Environmental Railyard Research Impacting Community Health (ENRRICH) Project

Background

- Using evidence-based computer modeling and toxicological data, the California Air Resources Board (CARB):

  - Has identified the BNSF San Bernardino Railyard (SBR) as one of the top 5 producers of diesel emissions among railyards statewide; and…

  - Because of the presence of exacerbating factors, the SBR ranks first in terms of potential health risk to its surrounding community.

Purpose of the Railyard Research Project:

- To understand if residential proximity to the San Bernardino Railyard is related to adverse health effects.

- To generate data on prevalence of adverse health effects within areas adjacent to the SBR

The overall goals of this study are:

- Population-based cancer assessment
- Community health analysis
- Elementary school health analysis

- support the development of an informed community response to current railyard related emissions and the resulting environmental impact challenges.

Overall Study Outline

Timeline

- The entire study is from January 1, 2011 through December 31,2012.

- For community data collection data Jul-Oct. 2011 (year 1) and then second round of data Feb-March 2012 (year 2).

- School data collection in February 2012

Household Survey

- Collecting data from community members
- Community members identified in one of three zones surrounding the railyard.
- Community team members go door to door: English and Spanish interviews.
- For each participant we collect: survey (symptoms and diseases) and respiratory tests (FeNO and Peak Expiratory Flow).
- Participants receive a small incentive to thank them for participating.

Sampling Areas

- Three zones that correspond with calculated cancer risk:
  - A- within 0.144 miles of railyard, highest cancer risk
  - B- 1.8 miles (average)
  - C- 4 miles (average)
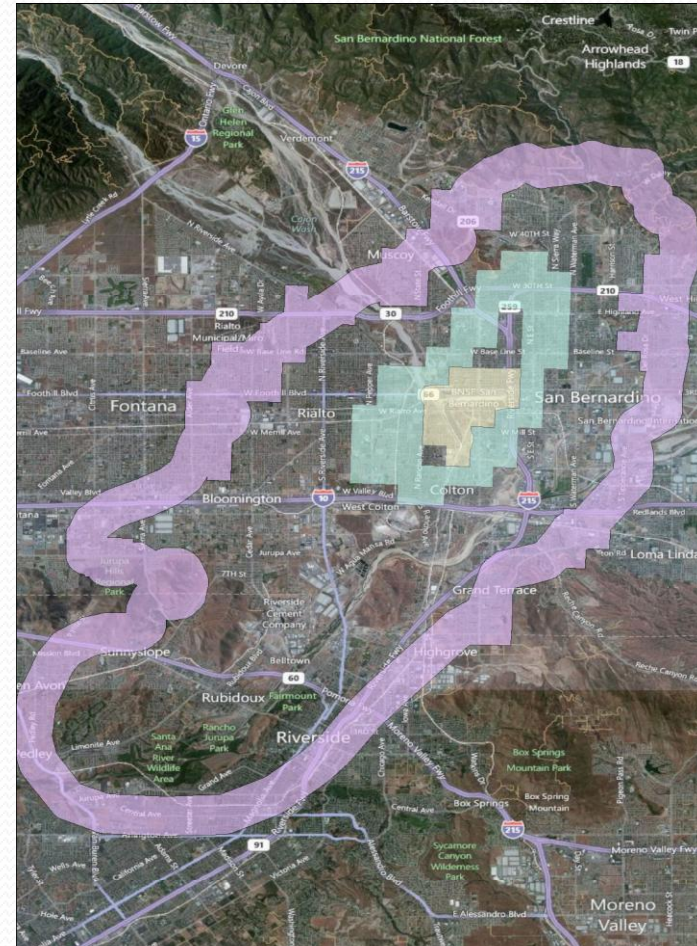
Legend

	A
	B
	C

Respiratory Health Measurements

NIOX MINO

Peak Flow Meter

School measurements

- Two elementary schools have been selected: one near the railyard and one farther away.

- Screening offered to all children each school

- With approved consent from the parent/guardian

- FeNO breath test and PEF

- Incentives for the schools and

  the children

PROGRESS UPDATE

# Work as of to-date: Qualitative Research

- We have conducted key informant interviews (n=12) and focus groups (5 groups with 53 total) with community members.
- Begin to discuss solution to pollution
- LLU Health Educators working toward formulating community intervention plan
- Presented at conferences
  - International Society for Environmental Epidemiology: Barcelona.
  - American Public Health Association: Washington DC.
  - Environmental Justice Conference: Detroit.
  - Healthy Communities By Design Summit: Loma Linda

Focus Group Update

- Four emergent themes from focus group analysis:
  - Complexities of Life (Economy, Violence, Barriers, Benefits)
  - Air Quality
  - Railyard: Mixed Emotions
  - Health as a seemingly unattainable value

