

Public Comment Release
**Evaluation of Serum PCB Levels and Cancer Incidence
(1982-2006)
Parker Street Waste Site
New Bedford, Massachusetts**

**Massachusetts Department of Public Health
Bureau of Environmental Health**

**Suzanne K. Condon, Associate Commissioner
Director, Bureau of Environmental Health
Jan Sullivan, Director, Community Assessment Program/BEH
Jessica Burkhamer, Health Assessor, CAP**





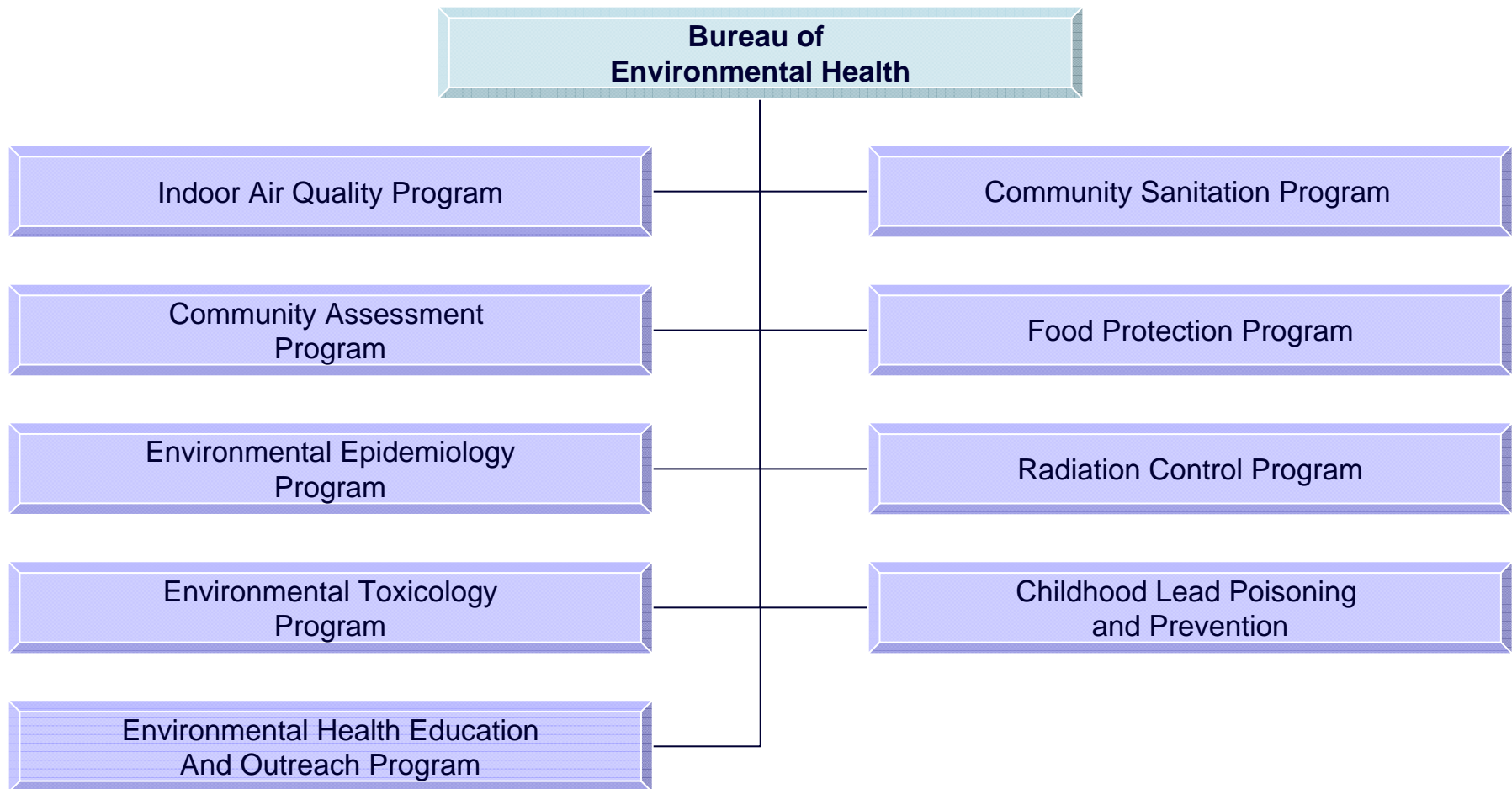
Presentation Outline

- Introduction and Background of PSWS Health Evaluation
- PCB Serum Testing
 - Methods
 - Results
- Cancer Incidence Evaluation
 - Methods
 - Results
- Conclusions
- Questions



Bureau of Environmental Health

- Has a broad mission of protecting the public from a variety of environmental exposures
- Responds to environmental health concerns and provides communities with epidemiologic and toxicological health assessments
- Is comprised of nine programs that are housed in the Boston office, the State Laboratory and several regional offices throughout the state





Community Assessment Program

- Evaluate frequency and patterns of disease in a population
- Respond to concerns about disease clusters
- Investigate possible associations between environmental exposures and disease



Scope of Investigation

- Serum PCB testing offer
 - Concerned residents and school staff
 - Compared to levels in the U.S. population
- Evaluate cancer incidence in the neighborhood around the Parker Street Waste Site (PSWS)
 - Nine cancer types
 - Five census tracts
 - Evaluate geographic and temporal patterns
 - Determine need for any additional public health assessments/actions



Serum PCB Testing Program



Serum PCB Testing - Methods

- Phase I
 - Outreach activities
 - PIP meeting presentation
 - School notices for staff
 - Press releases and interviews
 - Exposure assessment questionnaire
 - Risk factors for higher serum PCB levels
 - Activities conducted at the PSWS

