



# Cancer and the Environment: What Do We Know?

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# Objectives

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- Following this presentation, attendees should be able to:
  - Describe the most common sources of data on environmental carcinogens
  - Characterize two of the most important environmental carcinogens encountered in Wisconsin
  - List features of cancer clusters as environmental public health problems



# Cancer and the Environment

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- Estimates for fraction of cancer cases attributable to the environment varies
- More common for some types and sites than others (mesothelioma vs. cervical)
- As for other causal factors, generally difficult to identify an environmental causal agent for a particular case



# Carcinogens

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- Substances or energy forms (such as radiation) that are agents directly involved in the promotion of cancer or increase its propagation
- Two general classes:
  - tumor initiators
  - tumor promoters



# Routes of Exposure

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- Inhalation
  - asbestos, tobacco smoke, radon
- Ingestion
  - arsenic in water, PCBs in sport fish
- Skin Absorption
  - ultraviolet radiation



# Sources of Data

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- How do we know what chemicals might cause cancer?
  - Cellular and mechanistic studies
  - Animal studies
  - Occupational epidemiology
  - Environmental epidemiology



# Cellular and Mechanistic Studies

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- Provide data to support or refute theories about chemical carcinogenesis
  - Ames test
- May help determine which chemicals are worthy of further study
- Not a solid basis for definitively identifying carcinogens

# Animal Studies

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- Provide a more solid basis for identifying carcinogens
- Most conclusive: data in multiple species and long-term exposure (2-yr studies)
- Some human carcinogens lack a suitable animal model



# Occupational Epidemiology

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- Experience of exposed workers can identify human carcinogens of environmental concern
- “Healthy Worker” effect can be observed
- Primary route of exposure may be different than for environmental exposure



# Environmental Epidemiology

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- Studies of human environmental exposure provide the most definitive evidence
- Difficult to conduct
  - Exposures tend to be relatively low and hard to measure
  - May be significant lag between exposure and disease
  - Broad range of confounders (smoking, diet, genetics, occupation)



# Environmental Carcinogens

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- Which ones are likely responsible for the greatest morbidity and mortality in Wisconsin?
- How is the public health system responding to eliminate or reduce exposure?



# Radon

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- Naturally occurring radioactive gas
- Tasteless, odorless, colorless
- Results from the natural breakdown of uranium in the soil
- Elevated levels found in every state
- Important indoor air issue in Wisconsin