  Complexities of Life, refers to the varied set of barriers created due to living in close proximity to the railyard.
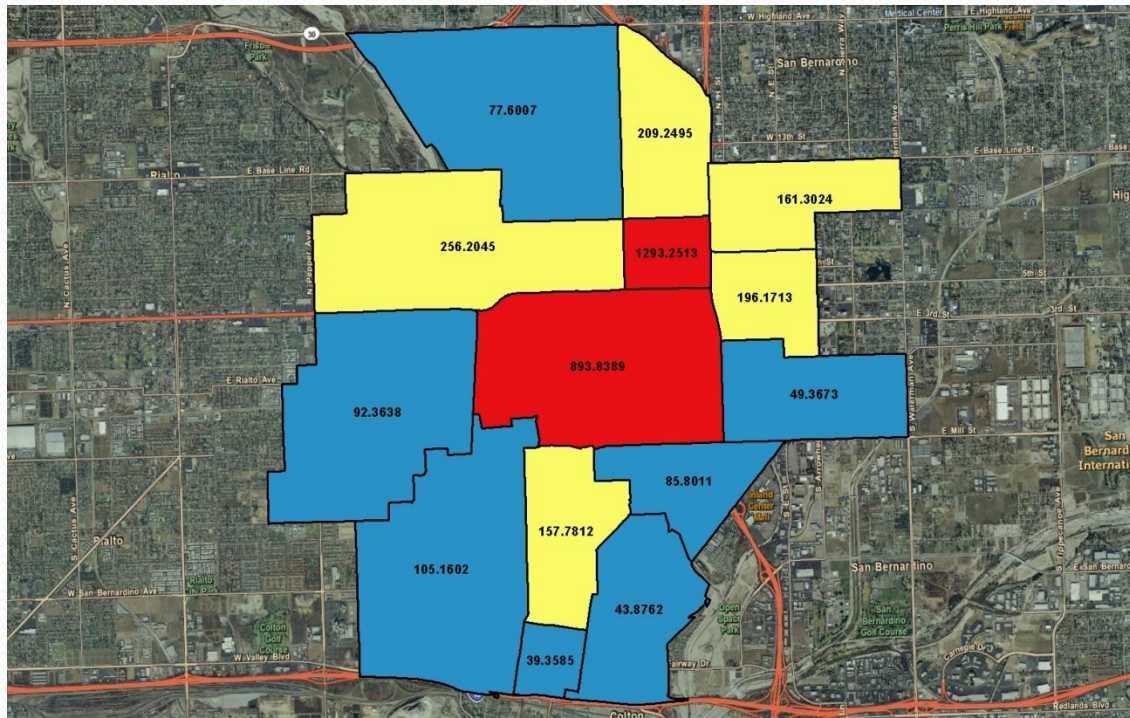
Cancer Assessment Update
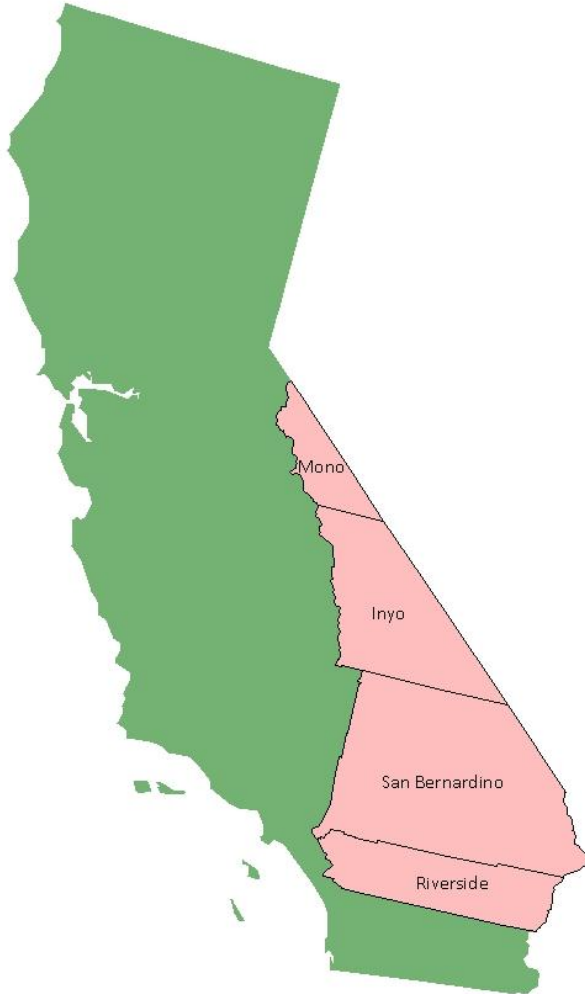
- The Desert Sierra Cancer Surveillance Program (DSCSP), also known as Region 5 of the California Cancer Registry (CCR) is the cancer surveillance system serving the population of Inyo, Mono, Riverside, and San Bernardino counties.
  - Registry located at LLU
    - The DSCSP's Cancer Epidemiologist, Dr. John Morgan, is a co-investigator in the ENRRICH Project.

Cancer Assessment Update

- For 1996-2008, observed counts of new cancers among residents of the 16, Year 2000 Census tracts surrounding the SBR were extracted and compared with the number of new cancers expected for an average risk population (i.e., the DSCSP) having the same demographic characteristics as the study population.

  - Expected cancer counts were computed for 1996-2008 using indirect standardization of <u>age</u>, <u>sex</u>, <u>race</u>/<u>ethnicity</u>, and <u>population size</u>, with <u>further adjustment for change in population size</u> during the 13 year study period.

  - Standardized incidence ratios (SIR) were derived by dividing the observed counts of new cancers for the study population and time-period by the expected counts.

Cancer Assessment Update

- Based on an air dispersion pollution model and using a GIS-based areal interpolation technique, we identified 3 exposure areas receiving 'high' (red), 'moderate' (yellow), and 'low' (blue) excess air pollution emissions from the BNSF facility.

Cancer Assessment Update

Findings for all cancer sites combined:

- High Exposure Census Tracts:
  - Females: SIR = 1.10   95% CI = 0.93-1.29
  - Males: SIR = 0.95   95% CI = 0.80-1.13
  - Both sexes: SIR = 1.02   95% CI = 0.91-1.15
- Moderate Exposure Census Tracts :
  - Females: SIR = 0.66   95% CI = 0.61-0.72
  - Males: SIR = 0.73   95% CI = 0.67-0.79
  - Both sexes: SIR = 0.69   95% CI = 0.65-0.74
- Low Exposure Census Tracts :
  - Females: SIR = 0.99   95% CI = 0.93-1.06
  - Males: SIR = 1.09   95% CI = **1.02-1.16**
  - Both sexes: SIR = 1.04   95% CI = 0.99-1.09

Cancer Assessment Update

Findings for all cancer sites combined:

- Elevation of SIR for Hispanic:
  - Females: SIR = 1.09   95% CI = **1.01-1.17**
  - Males: SIR = 1.18   95% CI = **1.10-1.27**
  - Both sexes: SIR = 1.13   95% CI = **1.08-1.19**
- Elevation of SIR for Non-Hispanic White:
  - Males: SIR = 1.23   95% CI = **1.13-1.34**
  - Both sexes: SIR = 1.15   95% CI = **1.08-1.22**
- Observed counts did not differ from expected numbers among non-Hispanic black females, males, or for the sexes combined.
- Markedly fewer observed new cancers than the expected numbers for Asian/Other:
  - Females: SIR = 0.71   95% CI = **0.51-0.97**
  - Males: SIR = 0.79   95% CI = **0.58-1.06**
 - Both sexes: SIR = 0.75   95% CI = **0.60-0.93**

Conclusions

- After adjusting for age, sex, race/ethnicity, population size, and change in population size, these assessments did not provide clear evidence of a differential occurrence of all cancers combined in railyard high, moderate, low excess exposure areas.

- Our assessments of observed and adjusted expected counts of new cancers among residents of the SBR railyard exposure areas identify mixed findings of deficits, no difference, and excesses in observed counts of new cancers compared to expected numbers in some race/ethnic groups and by sex.

  - Higher than expected counts of new cancers identified among Hispanic females and males and for non-Hispanic white males for the combined railyard exposure area and remarkably lower than expected cancer counts among Asian/Other residents of this combined exposure area are worthy of further exploration that is ongoing.

  - Additional analyses that distinguish findings for combined and dose-related railyard emission exposures for specific cancer types having different etiologic mechanisms are ongoing.

Household Survey Update

- Collected 768 surveys to date.