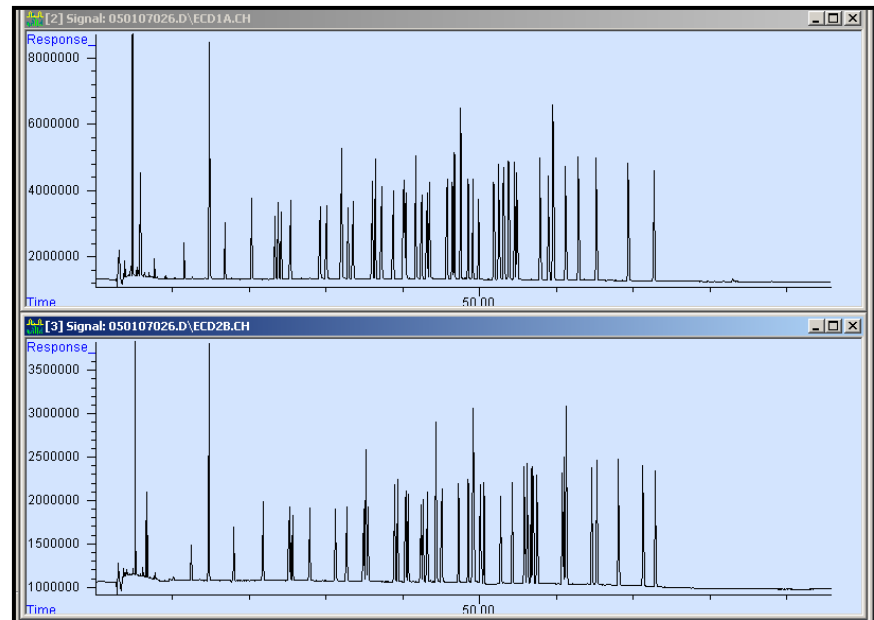


Serum PCB Testing - Methods

- Phase II
 - Given low number of residents that completed the questionnaire, letters offering blood testing sent to all 124 people
 - Blood sample collection
 - Blood drawing services provided by MDPH contractors
 - New Bedford Health Department provided space, support, and some basic supplies
 - Sample analysis

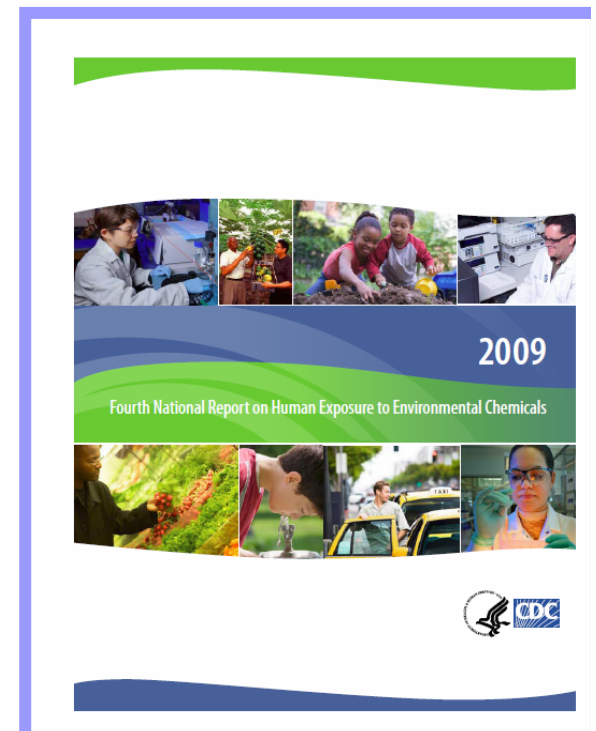
Serum PCB Testing - Methods

- Blood serum was analyzed by MDPH's William A. Hinton State Laboratory Institute
- Results reported as whole weight and lipid-adjusted

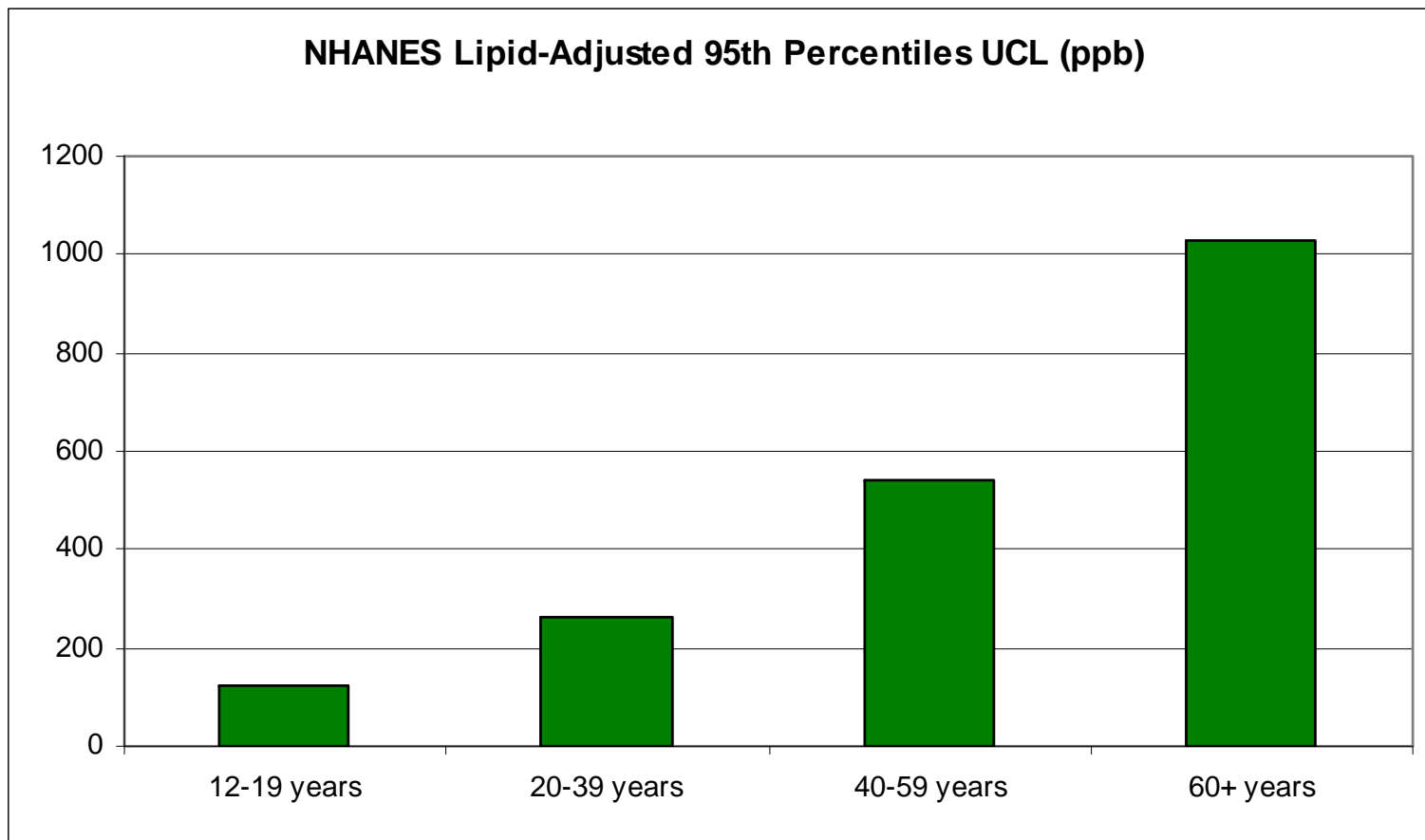


Serum PCB Testing - Methods

- Results compared with U.S. Centers for Disease Control's National Health and Nutrition Examination Survey
- Comparisons based on age groups: 12-19 years, 20-39 years, 40-59 years, and 60+ years
- According to the CDC, the 95th percentile is useful for determining whether serum PCB levels are unusual



