

# Updated Merrimack Cancer Analysis and Next Steps

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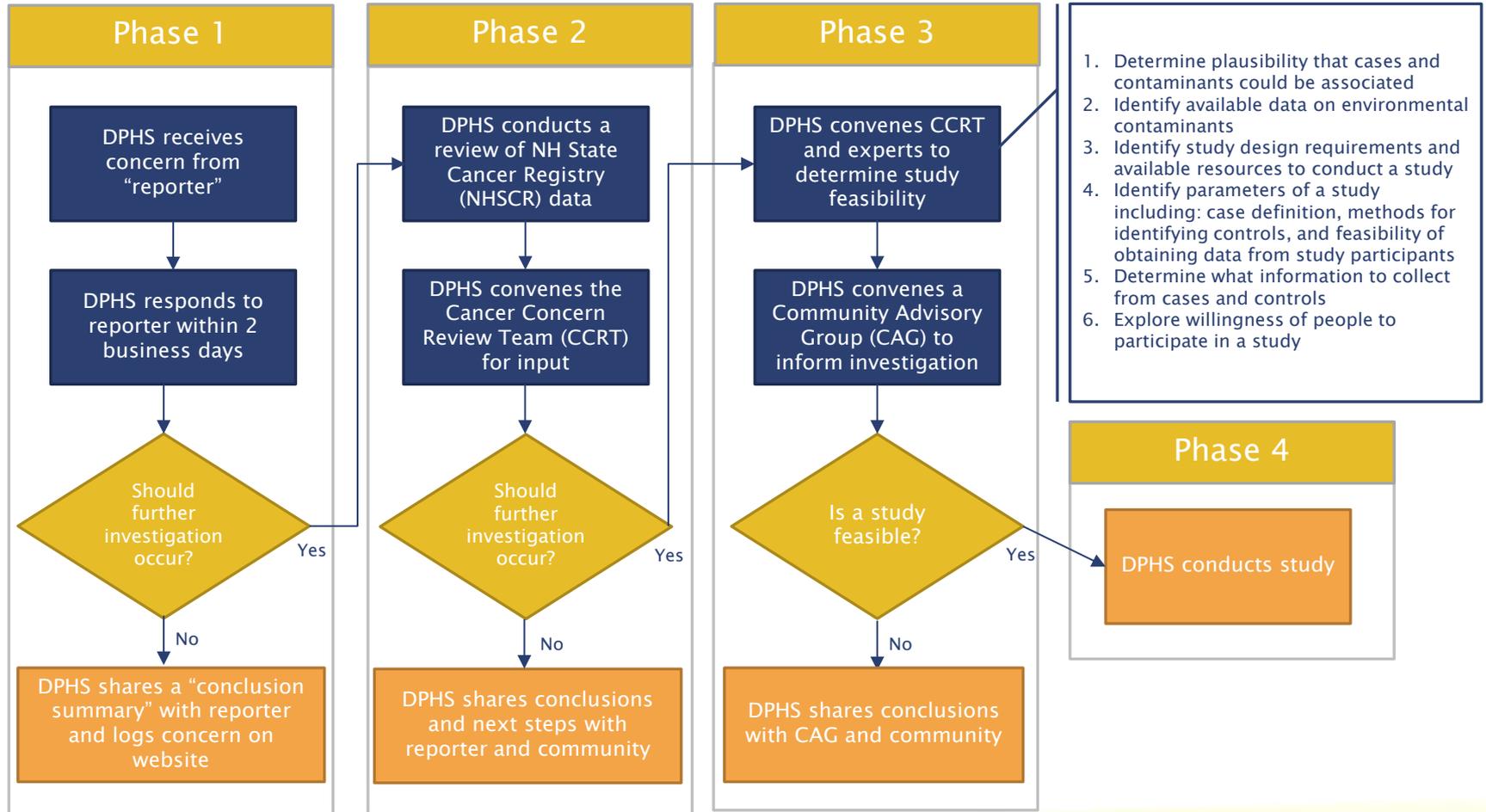
# Response to Cancer Concerns in Merrimack

- ▶ St Gobain plant has been operational since 1980 (~40 years ago)
- ▶ 2/2016- Low levels of PFOA were found in the water supplied by the Merrimack Village District
- ▶ 10/16 to 8/17 – DHHS conducts MVD Exposure Assessment (blood testing for PFCs)
- ▶ 1/18 – DHHS published a report on cancer in Merrimack ([here](#))
  - As a result of PFOA drinking water contamination surrounding the Saint-Gobain Plastics facility the DHHS received requests to look at cancer rates
  - At the time DHHS reviewed scientific literature related to the “cancer causing” nature of PFOA and found only some studies which showed an “association” not “causation”
  - Cancers associated with PFOA (Kidney SIR 1.25(0.93-1.64) , Prostate SIR 1.15 (0.99-1.32), Testicular SIR 0.91(0.39-1.78)) were not found to be higher in Merrimack using 2005-2014 NHSCR data.
  - DHHS committed to continuing to monitor cancer rates and re-running SIR calculations in 1-2 years
- ▶ 6/19 - HB737 Established a commission to investigate and analyze impacts of PFAS in air, soil and groundwater in Merrimack, Bedford, and Litchfield through 11/24
  - Commission members request update on cancer data