Number of participants by region:

- Zone A= 259
- Zone B= 240
- Zone C= 269
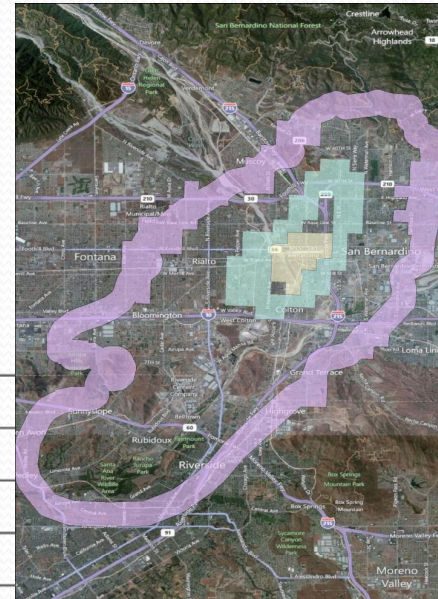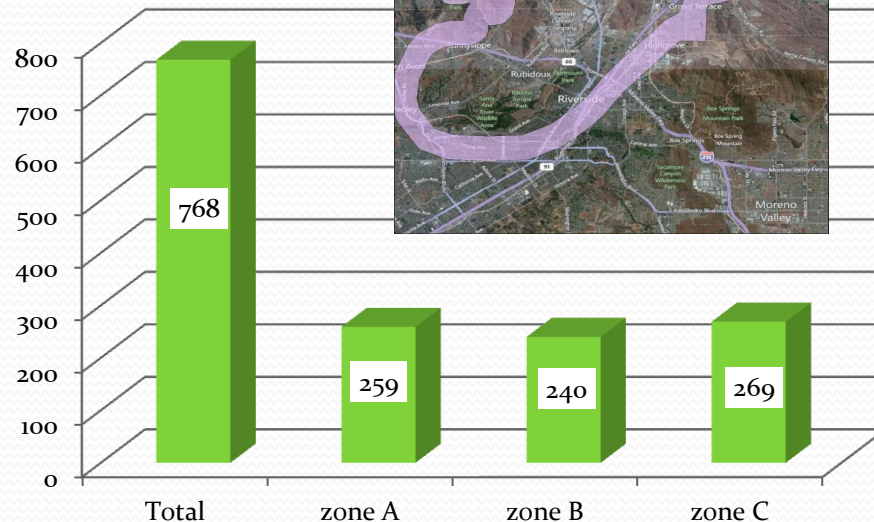
Distance of Study Population to SBR

Sampling Zone	Sample Size	Mean (SD) (miles)	Range: Min-Max (miles)
A	259	0.14 (0.07)	0.016-0.429
B	240	1.89 (0.78)	0.291-3.173
C	269	4.02 (1.10)	2.182-7.851
All Participants	768	2.04 (1.79)	0.016-7.850

