EPIDEMIOLOGY

Studies of Refinery Workers and Communities

Introduction

- CAP expressed an interest in understanding health effects of refineries on communities and refinery workers.
- I am NOT an epidemiologist but I can give you an overview.
- There are MANY studies.

Topics of Discussion

- What is EPIDEMIOLOGY
- What do we need to know to make minimal sense of the studies
- Studies of communities surrounding refineries-North Burnaby Refinery example
- Studies of refinery workers-California 1950-1995 example
- Studies of exposures at the Superior refinery

EPIDEMIOLOGY

- What Is It? :
  - The branch of medicine that deals with the study of the causes, distribution, and control of disease in populations (previously, the study of epidemics).
  - Epidemiologists, using sophisticated statistical analyses, field investigations, and complex laboratory techniques, investigate the cause of a disease, its distribution (geographic, ecological, and ethnic), method of spread, and measures for control and prevention.

EPIDEMIOLOGY

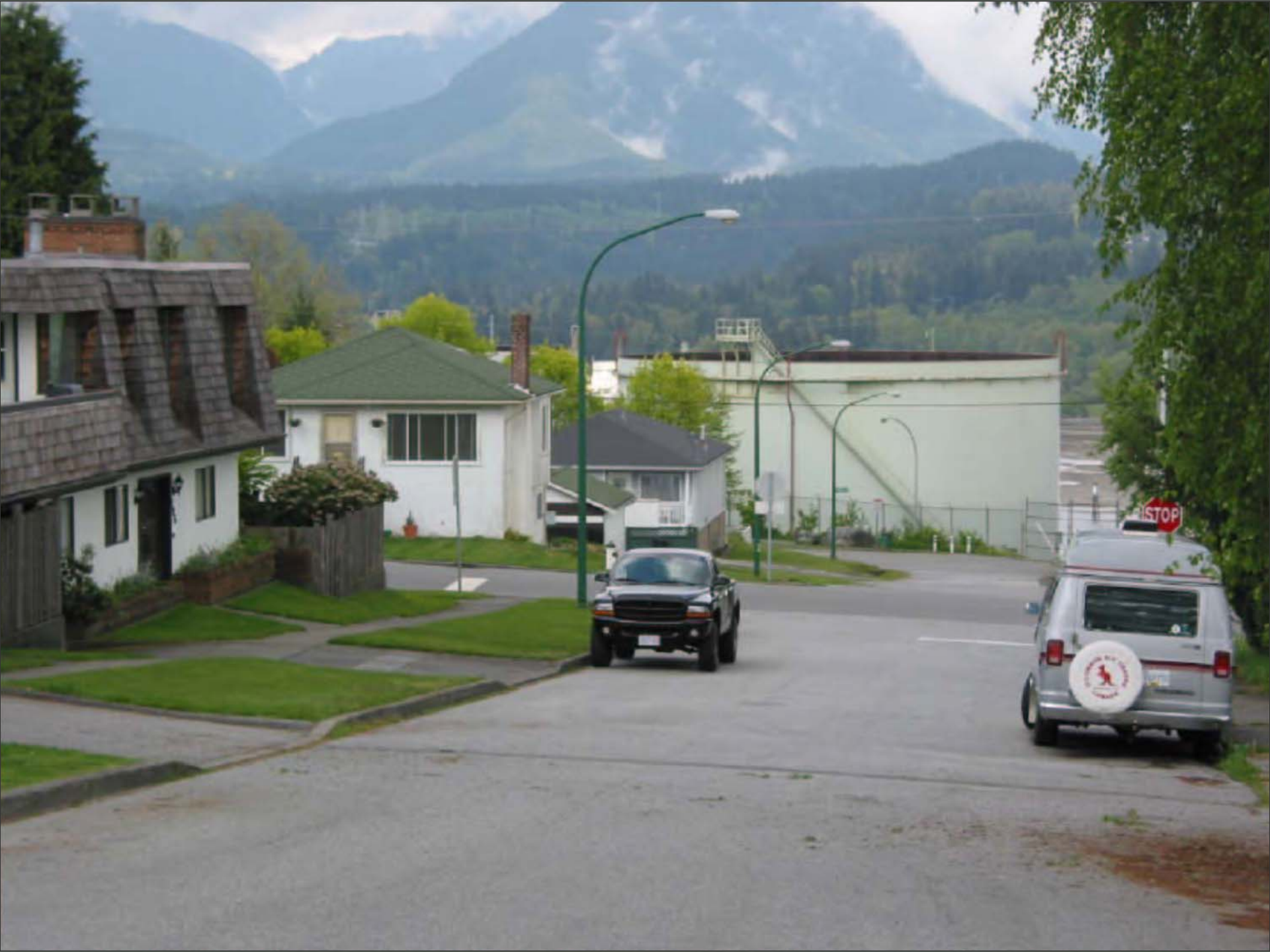
- How is it used?
  - Epidemiology is used-in our case-to help us understand the ***possible*** risks associated with living near or working at a refinery.
- Limitations:
  - Studies are based on data available for researchers sometimes including limited exposure information-especially for communities.
  - Statistical analysis can be applied in many ways

