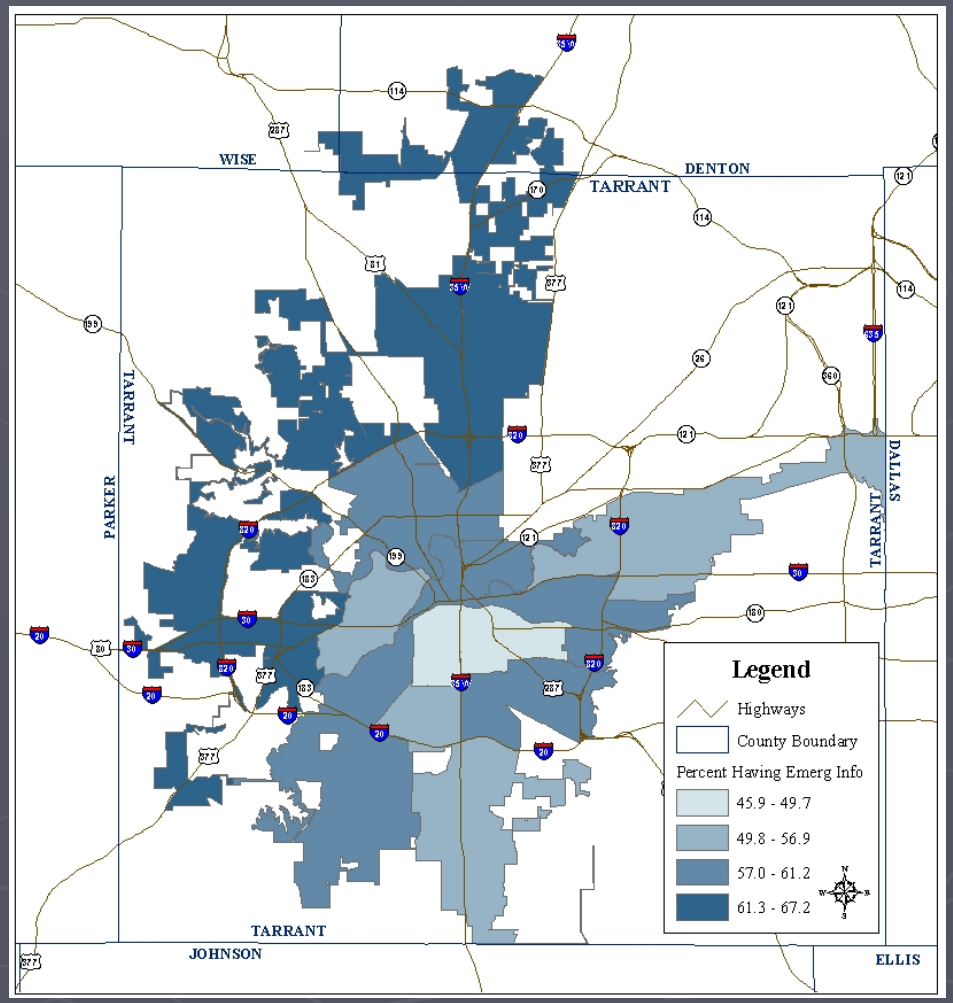


# Emergency Preparedness

## -Percent who feel they have adequate information to prepare/respond to an emergency

**Fort Worth: 59.3%**

**Range: 45.9 to 67.2%**

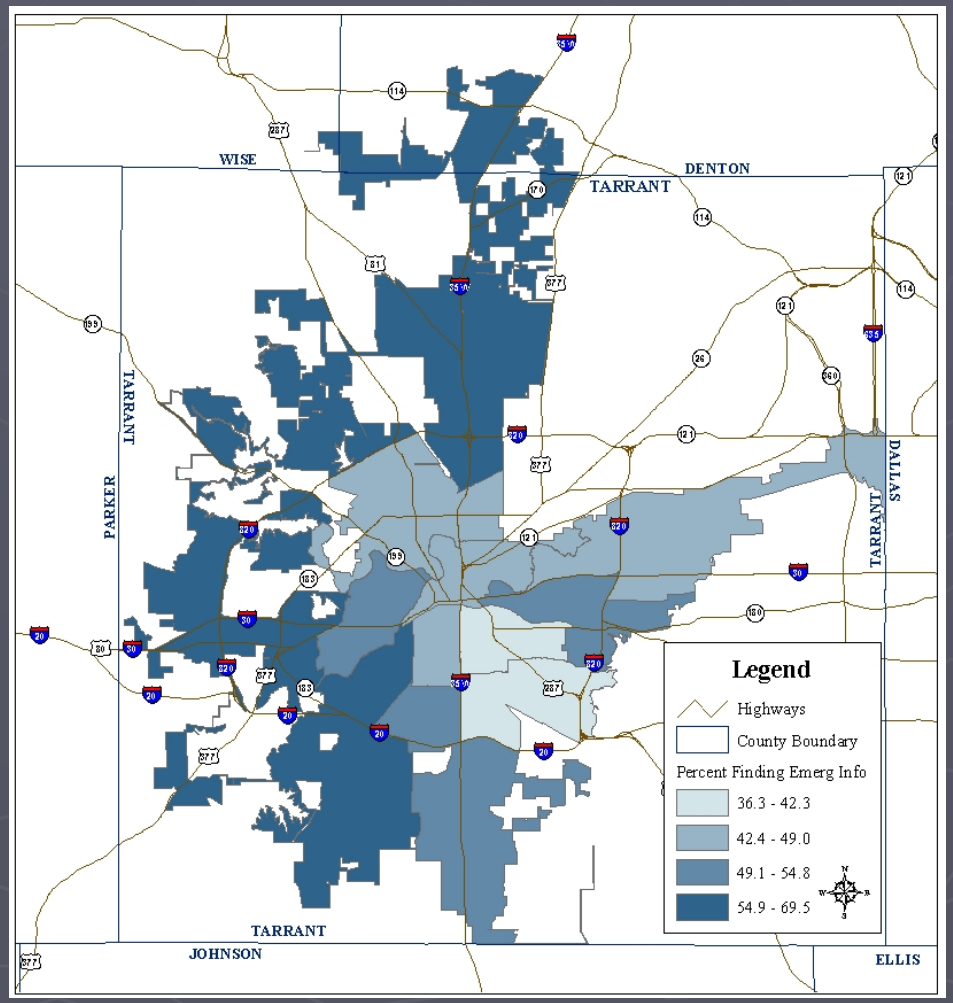


# Emergency Preparedness

## - Percent who feel they know where to find info. about how to prepare/respond to an emergency

**Fort Worth: 54.9%**

**Range: 36.3 to 69.5%**

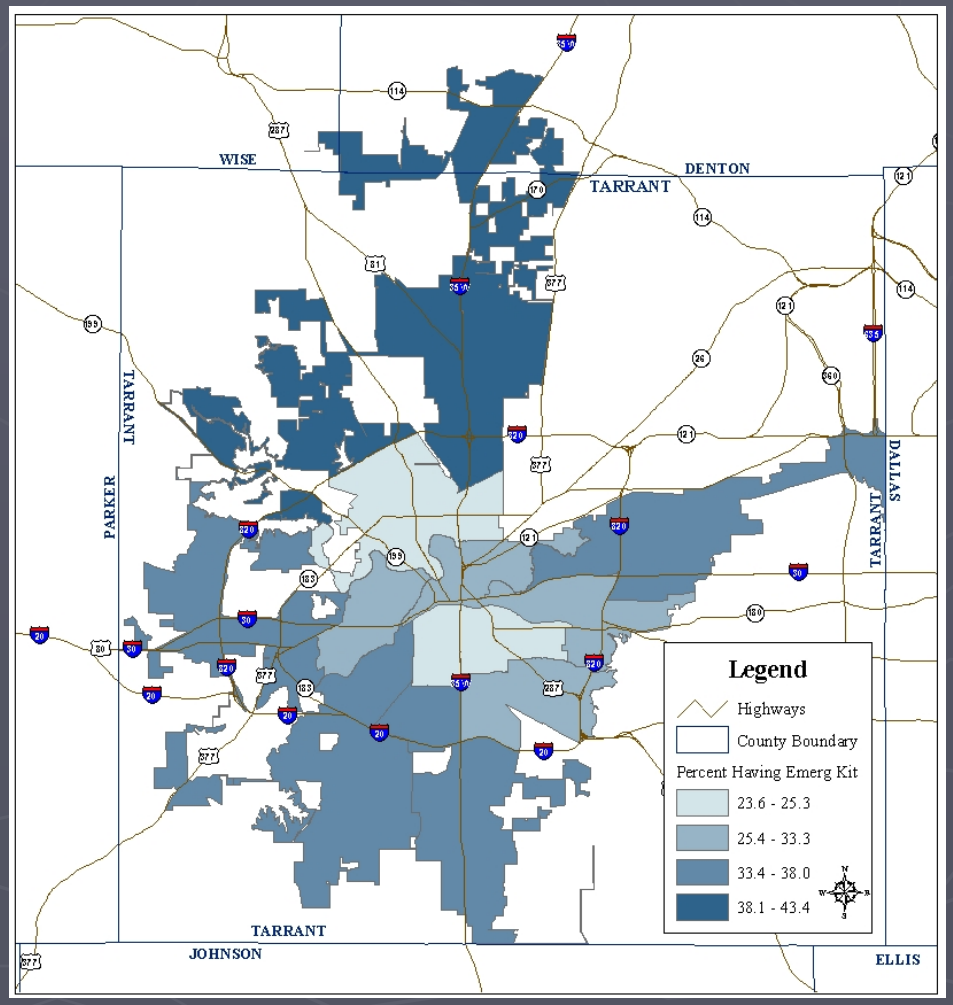


# Emergency Preparedness

## - Percent who have prepared an emergency kit for the household

**Fort Worth: 33.8%**

**Range: 23.6 to 43.4%**

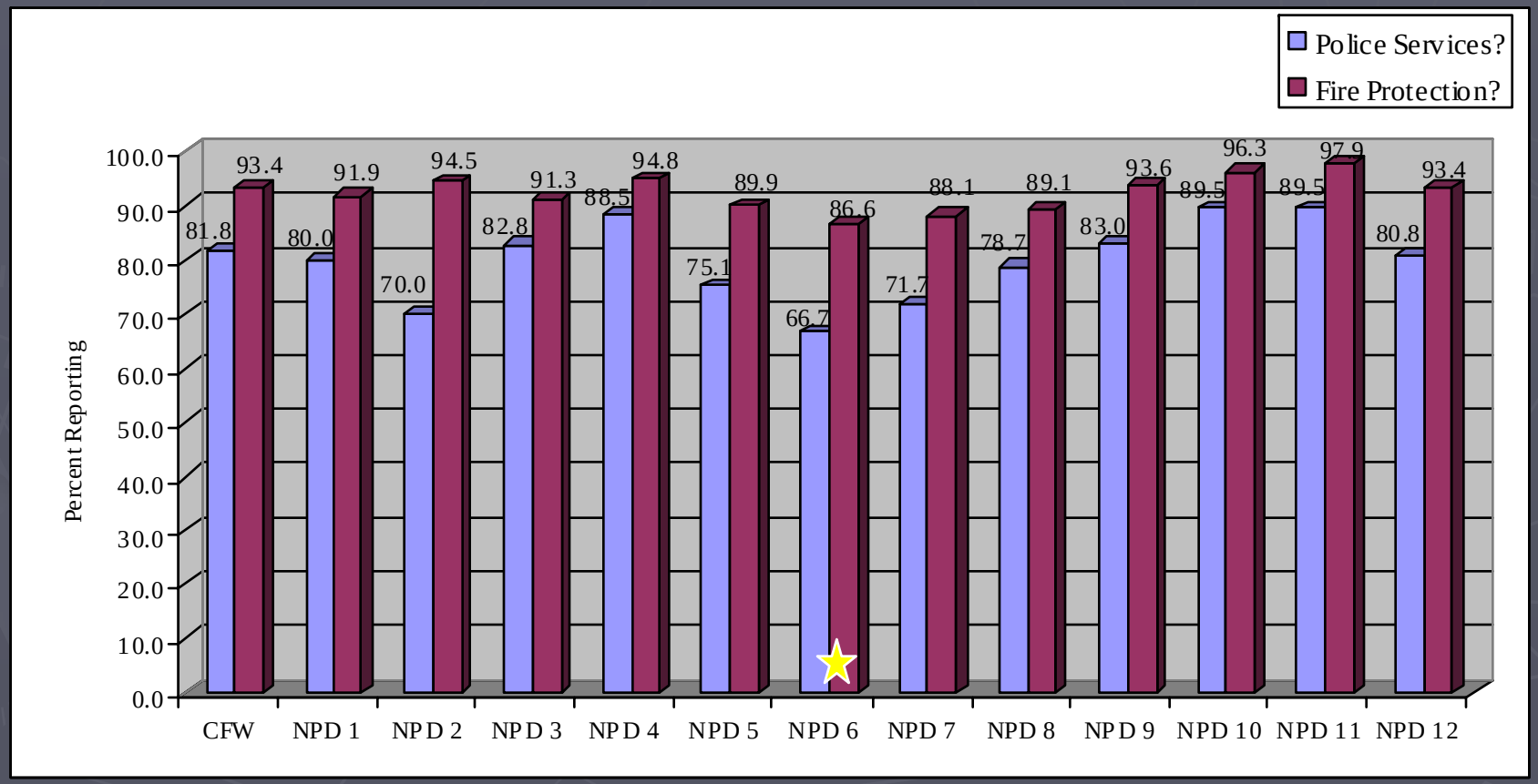