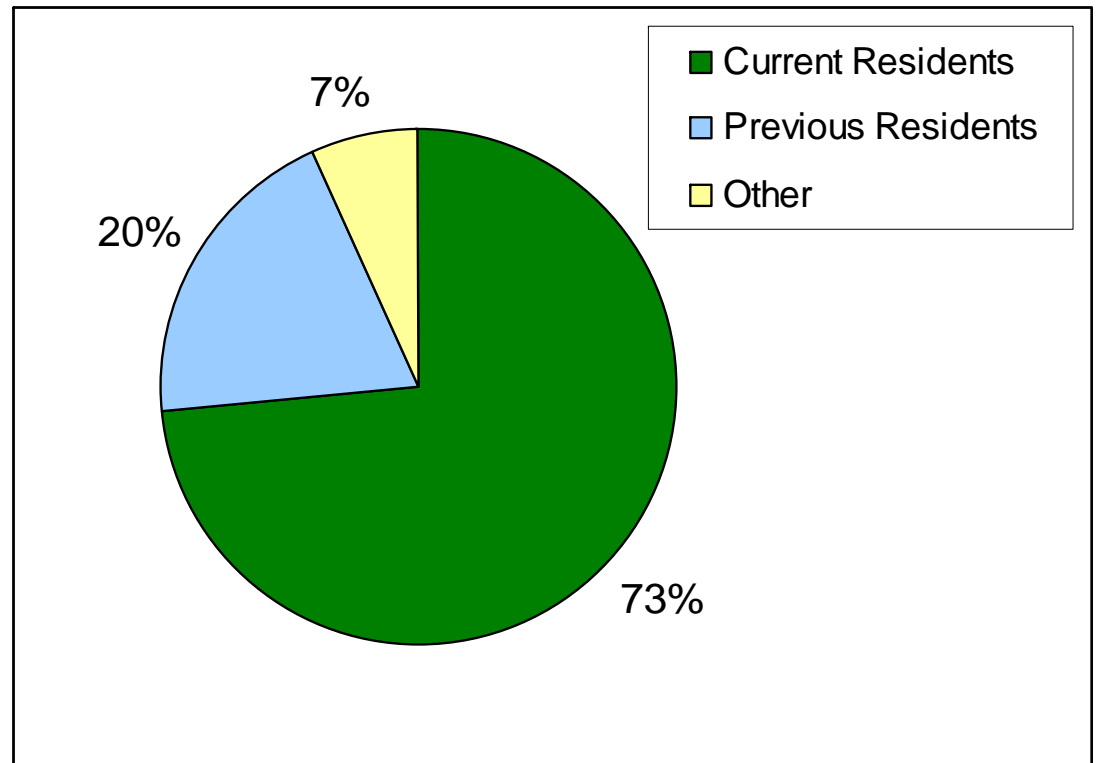
Serum PCB Testing - Methods



Serum PCB Testing - Results

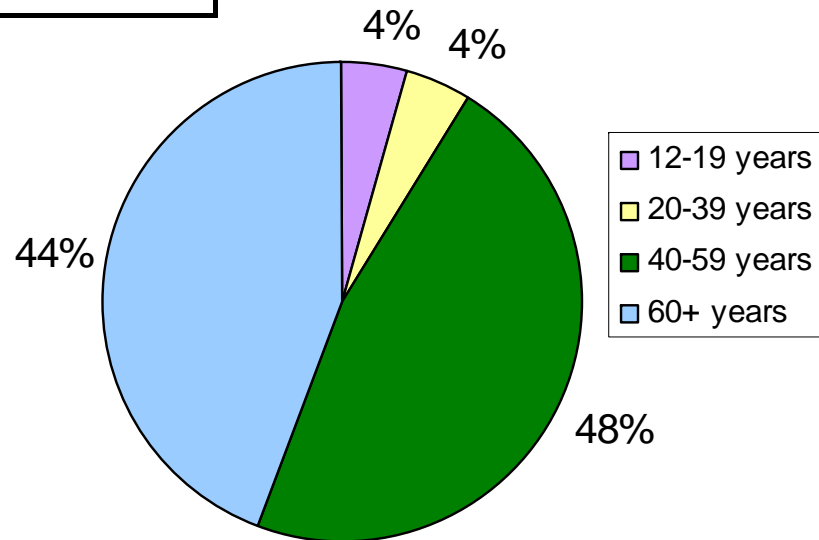
This report summarizes the results for 45 people

- 33 current residents
- 9 previous residents
- 3 other individuals who reported spending time at the PSWS, but did not live there