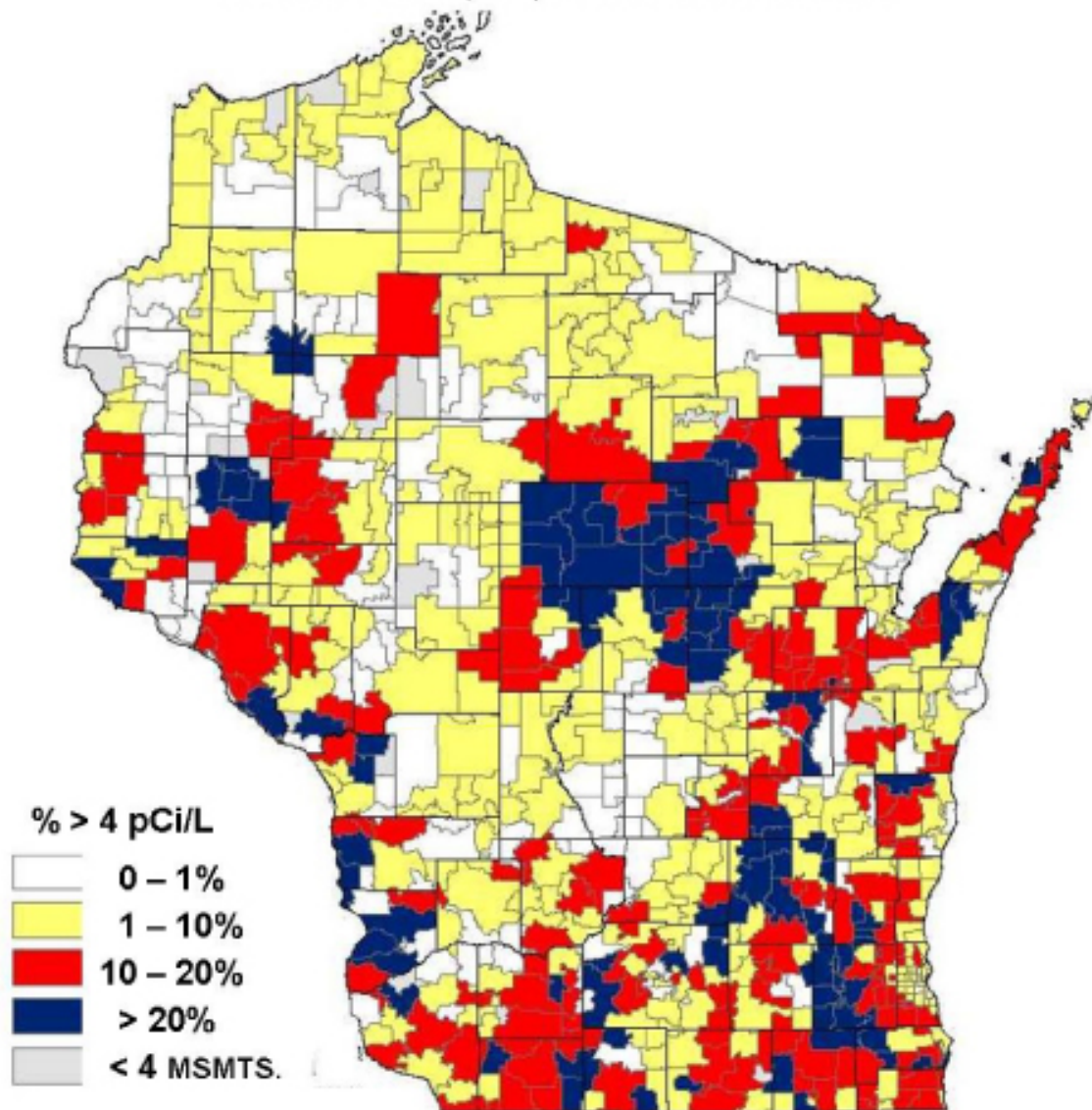
# Radon

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- Inhaled alpha particles act directly on DNA
- Primary health concern: lung cancer
  - Second leading cause of lung cancer
  - 30% of lung cancer in non-smokers
  - Synergistic effect with tobacco smoke
- Early data came from miners cohort
  - Higher exposure and lung cancer rates



# ESTIMATED PERCENTAGES OF HOMES WITH RADON > 4 pCi/L, MAIN FLOOR YEAR AVERAGE BY ZIP CODES; 87,000 MEASUREMENTS





# Radon

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- Interventions
  - Testing
  - Sub-slab depressurization
  - Radon-resistant construction
- 16 Regional Radon Info Centers
- (888) LOW-RADON