Participant Age Profile

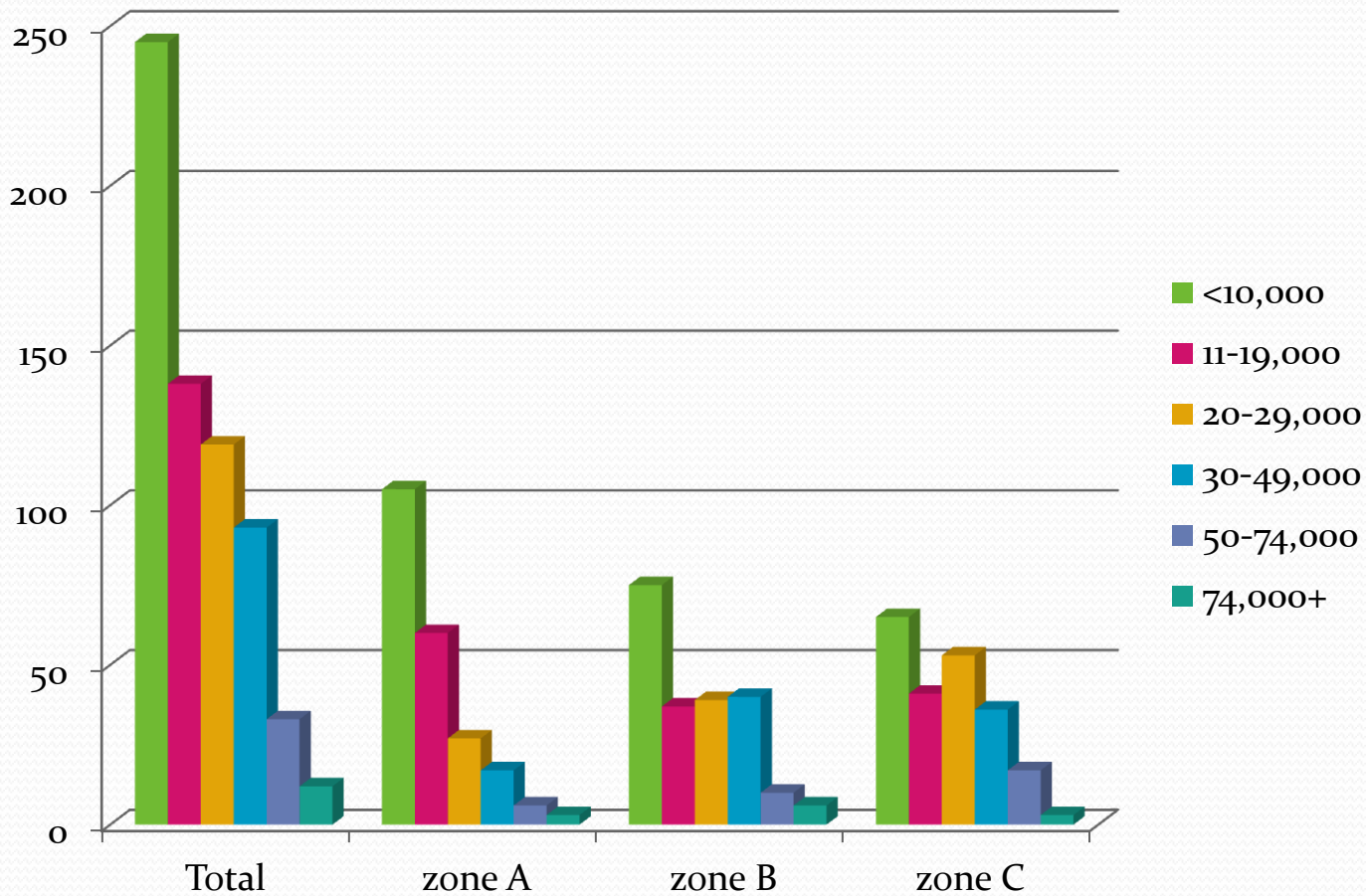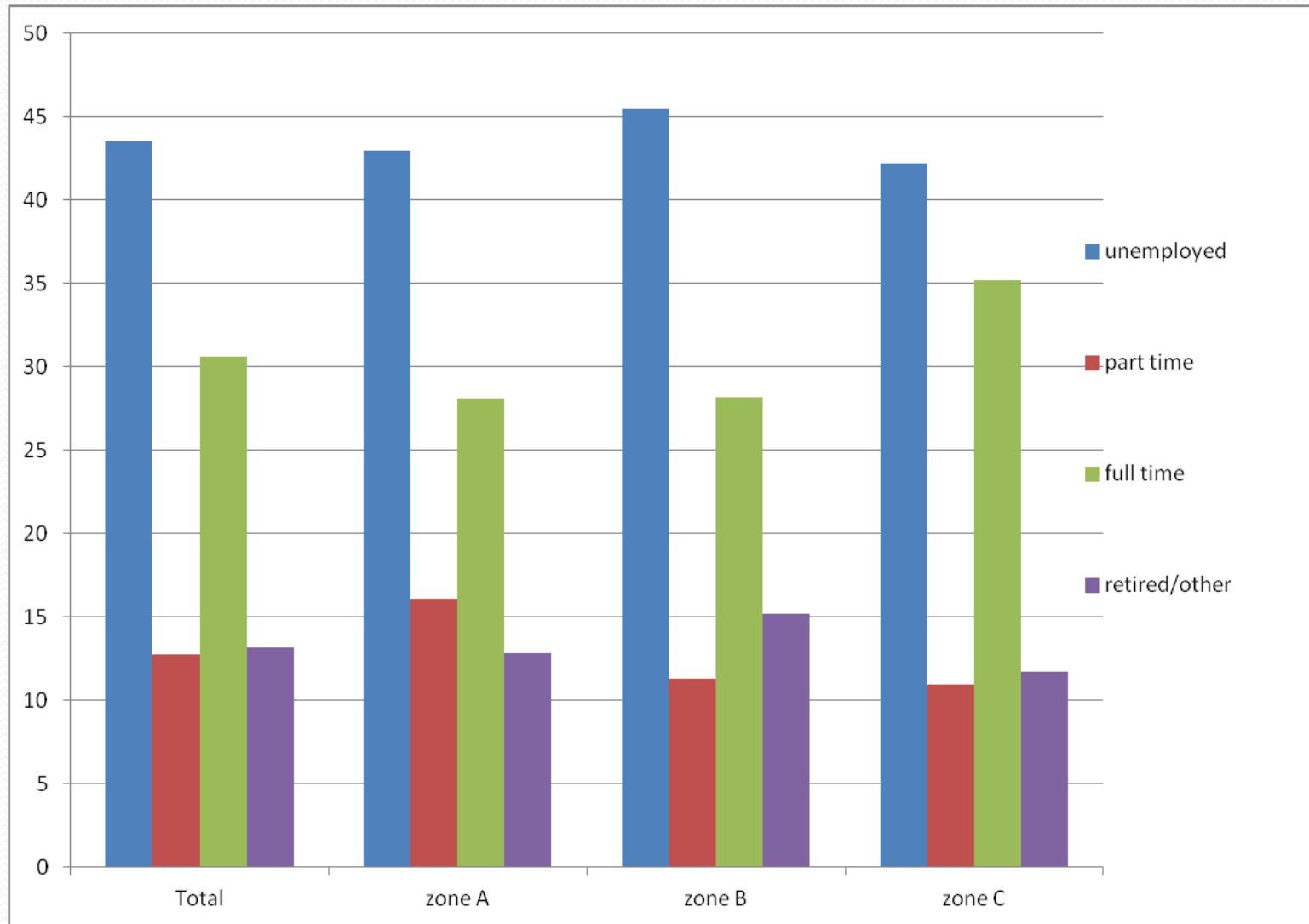| Sampling Zone	Sample Size	Mean $\pm$ SD (yrs)	Range: Min-Max (yrs)
A	259	42.4 $\pm$ 15.7	17.0 – 82.0
B	240	40.5 $\pm$ 14.3	14.0 – 81.0
C	269	42.5 $\pm$ 14.3	18.0 – 82.0
All Participants	768	41.9 $\pm$ 14.8	14.0 – 82.0