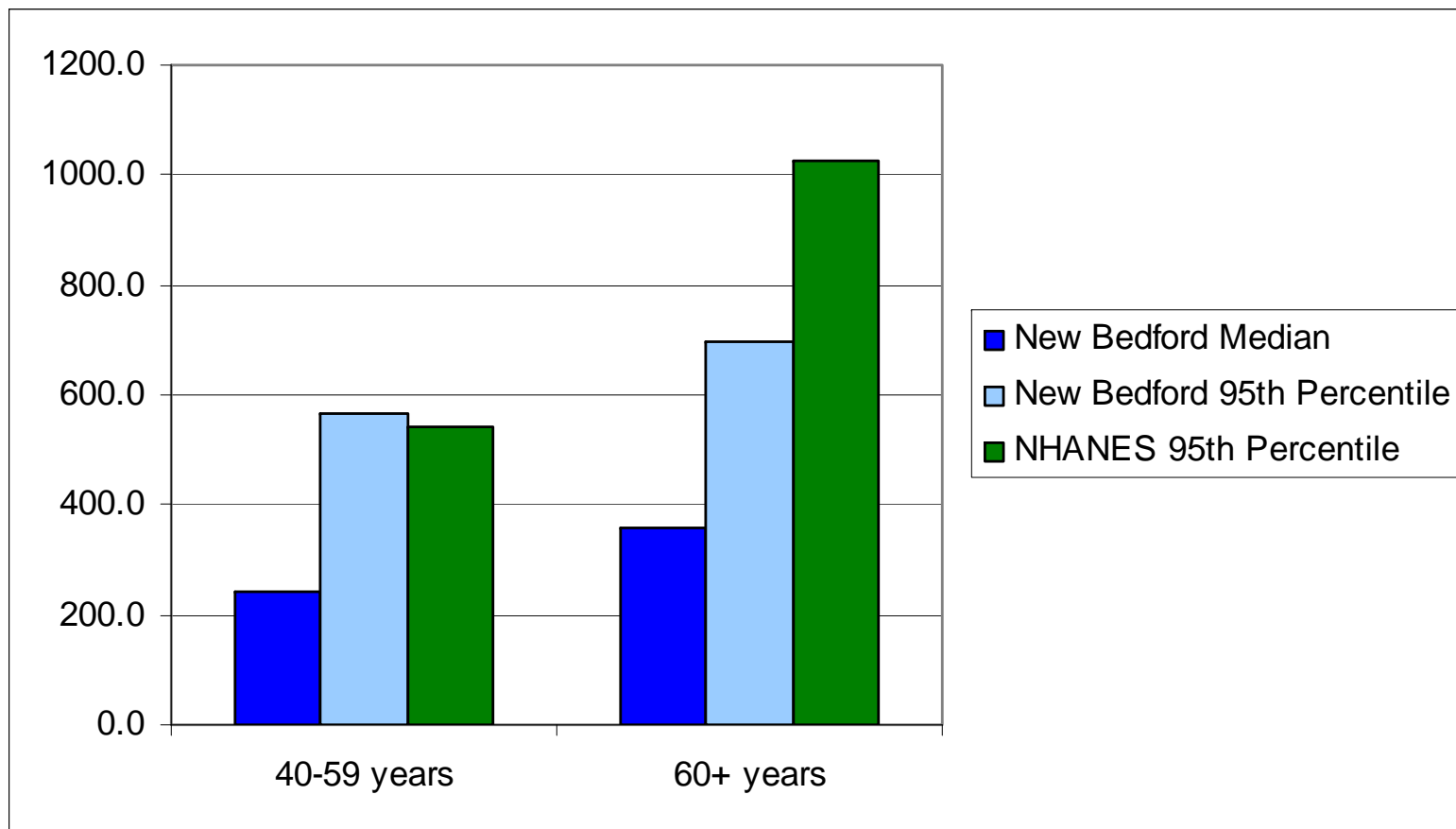


Results – Serum PCB Testing

NHANES Age Groups	Number of Participants
12-19 years	2
20-39 years	2
40-59 years	21
60+ years	20

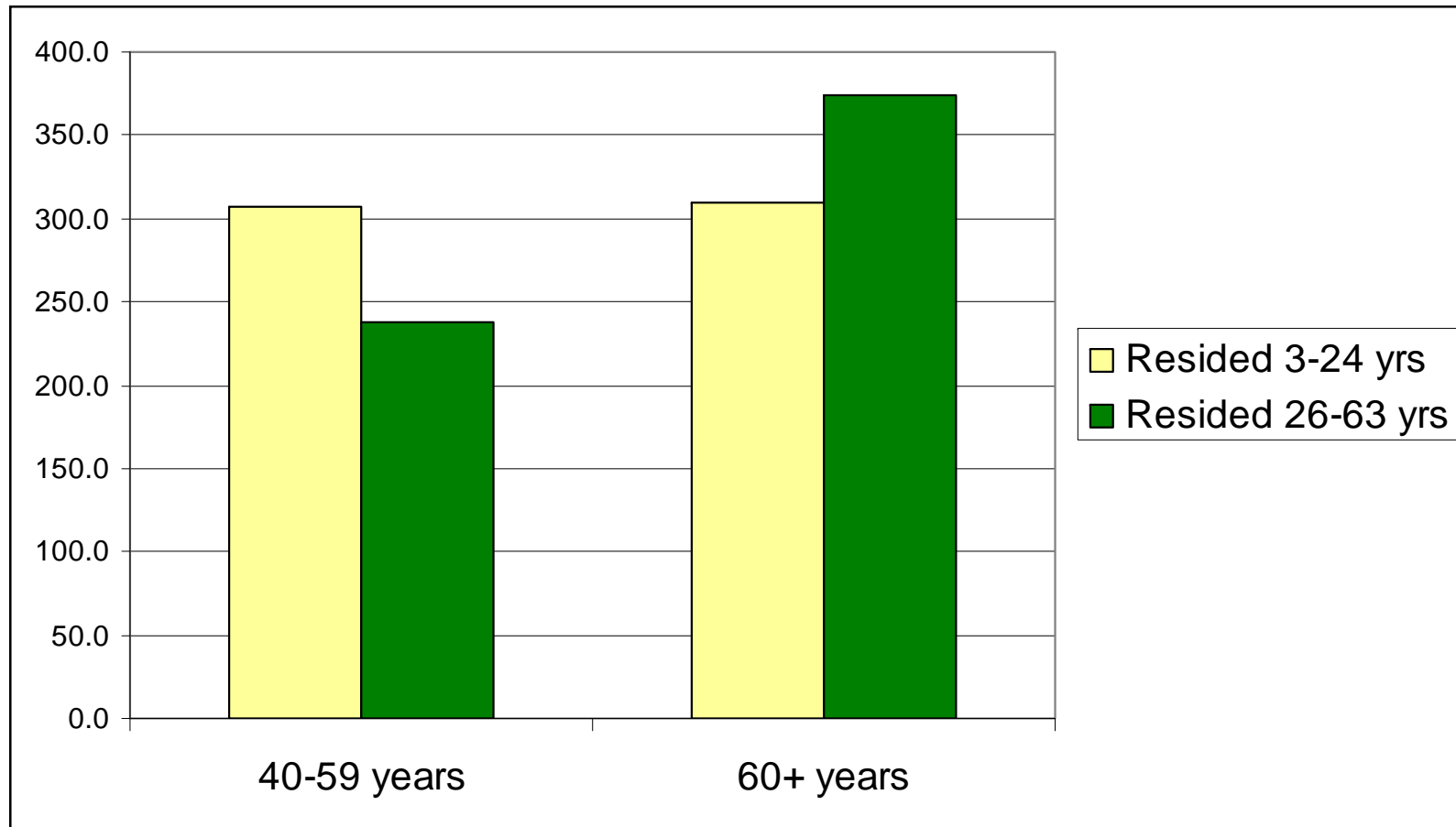


Results - Serum PCB Concentrations (Lipid-Adjusted in ppb)



Results – Serum PCB Testing

Geometric Mean Lipid-Adjusted Serum PCB Levels by Years Resided in the Five Census Tracts





Results – Serum PCB Level in Participants Diagnosed with Cancer

- 5 of the 45 participants reported a diagnosis of cancer since 1982
- Serum PCB concentrations for these individuals were within the range of levels measured in the NHANES 2003-2004 survey



*Evaluation of Cancer in Parker Street
Waste Site Neighborhood*



Massachusetts Cancer Registry (MCR)

- Massachusetts law requires reporting of all newly diagnosed primary cancers in MA residents
- Population-based surveillance system that began collection in 1982
- Confidential database