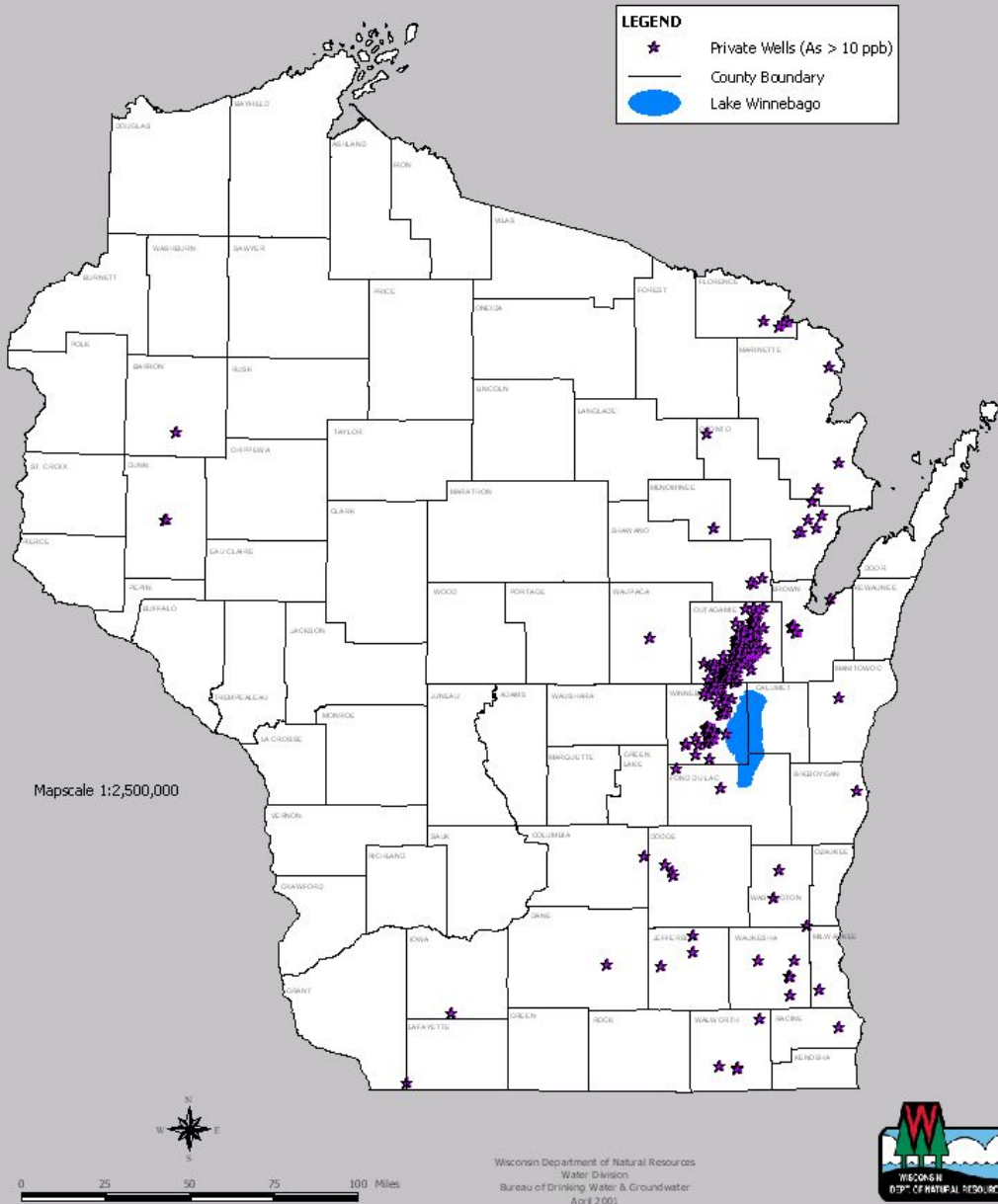


# Arsenic in Groundwater

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- Natural element found in soil and bedrock
- Common groundwater contaminant
- Confirmed human carcinogen
  - Lung, skin and bladder cancer
  - Some dermatological effects seen
- Risk assessments based on human data from Bangladesh and elsewhere

# Private Drinking Water Wells with Arsenic Detects > 10 ppb



- EPA Maximum Contaminant Level = 10 ppb
- Most exceedances in Winnebago, Outagamie and Brown Counties
- With increased sampling, high levels are being found elsewhere



# Arsenic in Groundwater

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## ○ Interventions

- Town-based private well testing campaigns
- Testing as a pre-condition of real estate transfer is increasingly required
- Stringent well construction requirements in 'arsenic advisory area'
- Expansion of public water supplies



# 'Cancer Clusters'

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- Investigation of clusters is a common health agency request
- Confirmation of case information is critical
- Exposure information is usually lacking
- Often emotionally-charged and high level of media interest

# 'Cancer Clusters'

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- Limits on ability to respond:
  - Small numbers of cases
  - No exposure data
  - Limited geographical resolution
  - Need to protect confidentiality
- Agency responses are often poorly-received
- DHS fact sheet can be useful
  - Search for 'cancer cluster' at [dhs.wisconsin.gov](https://dhs.wisconsin.gov)



# Summary

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- Broad range of data sources help inform our knowledge of cancer and the environment
- Many interventions exist for some of our most common carcinogenic exposures
- Insights of broader cancer care community are valuable to identify environmental cancer risks