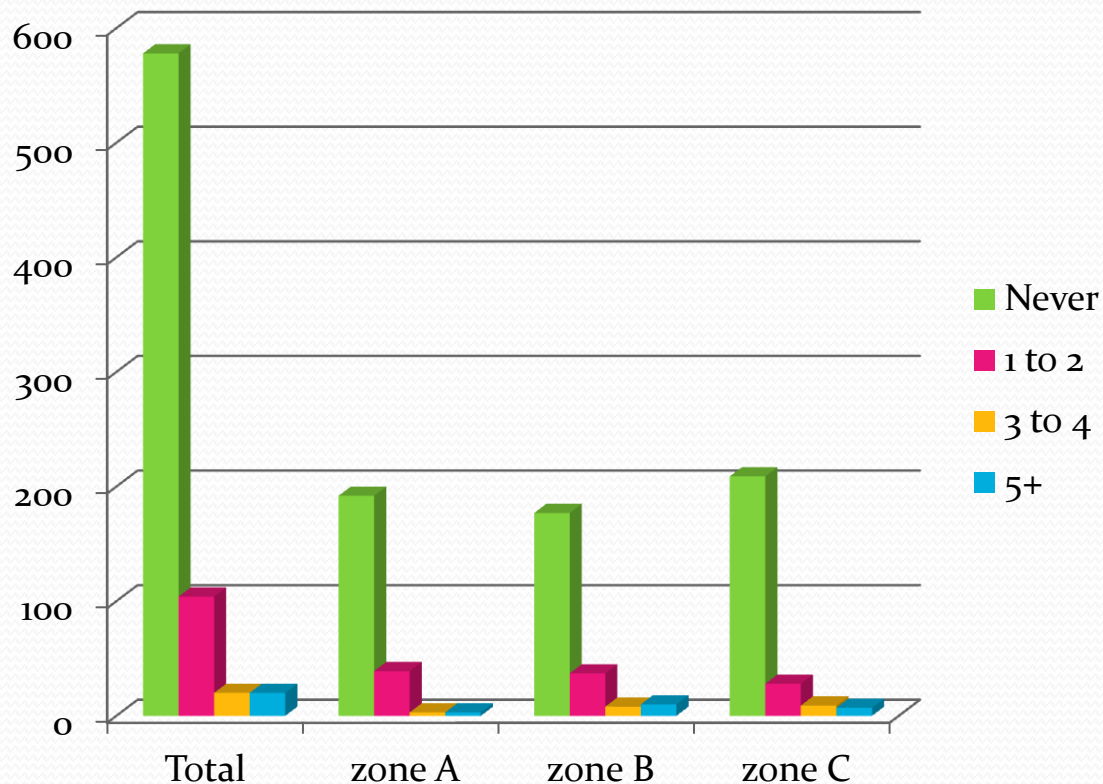# Participant Gender Profile
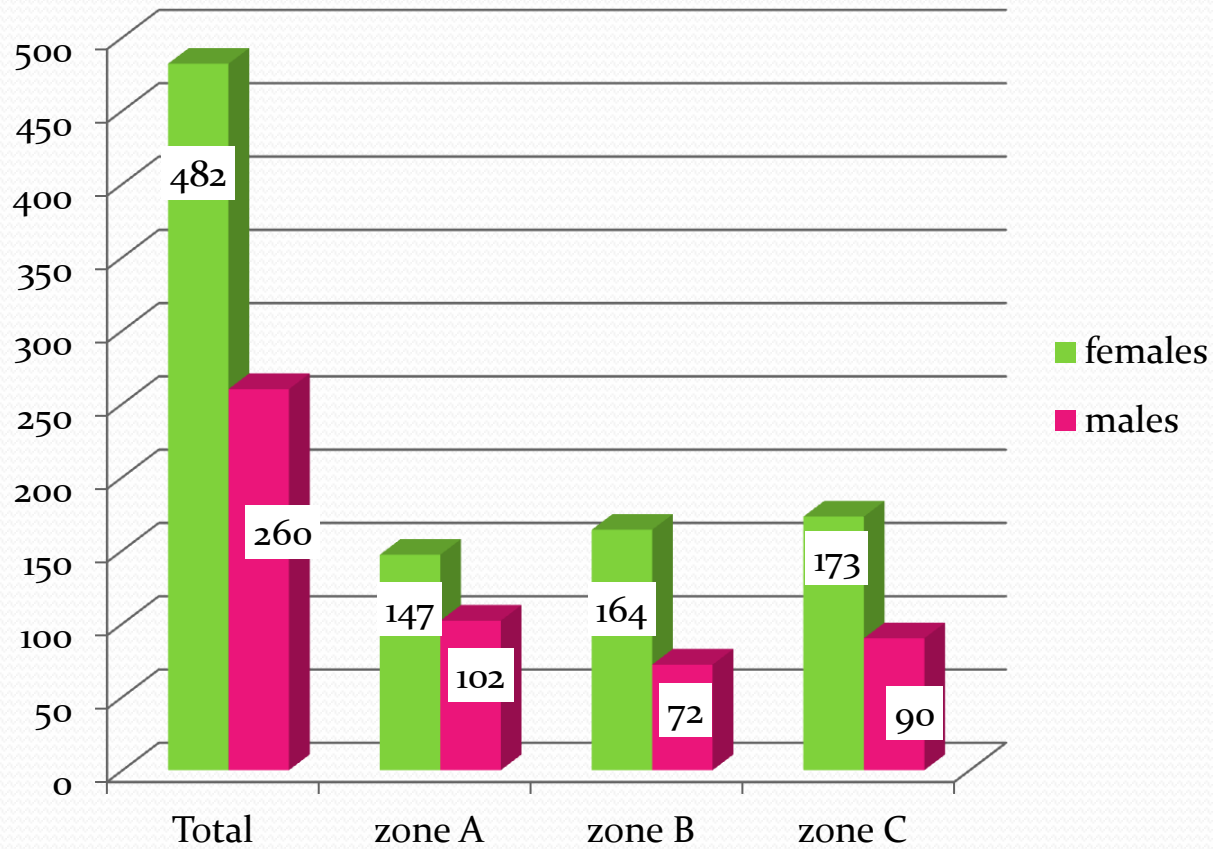
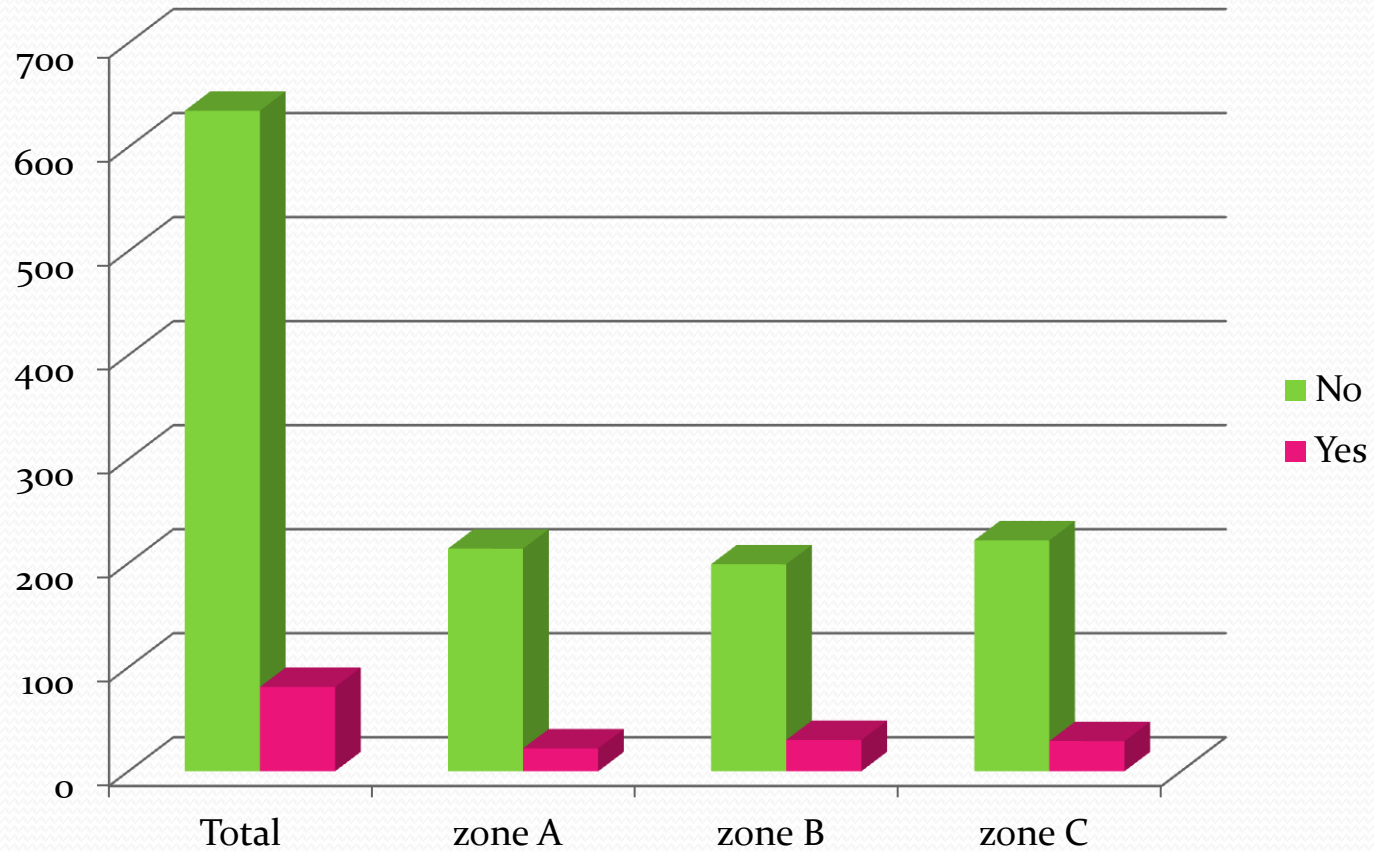# Participant