# NH Cancer Concern Review Protocol

- ▶ NH Protocol Available ([here](#))
- ▶ Guided by CDC Guidelines ([here](#)) from 2013 due for updates in 2022
  - CDC defines a cancer cluster as a:
    - 1) greater than expected number of cases;
    - 2) that occurs within a group of people;
    - 3) in a geographic area;
    - 4) over a defined period of time.
- ▶ Involves a 4-phase process for “evaluating suspected clusters”

# State of New Hampshire Cancer Concern Investigation Protocol



# What IS an SIR?

- ▶ It provides NHDHHS with a “signal”
- ▶ Standardized Incidence Ratio (SIR)
  - Calculated to provide an estimate of the likelihood that an excess of cases exists in the population of concern
  - Since cancer rates vary by age the SIR calculates “age-specific” rates which takes into account the actual age distribution of a population
- ▶ The SIR is the recommended measure for comparison of cancer in small areas with small numbers of cases rather than comparison of age-adjusted rates

# What ISN'T an SIR?

- ▶ Proof of correlation or causation
- ▶ An indication of a cluster of cancers caused by an environmental exposure
- ▶ The end of an investigation



# Interpreting the SIR

- ▶ An SIR of 1.00 means that observed cases are the same as expected, while an SIR of 1.20 means that observed cases are 1.20 times expected
  - SIR of 1.20 also means that observed cases are 20% greater than expected
- ▶ The SIR is accompanied by a confidence interval to assess statistical significance. If the SIR does not cover the base value of 1, then it is significant
  - e.g. An interval of (1.10, 1.30) indicates significance, while an interval of (0.90, 1.50) does not

# Considerations in computing and interpreting SIR

- ▶ Factors to consider in computing SIRs include
  - Types of cancer
  - Choice of reference population (e.g., cancer incidence in the larger reference population)
  - Time period of concern
  - Geographic area of concern
  - Demographic characteristics of cases in reference population
- ▶ Like any statistical procedure, SIR is not foolproof
  - Analogously to disease testing, false positive and false negatives can occur
  - Specificity of a test is related to “Type I error” in statistics
  - Sensitivity of a test is related to “Type II error”
  - The more statistical tests or intervals you compute, the greater the chance that some significant results will be due merely to chance

## Standardized Incidence Ratios (SIRs) for cancer in Merrimack, NH 2009-2018

| Cancer Type <sup>1</sup>              | Observed  | Expected <sup>2</sup> | SIR         | Lower Confidence Interval <sup>5</sup> | Upper Confidence Interval |
|---------------------------------------|-----------|-----------------------|-------------|--|---------------------------|
| Brain and Other Nervous System        | 20        | 21.1                  | 0.95        | 0.58                                   | 1.47                      |
| Colon and Rectum                      | 122       | 101.8                 | 1.20        | 1.00                                   | 1.43                      |
| Esophagus                             | 19        | 19.8                  | 0.96        | 0.58                                   | 1.50                      |
| Gall Bladder <sup>4</sup>             |           |                       |             |  |                           |
| Hodgkin Lymphoma                      | 7         | 7.7                   | 0.91        | 0.37                                   | 1.88                      |
| Kaposi Sarcoma <sup>4</sup>           |           |                       |             |  |                           |
| <b>Kidney and Renal Pelvis</b>        | <b>66</b> | <b>46.5</b>           | <b>1.42</b> | <b>1.10</b>                            | <b>1.81</b>               |
| Larynx                                | 8         | 10.0                  | 0.80        | 0.35                                   | 1.58                      |
| Leukemia                              | 39        | 37.9                  | 1.03        | 0.73                                   | 1.41                      |
| Liver and Intrahepatic Bile Duct      | 16        | 18.5                  | 0.86        | 0.49                                   | 1.40                      |
| Lung and Bronchus <sup>3</sup>        | 167       | 181.0                 | 0.92        | 0.79                                   | 1.07                      |
| Melanoma of Skin                      | 77        | 83.5                  | 0.92        | 0.73                                   | 1.15                      |
| Mesothelioma <sup>4</sup>             |           |                       |             |  |                           |
| Myeloma                               | 22        | 16.9                  | 1.30        | 0.82                                   | 1.97                      |
| Non-Hodgkin Lymphoma                  | 73        | 59.0                  | 1.24        | 0.97                                   | 1.56                      |
| Oral Cavity and Pharynx               | 35        | 37.3                  | 0.94        | 0.65                                   | 1.30                      |
| Pancreas                              | 30        | 34.4                  | 0.87        | 0.59                                   | 1.24                      |
| Stomach                               | 11        | 15.5                  | 0.71        | 0.35                                   | 1.27                      |
| Thyroid                               | 44        | 42.9                  | 1.03        | 0.75                                   | 1.38                      |
| Urinary Bladder, invasive and in situ | 91        | 74.8                  | 1.22        | 0.98                                   | 1.49                      |
| Prostate <sup>3</sup>                 | 207       | 185.0                 | 1.12        | 0.97                                   | 1.28                      |
| Testis                                | 10        | 8.6                   | 1.16        | 0.55                                   | 2.13                      |
| Breast (Female)                       | 231       | 221.7                 | 1.04        | 0.91                                   | 1.19                      |
| Cervix Uteri                          | 7         | 6.9                   | 1.02        | 0.41                                   | 2.09                      |
| Ovary                                 | 17        | 16.8                  | 1.01        | 0.59                                   | 1.62                      |
| Uterus                                | 55        | 53.3                  | 1.03        | 0.78                                   | 1.34                      |
| Other                                 | 118       | 113.4                 | 1.04        | 0.86                                   | 1.25                      |