To Understand the Reports We Need

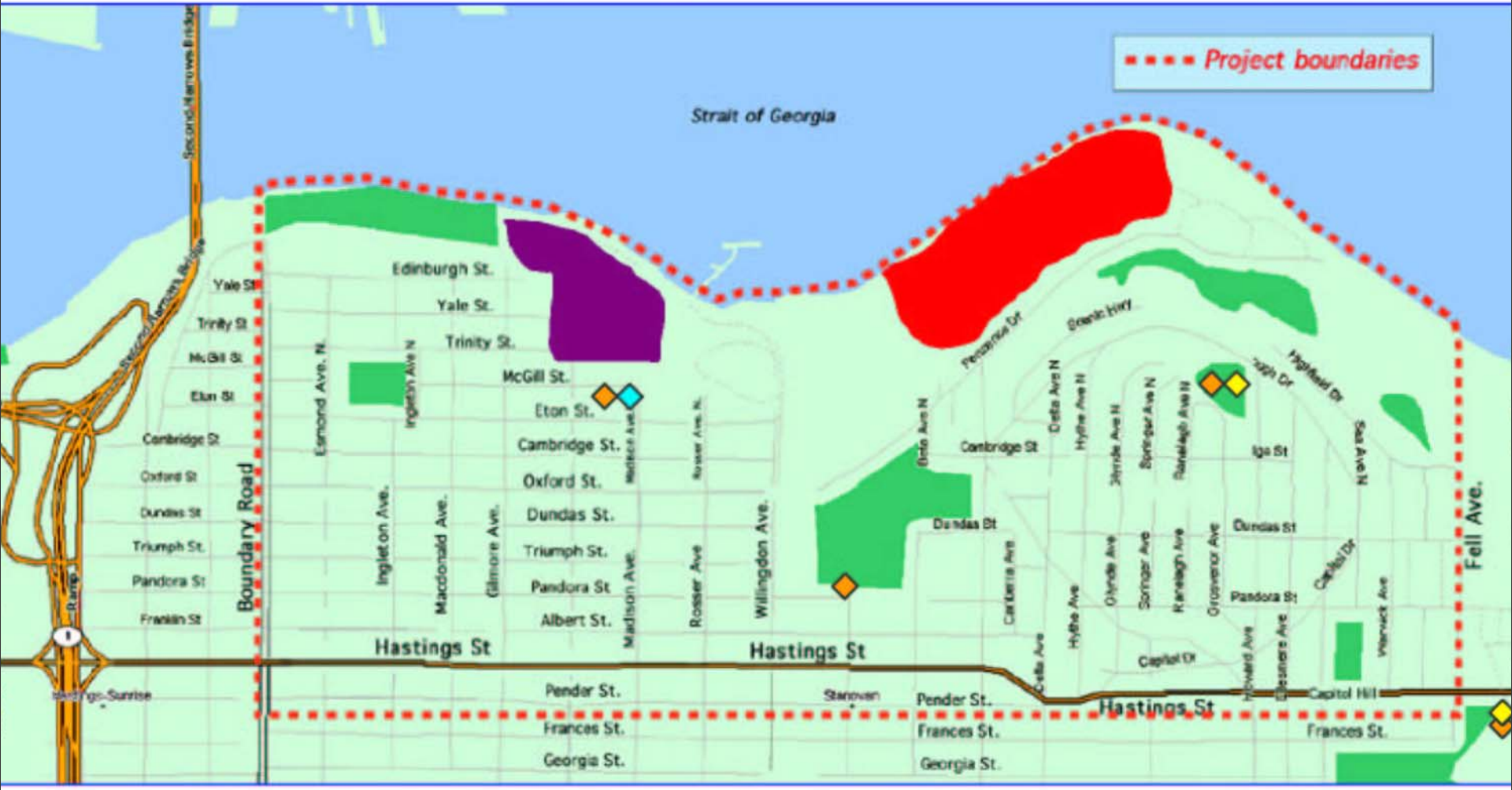
- Understanding of statistics
  - Probability--the likelihood that an event will occur expressed as a ratio
    - SMR-standardized mortality ratio-ratio of ACTUAL deaths from a specific cause to expected deaths in the general population from that same cause
- Understanding of risk analysis
  - IF working at a refinery is associated with an increased risk of some illness associated with chemical exposure-does that risk apply to me because I work at a refinery? Not necessarily! I would have to be EXPOSED first.
- Understanding of motivation for compiling the reports (***possible*** bias)