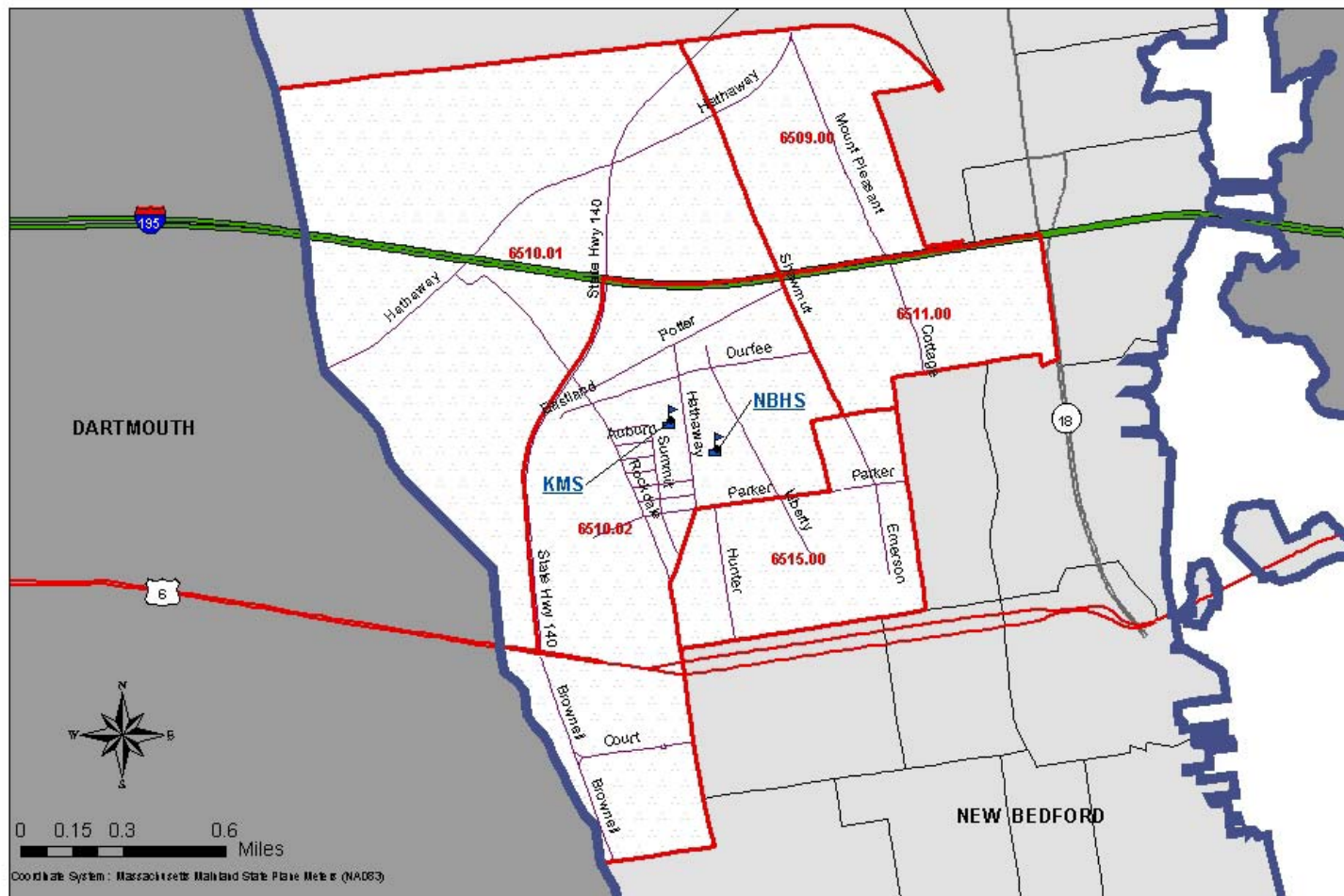


Methods – Cancer Evaluation

Evaluation of cancer data

- Calculate cancer rates for the five census tracts and for New Bedford as a whole
- Evaluate geographic patterns of cancer in New Bedford, particularly in relation to the PSWS
- Evaluate cancer patterns over time
- Evaluate available cancer risk factor information

Methods - Census Tracts Evaluated





Methods – Statistical Calculations

Standardized Incidence Ratio:

$$\text{SIR} = \frac{\text{Observed}}{\text{Expected}} \times 100$$

95% Confidence Interval



Methods - Cancer Types Evaluated

- Liver/Intrahepatic Bile Duct (IBD)

- Biliary tract
- Melanoma
- Non-Hodgkin Lymphoma
- Colon/rectal
- Breast

- Lung
- Gallbladder
- Bladder



Methods – Cancer Data Evaluated

- Cancer rates for 1982-2006 broken down into 5 shorter time periods to evaluate trends:
 - 1982 – 1986
 - 1987 – 1991
 - 1992 – 1996
 - 1997 – 2001
 - 2002 - 2006



Facts About Cancer

- ❑ Cancer is not one disease but a group of different diseases
- ❑ There are more than 100 types of cancer, each with different risk factors
- ❑ One or several factors acting over time can cause cancer