**Table Notes:**

1. Cancer types are listed in the order of their assigned diagnostic codes in the International Classification of Disease for Oncology, 3rd Edition.
2. The expected number is calculated by multiplying each age-specific cancer incidence rate of the reference population by each age-specific population of the community in question and then adding up the results.
3. Cancer cases are likely higher than reflected for all of New Hampshire due to a delay in receiving cancer data from the Veterans Administration. Based on previous analysis we think Lung and Bronchus and Prostate cancer types are impacted by these missing data.
4. Data are suppressed for all cancer types where the observed number of cases was less than 5.
5. For an SIR to be considered statistically significant the lower confidence interval must be above 1.0

# Next Steps in Phase 2

- ▶ Additional data analysis?
  - Appropriate geographic area (e.g., additional towns, census tracts with known exposure)
  - Power analysis
  - Mapping the cluster and contaminants of concern
  - Descriptive and spatial statistical epidemiologic methods
- ▶ Identify community concerns and identify local environmental factors
- ▶ Communicate with the community
  - Share the results of SIR calculations, process, and next steps

# Next Steps in Phase 2

- ▶ DHHS established the CCRT in an effort to respond to community concerns about cancer using the full range of expertise that is advised be involved in the CDC Guidelines. Including:
  - Cancer epidemiology
  - Environmental epidemiology
  - Risk communication
  - Cancer prevention
  - Guidelines on cancer cluster investigations
  - Familiarity with the geographic area and environmental concerns of the community
- ▶ The CCRT can help:
  - To avoid over-reliance on cancer calculations
  - To guide a more coordinated approach that is responsive to an array of concerns in the community (e.g., cancer prevention, environmental response, etc.)
  - To provide expertise in around each phase of the cancer cluster response process

# Next Steps Phase 2

- ▶ Decision to close the investigation or continue to Phase 3
  - Are there enough cases and a large enough population for statistical stability (numerator and denominator)?
  - Are there environmental contaminants that could be related to these cases?
  - Are there population-related issues that might explain excess not controlled for with SIR? (smoking, TCE exposure, etc.)
  - Has there been an increase in the incidence of the cancer overtime?
  - What is the number of excess cases? (n=13)
  - Are the demographics of these cases unusual? (age, gender)
- ▶ “A statistically significant SIR of great magnitude and an increasing trend in incidence rate, together with a known environmental contaminant would argue for continuing to Step 3”

# Next Steps Phase 3

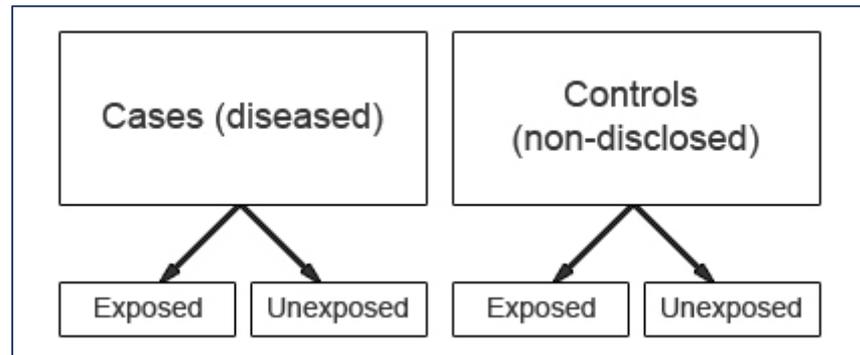
## ▶ Phase 3 Procedures

- Determine study hypothesis and review scientific literature
  - Learn what the community wants and needs and feasibility of addressing them (Community Panel)
  - Consider study design issues (Establish an Expert Panel)
- Determine study parameters
  - Case definition
  - Comparison group
  - Explore willingness of people to participate
- Consider plausibility that cases and contaminants could be associated
  - Known carcinogen, routes of exposure, sufficient doses, duration of exposure, historical records on exposures exist, residential history exists
- Identify available data on environmental contaminant of concern
- Identify study design requirements AND available resources to conduct the study

# Next Steps Phase 4

## ▶ Case-Control Study

- Compares prevalence of an exposure between cases and controls



# In summary...

- ▶ Initial analysis found a signal in Merrimack for kidney and renal cancer
- ▶ DHHS will work to better understand this signal
- ▶ This signal DOES NOT tell us anything about a common exposure
- ▶ More work is needed to better understand this signal
- ▶ This is a priority for DHHS

# Thank You!

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