Racial Profile
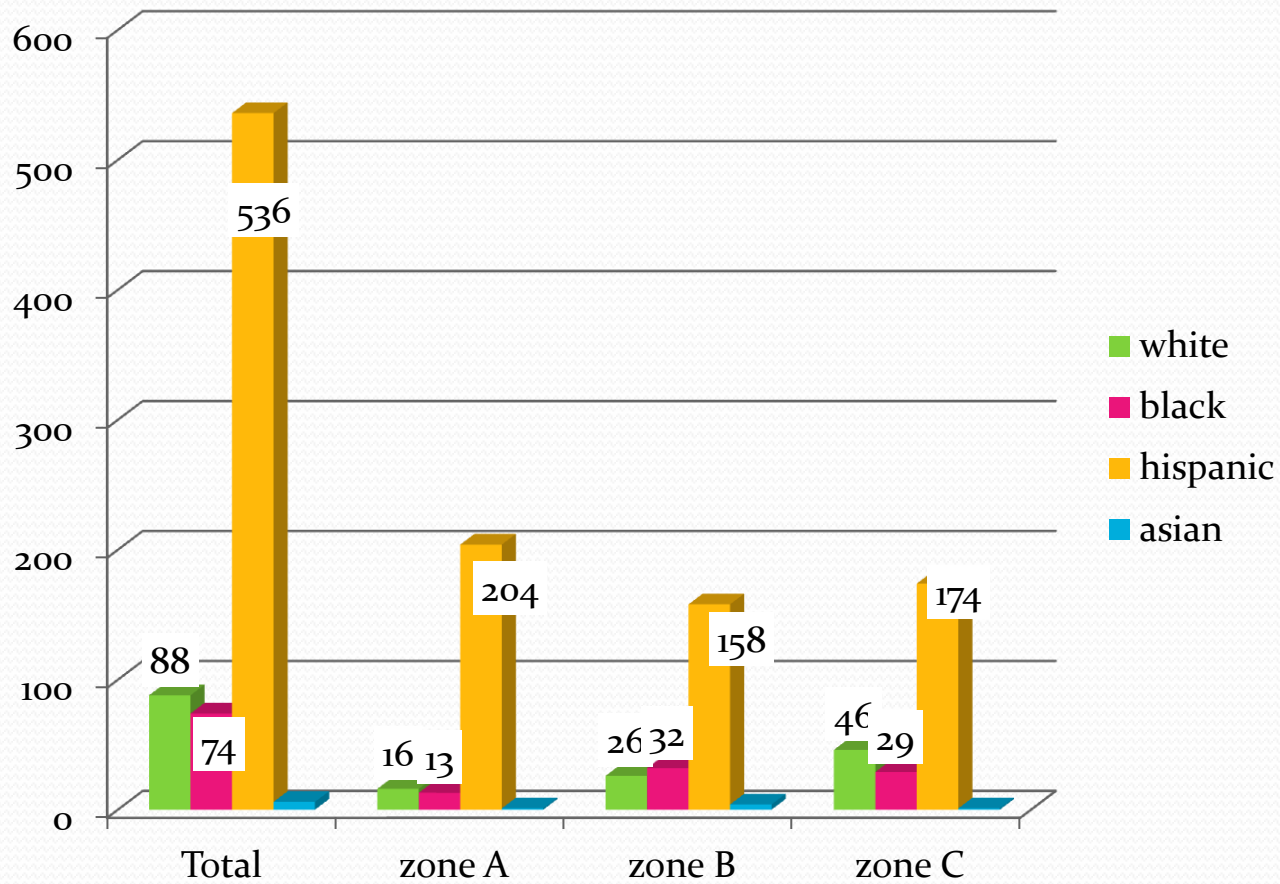
Average household Income
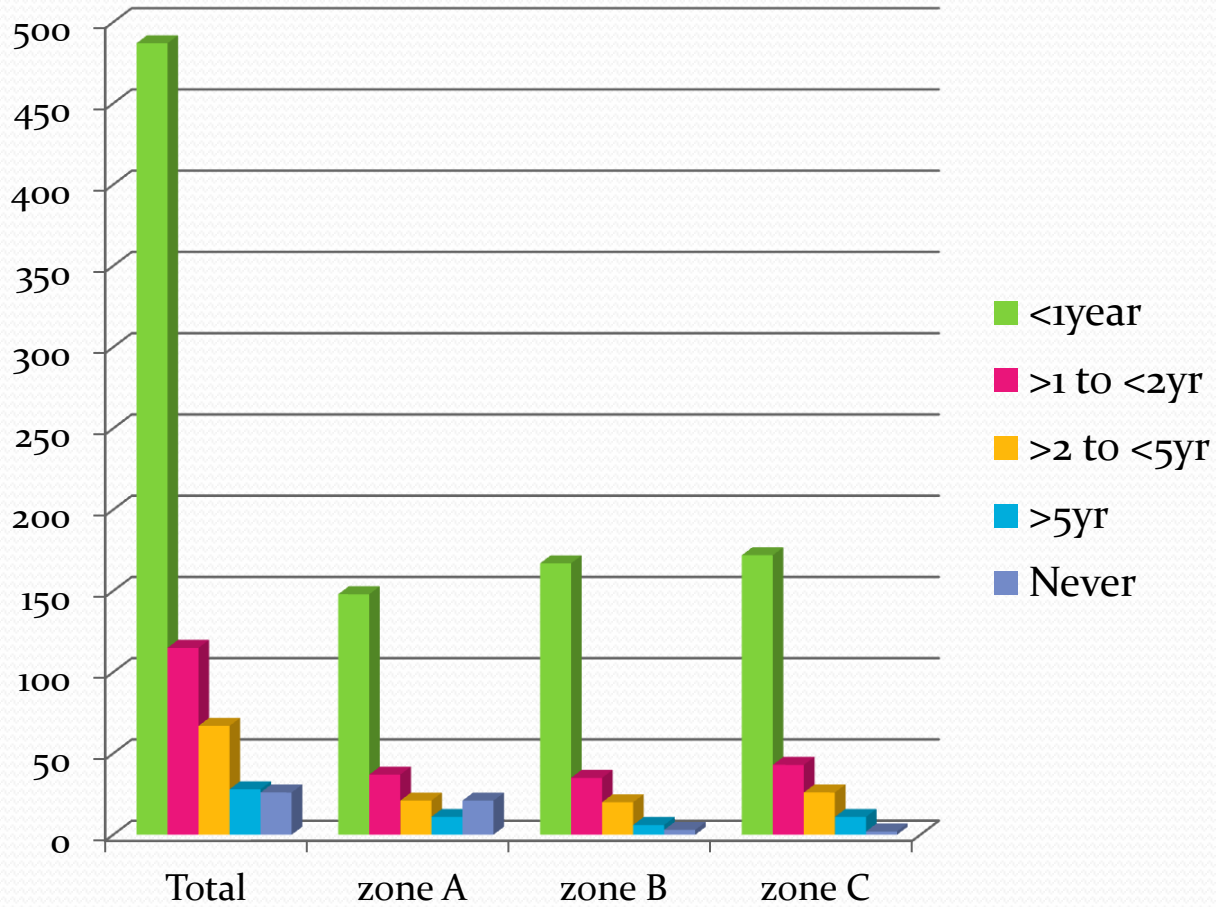
Employment Status (%)