Facts About Cancer

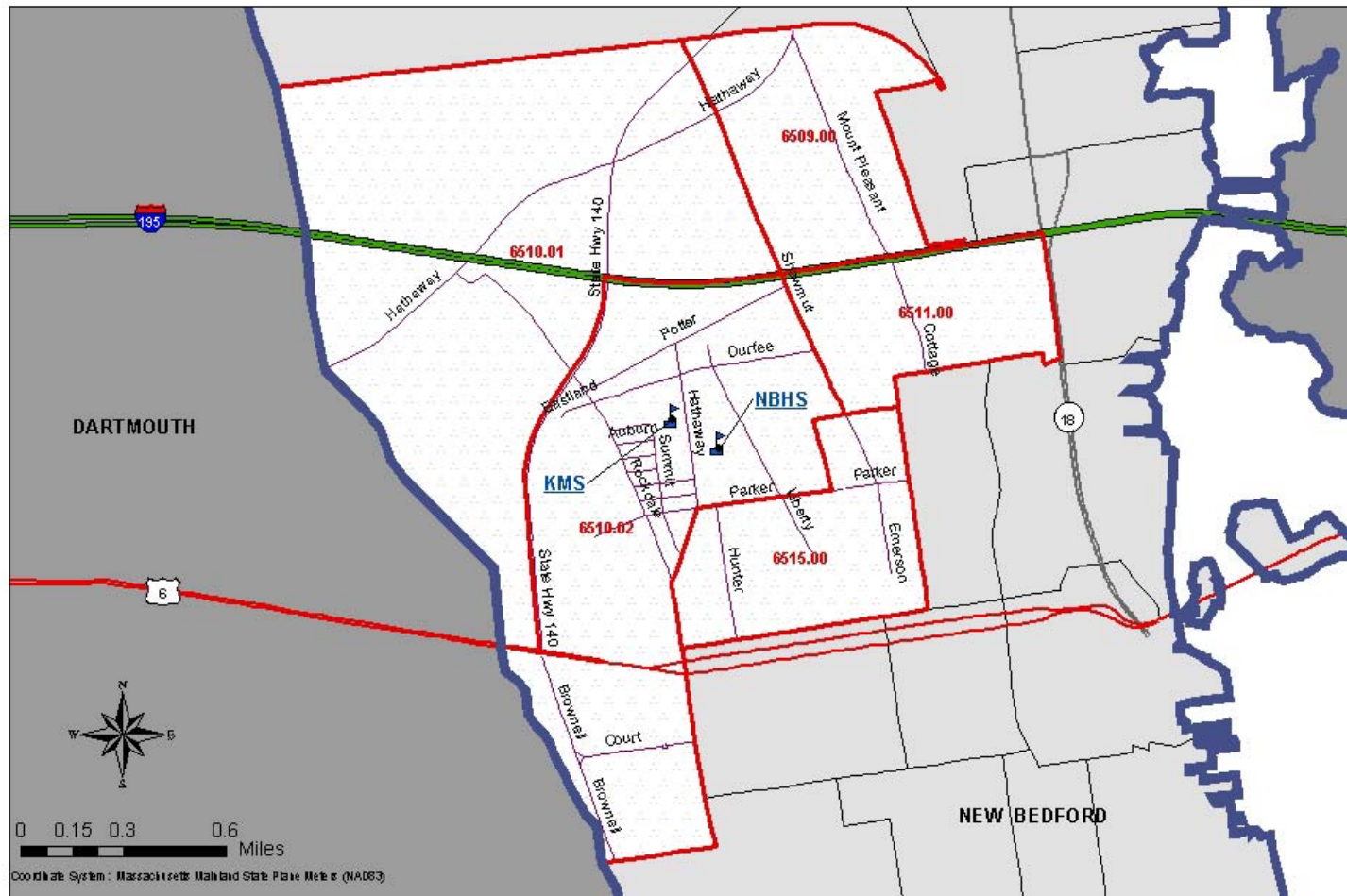
- American Cancer Society estimates
 - 1 out of every 2 men
 - 1 out of every 3 women
 - 3 out of every 4 families→ Will develop cancer in their lifetime
- Cancer has a long development period (can range from 15 to 40 years)



Purpose of Health Investigations

- Health investigations like this
 - **Cannot determine what caused any one person's cancer**
 - **Can be used to determine if further investigation and public health actions are needed**

Methods - Census Tracts Evaluated





Methods – Risk Factor Evaluation

- Residence/Environmental Factors
- Age
- Gender
- Smoking
- Occupation

- Other risk factors
 - Genetics, family history
 - Lifestyle factors (e.g., diet, alcohol)



Methods – Geographic Distribution Analysis

- Map locations of residences reported at time of cancer diagnosis
- Evaluate spatial patterns of cancer
 - within each community
 - in relation to PSWS
 - in relation to population density



Results – Cancer Evaluation

New Bedford – city-wide

- Four cancer types occurred less frequently than expected over all time periods
 - Breast, NHL, melanoma, and lung cancer in females
- Bladder cancer occurred as expected or less than expected over all time periods
- Rates for 4 cancer types showed more variability but no consistent trends
 - Colorectal, liver/IBD, gallbladder, and biliary tract
- Lung cancer in males occurred more often than expected in 4 of 5 time periods evaluated

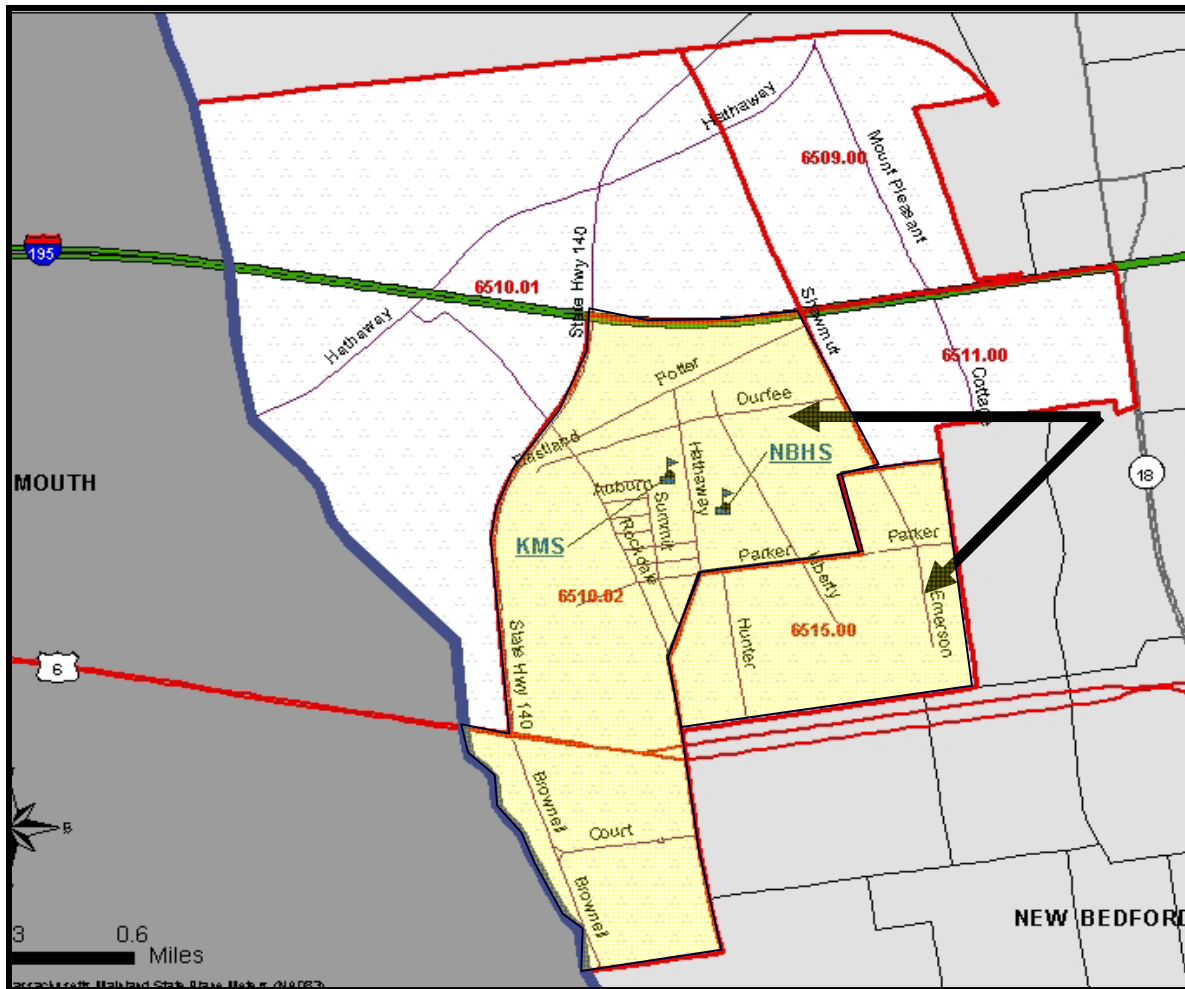


Results – Cancer Evaluation

New Bedford – city-wide

- Risk Factor Evaluation for Lung Cancer
 - Lung cancer sub-types were consistent with what would be expected
 - A higher percentage of New Bedford males were current or former smokers than U.S. males (97 % versus 87%)
 - Age at diagnosis was consistent with American Cancer Society statistics

