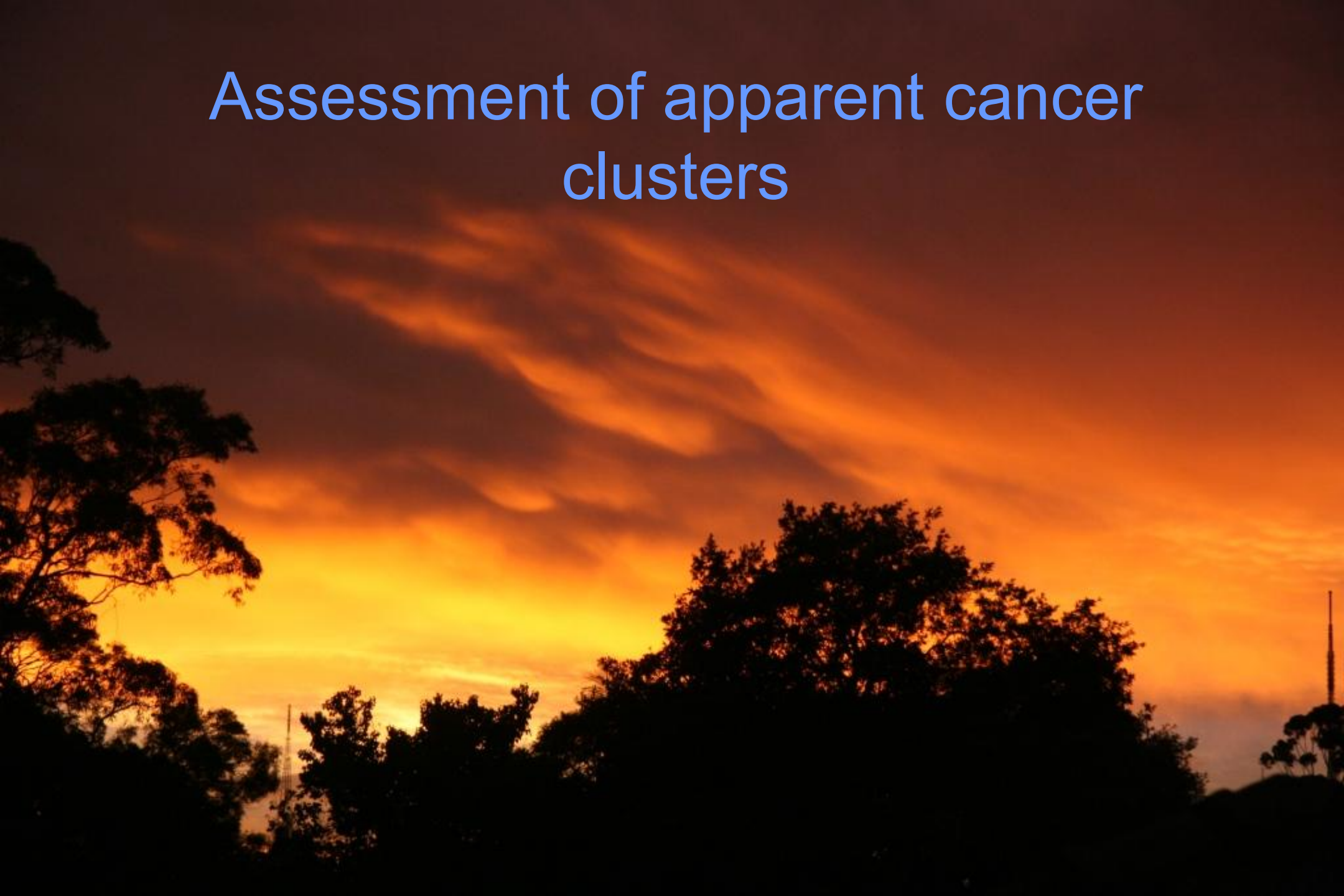
# Assessment of apparent cancer clusters



# Aims

Provide an overview of cancer clusters

Consider aspects of investigating cancer clusters

- issues

- approaches

- examples

# Learning outcomes

Gain a greater understanding of the important principles to keep in mind when considering the investigation of a reported cancer cluster.