Community Case Study:

- Air emissions from the Chevron North Burnaby refinery: Human health impact assessment


STOP

Location of Sampling Sites in North Burnaby



- Tank Farm
- Refinery
- SO2, TRS
- PM10, NO2, O3
- VOCs

Air pollutant levels compared to other residential areas in GVRD

Not elevated

- fine particles (PM_{10})
- ozone (O_3)
- nitrogen dioxide ($NO_{2)}$
- carbon monoxide (CO)

Elevated

- sulphur dioxide (SO_2)
- reduced sulphur gases(TRS)
- volatile organic compounds

Sulphur dioxide:
how many people might be affected?

- estimated 40 to 80 asthmatics at risk during each peak episode
- about one third of these may have symptoms

Conclusion:

~ 15-30 asthmatics expected to have worsening of asthma symptoms from short term SO_2 peaks on any of 20-25 days/year.

Predicted cancer risk due to benzene exposure in air

	number of cancers expected if 1 million people were exposed for their whole life (or about 70 years)			number of excess cancers expected over 70 years, in a population the size of North Burnaby
	if outdoor concentrations were similar to those in North Burnaby "A"	if outdoor concentrations were similar to the rest of the GVRD "B"	expected excess cancers in a population of 1 million "A minus B"	
average value	17.2	16.0	1.2	0.023
upper 95% confidence bound "worst case"	41.8	40.5	4.3	0.115

Chevron Refinery Air Emissions Risk Assessment

Key conclusions

- Sulphur dioxide
  - peaks likely contributing to exacerbations of symptoms among N.Burnaby residents with asthma
- VOCs (petroleum vapours)
  - considerably higher than elsewhere in GVRD and near other Canadian refineries
  - likely contributing to odour annoyance, but unlikely to contribute to excess cancers or other adverse health effects
- reduced sulphur gases
  - peak levels contribute to odour annoyance

Refinery Employee Case Study:

- Updated epidemiological study of workers at two California petroleum refineries 1950-1995

Superior Refinery Exposure Studies

- We compile information regarding employee exposures
- These studies indicate that our employees are not exposed to contaminants in excess of acceptable levels.
- We do have many programs in place to protect our employees from exposure.
  - This is another topic entirely

QUESTIONS?