Census Tracts 6510.02 and 6515





Major Findings - CTs 6510.02 and 6515

- Liver Cancer – over 25 years
 - CT 6510.02
 - 6 Observed versus 5 Expected
 - CT 6515
 - 4 Observed versus 3 Expected

Major Findings – CT 6510.02

- Majority of 9 cancer types occurred about as expected over 25-year period
- For 7 of 9 cancer types, incidence was lower than or about as expected

Cancer Type	Obs	Exp
liver	6	5
biliary tract	1	2
NHL	18	21
colo-rectal	71	84
melanoma	11	16
breast	81	91
gallbladder	2	2



Major Findings – CT 6510.02

- For bladder and lung cancers, small amount of variability but no persistent elevations
- No statistically significant elevations in any cancer types during 25 years evaluated

Major Findings – CT 6515

- With 2 exceptions, the incidence of cancer types evaluated was about as expected over the 25 years evaluated
- For 7 of 9 cancer types, incidence was lower than or about as expected over 25 years

Cancer type	Obs	Exp
liver	4	3
biliary tract	2	1
melanoma	3	11
breast	55	58
lung	46	52
bladder	9	13
gallbladder	2	1

Results – Cancer Evaluation

Colorectal Cancer – CT 6515

	Observed	Expected	SIR
1982-1986	10	11.7	86
1987-1991	14	11.0	128
1992-1996	10	9.3	108
1997-2001	10	8.7	114
2002-2006	15	8.1	184*

* = statistically significant



Results – Cancer Evaluation

Risk Factors for Colorectal Cancer

- ❑ More than 90% of individuals diagnosed are over the age of 50 and the average age at diagnosis is 72 years
- ❑ Family history
- ❑ Hereditary health conditions
- ❑ Personal medical history
- ❑ Other possible risk factors include diet and smoking
- ❑ Some evidence points to PCB exposures in the workplace as being associated with colorectal cancer



Results – Cancer Evaluation

Risk Factor Evaluation for Colorectal Cancer

For CT 6515:

Age – Average age at diagnosis was similar to national patterns

Geographic Distribution – Closely followed population density

Trend – Occurred at or near expected in 4 of 5 time periods.

Results – Cancer Evaluation

Non-Hodgkin Lymphoma – CT 6515

	Observed	Expected	SIR
1982-1986	0	2.1	NC
1987-1991	3	2.5	NC
1992-1996	1	2.8	NC
1997-2001	8	2.8	283*
2002-2006	2	3.1	NC

NC = not calculated

* = statistically significant



Results – Cancer Evaluation

Risk Factors for Non-Hodgkin Lymphoma

- Average age at diagnosis is in the 60s, and around half of patients are older than 65 at diagnosis
- Medical conditions involving a weakened immune system
- Prior treatment for cancer
- Certain viral infections
- Other possible risk factors include smoking, high-dose radiation exposure, exposure to some chemicals including benzene and certain herbicides and insecticides
- Some studies suggest an association between PCBs and certain more common sub-types of NHL



Results – Cancer Evaluation

Risk Factor Evaluation for Non-Hodgkin Lymphoma

For CT 6515:

Age – Average age at diagnosis was similar to what we'd expect

Subtype – Majority were the most common subtype, B-cell lymphomas

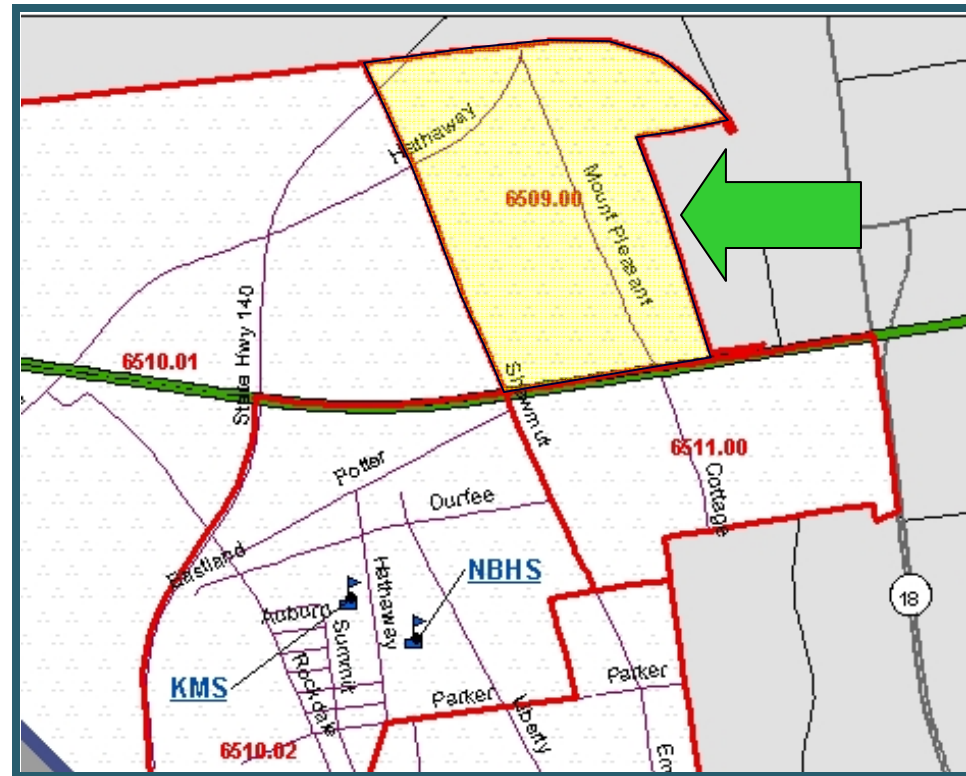
Geographic distribution – Closely followed population density

Trend – Occurred about as expected or less than expected during 4 of the 5 time periods