- How many times in the past 12 months have you visited a health care provider for respiratory or heart condition?
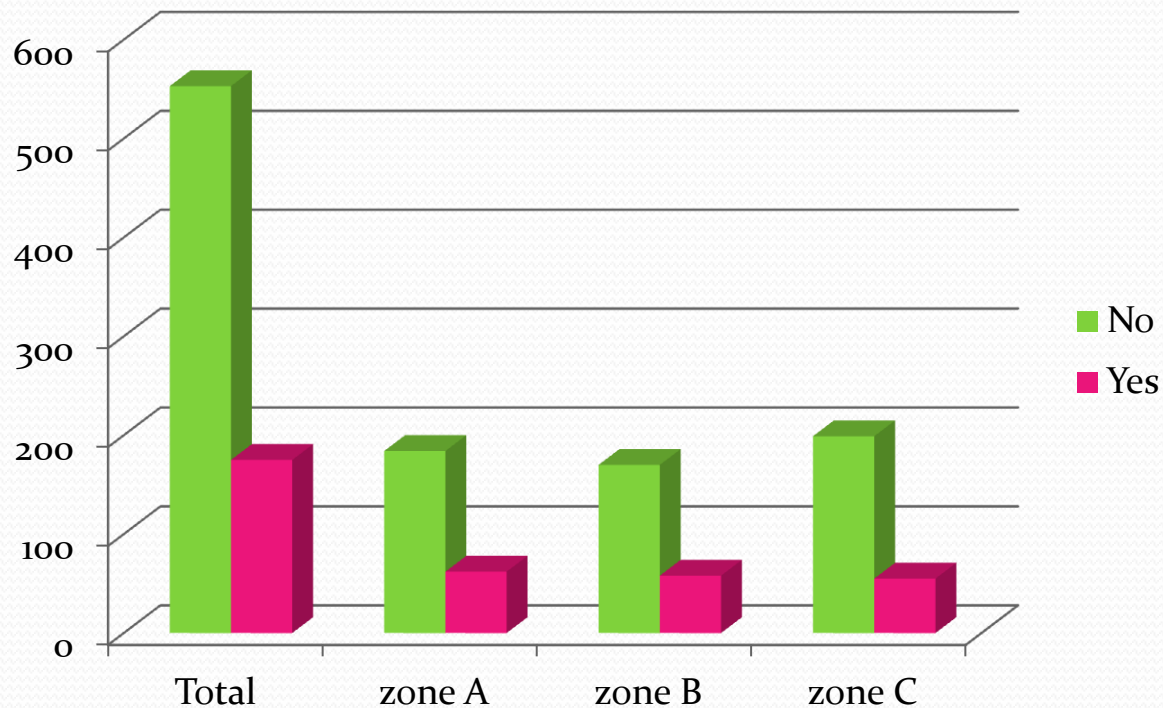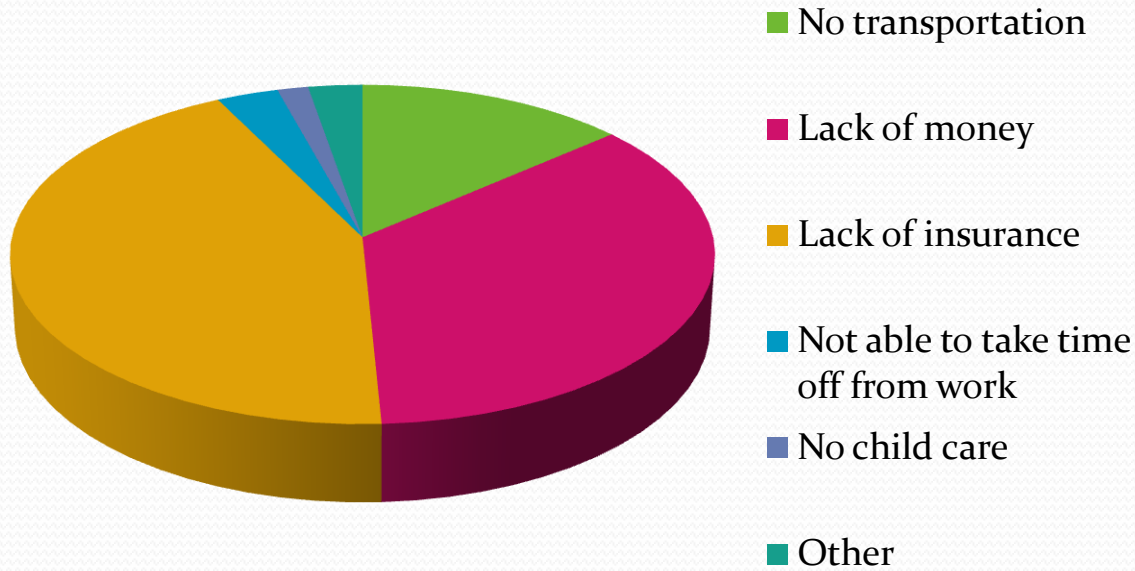
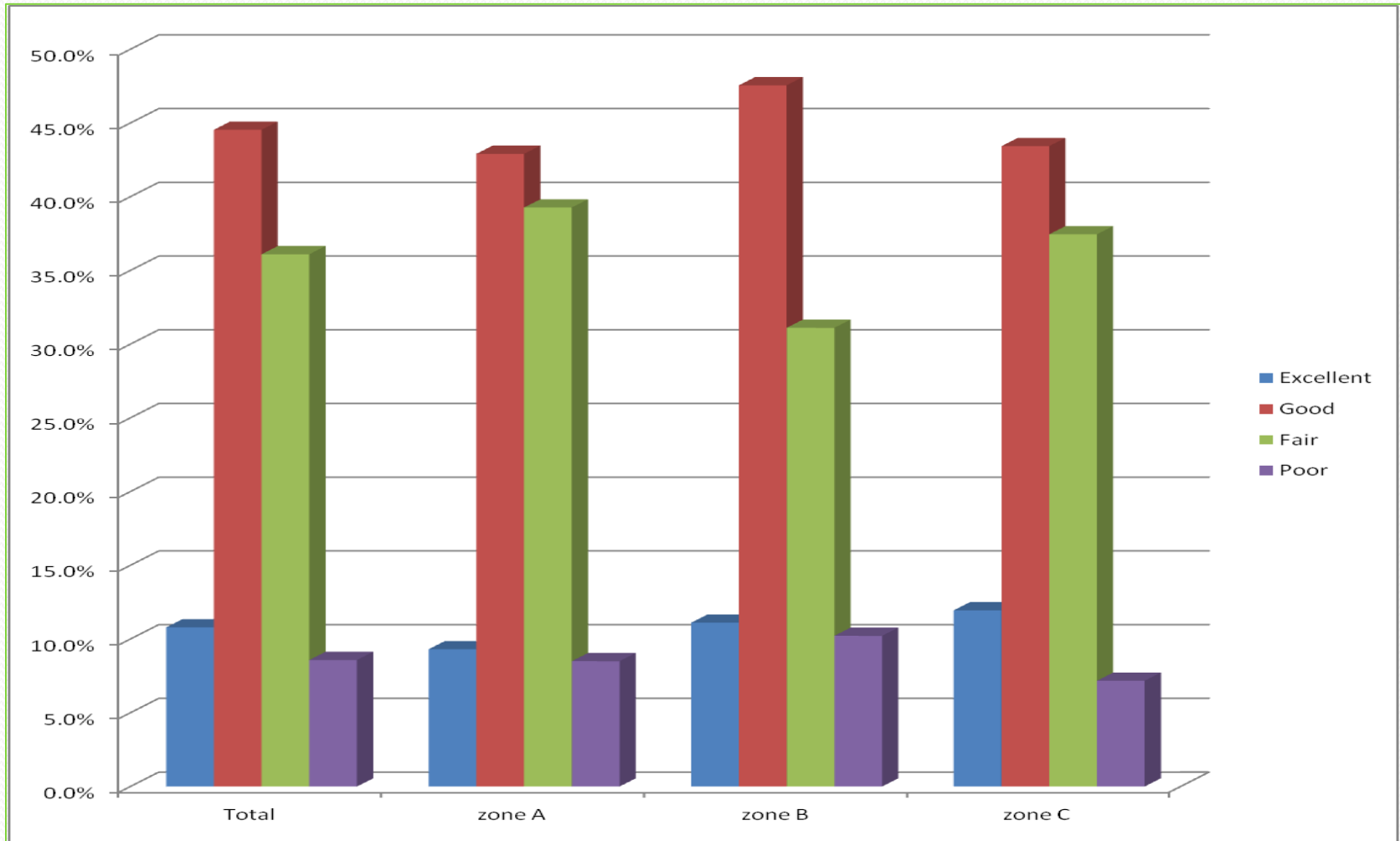- Use of asthma inhaler