Gain a greater understanding of approaches to use when investigating a reported cancer cluster.

# Question 1

- Where are you from?

# A few concepts

# What is a cancer cluster?

- Various definitions

"An unusually high number or rate of cancer"

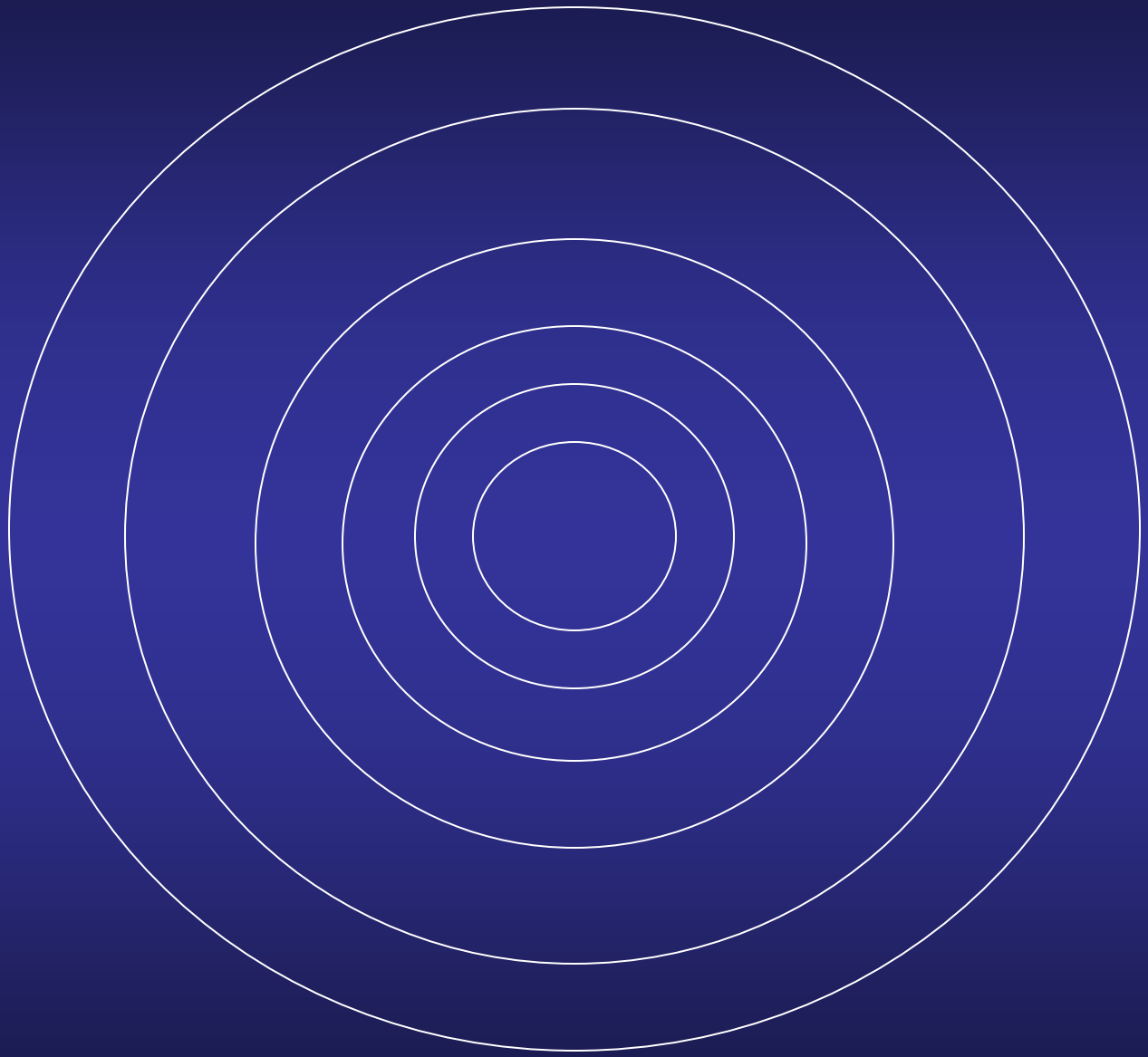
- Usually describes one type of cancer, but may be all cancers