# Uncovering Specific Un-served Cross-Section of the Population

- **GIS analysis uncovered that the group that was least prepared, least informed and most worried were non-English speaking citizens in the Northside of town.**
- **Demonstrated need to NACCHO for funding**
- **Demonstrated gaps in services to stakeholders**
- **Effectively implemented coordinated , multi-organizational intervention that connected nearly 70% of participants to services *that most were not even aware existed or available*.**

# Service Evaluation: Police and Fire Protection Services

## - Percent Rating Services Good to Excellent



# Future Plans

- Increased use of ArcIMS site for distribution and viewing data among vector control and other inter-departmental team members
- Expanded field GPS/GIS capacity

# Data Maintained by Public Health Department

- **Births**
- **Deaths**
- **Childcare Centers**
- **Public Health Facilities**
- **Outreach Teams**
- **Animal Bites**
- **Mosquito Complaints**
- **Dead Bird Reports**
- **2003 Community Needs Assessment Data**

# Conclusions

- Geo-coded data allow for display of health-related information and geospatial analyses to determine any geographic patterns, as well as measuring access to local community resources (i.e.: specifically target disparities)
- GIS permits determining health-related events in rates with simultaneous integration of various types of census or demographic data
- Depending on target area size, it allows sensitive data to be displayed without revealing confidential information
- Proves very effective in disease outbreak investigations and recognition of potential clusters

# Conclusions (Cont…)

- Allows for the stratification of data by an infinite number of perspectives and interests
- GIS also provides a reliable and accurate sampling platform for a large scale municipal survey
- Permits the presentation of data relevant to specialized groups such as neighborhood associations, council districts, etc.
- Can serve as an effective medium to request and justify funding

# Questions?

**Contact**
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**City of Fort Worth**
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***THANK YOU!!!***