- How long since you last visited a doctor?

In the past 12 months were there medical services you needed but could not get?

- Reasons for not being able to access medical services? (all zones combined)

- No transportation
- Lack of money
- Lack of insurance
- Not able to take time off from work
- No child care
- Other

Self-described general health condition

Prevalence of selected clinical symptoms

Symptom	Prevalence (Cases/Respondents)			
	Total	Zone A	Zone B	Zone C
Cough	24.0 % (177/737)	25.7 % (64/249)	22.8 % (53/233)	23.5 % (60/255)
Wheezing	30.4 % (224/736)	30.9 % (77/249)	35.2 % (82/233)	25.6 % (65/254)
Breathlessness	43.1 % (316/734)	38.6 % (95/246)	48.7 % (113/232)	42.2 % (108/256)
Watery/itchy eyes	40.4 % (296/733)	42.5 % (105/247)	41.0 % (95/232)	37.8 % (96/254)

Prevalence of self-reported, doctor-told selected illnesses

Doctor-told Diseases	Prevalence (Cases/Respondents)			
	Total	Zone A	Zone B	Zone C
Respiratory Illnesses				
Asthma	13.2 % (95/717)	14.3 % (34/237)	12.7 % (29/228)	12.7 % (32/252)
Bronchial Conditions	12.4 % (89/717)	9.3 % (22/237)	17.5 % (40/228)	10.7 % (27/252)
COPD	4.7 % (35/750)	2.8 % (7/252)	6.8 % (16/237)	4.6 % (12/261)
Other Diseases				
Allergies	17.9 % (134/750)	20.2 % (51/252)	19.4 % (46/237)	14.2 % (37/261)
CVD	30.3 % (227/750)	31.3 % (79/252)	32.5 % (77/237)	27.2 % (71/261)
Diabetes	16.5 % (124/750)	18.3 % (46/252)	15.6 % (37/237)	15.7 % (41/261)
Cancer	2.8 % (21/750)	2.0 % (5/252)	4.2 % (10/237)	2.3 % (6/261)
Hearing Loss	18.0 % (130/722)	19.0 % (46/242)	19.8 % (45/227)	15.4 % (39/253)

Household Survey Update

- Preliminary analyses of round 1 data demonstrate substantial differences in self-reported variables, such as health insurance status, ethnicity, income, or healthcare utilization between SBR-proximal and distal areas.

School Survey Update

- Working with Fontana and San Bernardino City Unified School Districts:
  - Ramona Alessandro Elementary
  - South Tamarind Elementary
- School data collection during last two weeks of February 2012
- Doctoral health education students developing informational intervention for parents of kids identified as "high risk"

School Survey Update

- Collaboration with Arrowhead Regional Medical Center Breath Mobile
    - Clinic site at the schools
    - Referral point for children with high airway inflammation

School Survey Update

- Developed and educational/fun assembly to educate and encourage participation