Results – Cancer Evaluation

Summary of Major Findings CT 6509

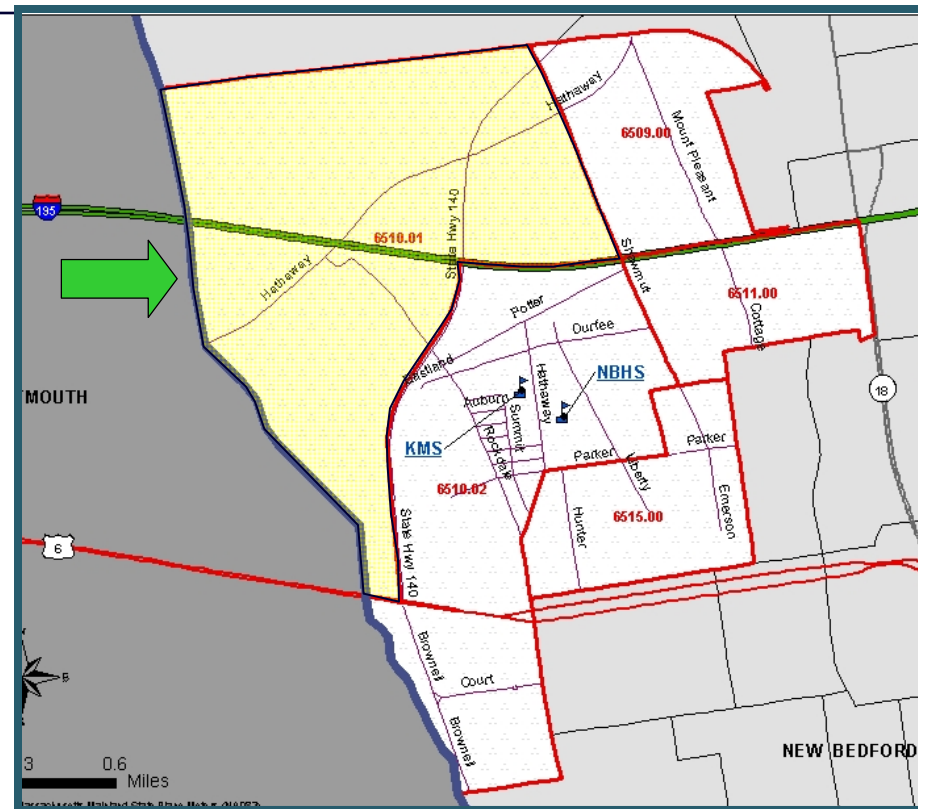
All cancer types occurred as expected



Results – Cancer Evaluation

Summary of Major Findings CT 6501.01

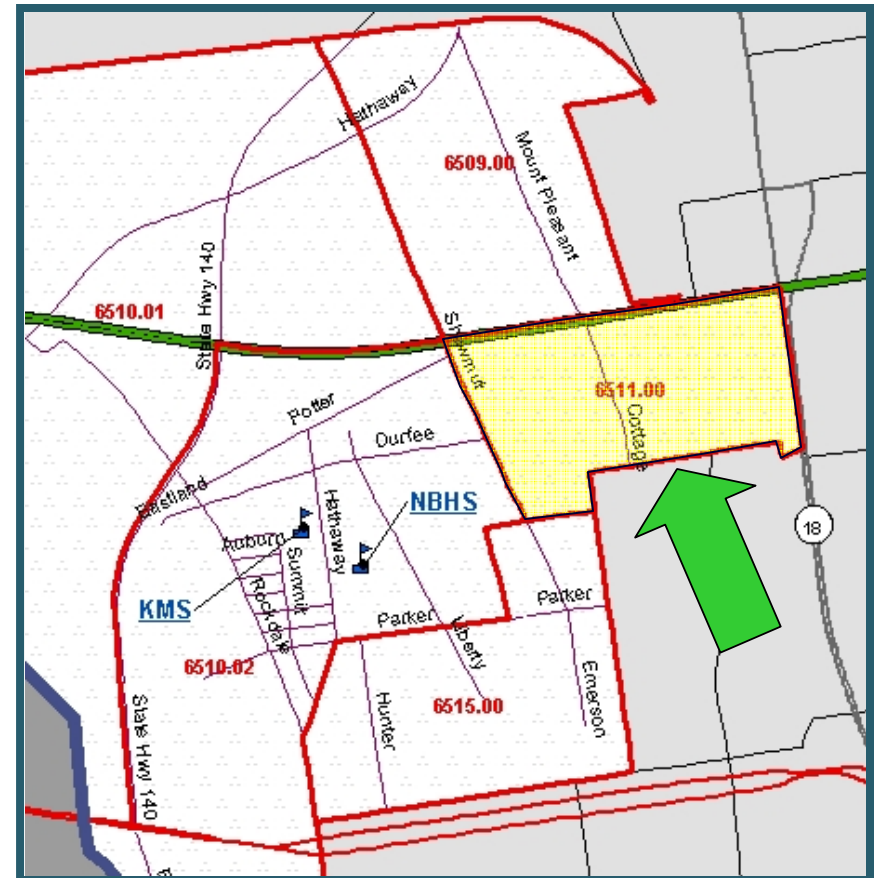
- 1982-1991: All cancer types occurred as expected
- Colorectal cancer elevated in middle time period (1992-1996)
- 1997-2001: Most cancer types occurred as expected
- 2002-2006: Slight elevations observed in biliary tract and lung and bronchus cancer incidence



Results – Cancer Evaluation

Summary of Major Findings CT 6511

- Colorectal cancer in females slightly elevated
- 8 out of 9 cancer types occurred as expected





Conclusions – Serum PCB Testing

- The majority of PSWS participants have serum PCB levels within the typical variation seen in the U.S. population
- No consistent pattern of increasing serum levels with years of residency



Conclusions – Cancer Evaluation

- City-wide elevations were observed in lung/bronchus cancer in males
 - Smoking likely to have played a role (97% were current/former smokers)
- For the two CTs that contain the PSWS, incidence of the cancer types most strongly associated with exposure to PCBs occurred approximately as expected compared to the state; no consistent trends in any cancer types
- For the other three CTs, the incidence of the majority of cancer types occurred as expected



Conclusions

Breast cancer staging

- Although breast cancer rates were lower than expected over the 25 year time period in New Bedford, we examined staging information
- Staging describes the extent of spread of an individual's cancer
- Higher percentage of New Bedford women being diagnosed with distant stage breast cancer compared to the state (7% vs 4%)
- May indicate a lack of access to early screening



Conclusions

- Even though the general pattern of cancer did not appear unusual and the majority of the serum PCB levels were within typical levels, it is still necessary that cleanup actions continue when regulatory standards are exceeded to protect public health.
- Meeting regulatory standards minimizes health risks to residents and protects future generations.



Recommendations

To address what may be inadequate early screening for breast and colo-rectal cancers in New Bedford, MDPH recommends that the New Bedford Health Department work with the MDPH Comprehensive Cancer Prevention and Control Program to increase awareness of the importance of early screening.



Questions and Answers



How to submit comments

Write to:

Massachusetts Department of Public Health
Bureau of Environmental Health
250 Washington Street, 7th floor
Boston, MA 02108