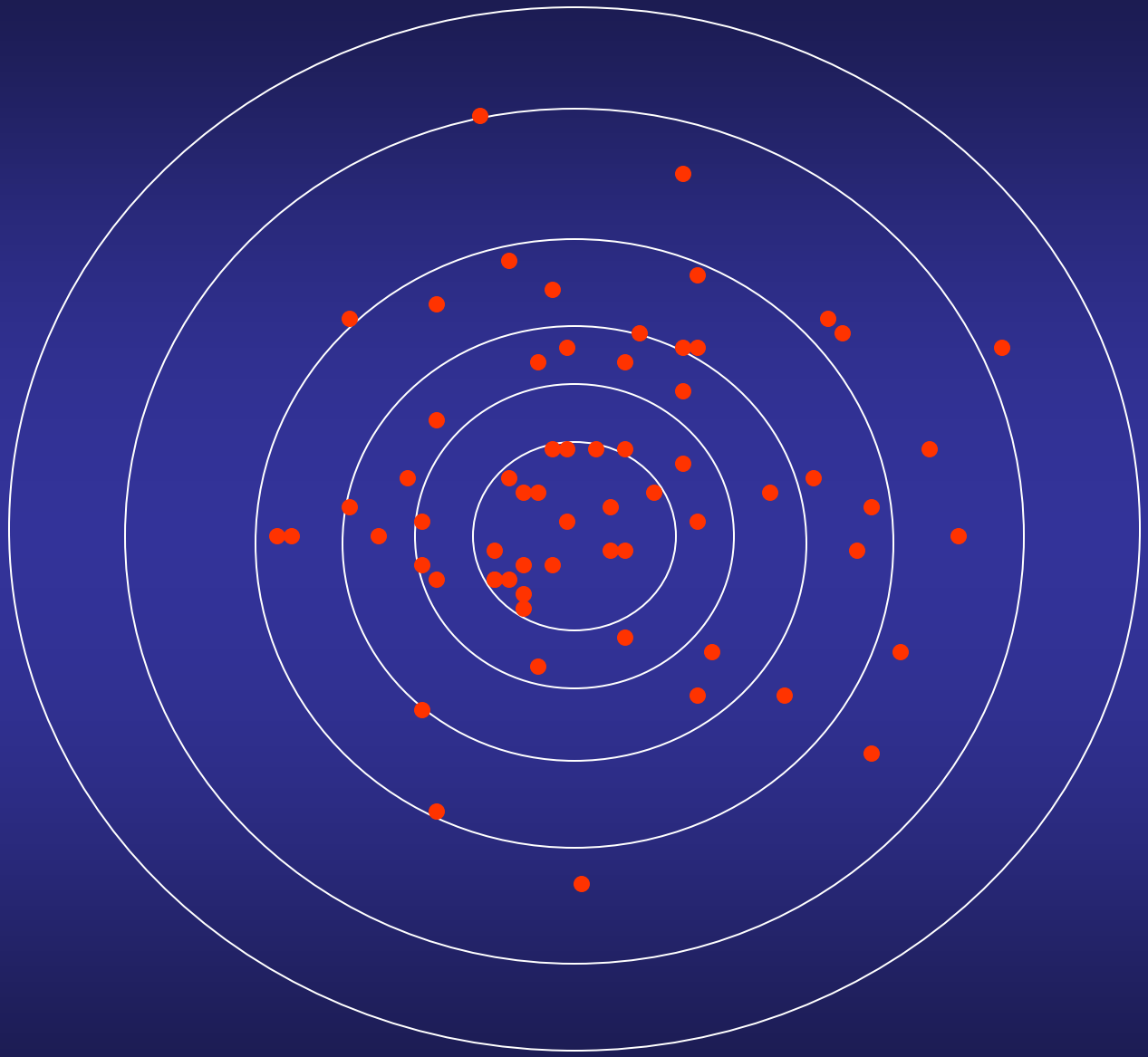
# A few concepts about cancer

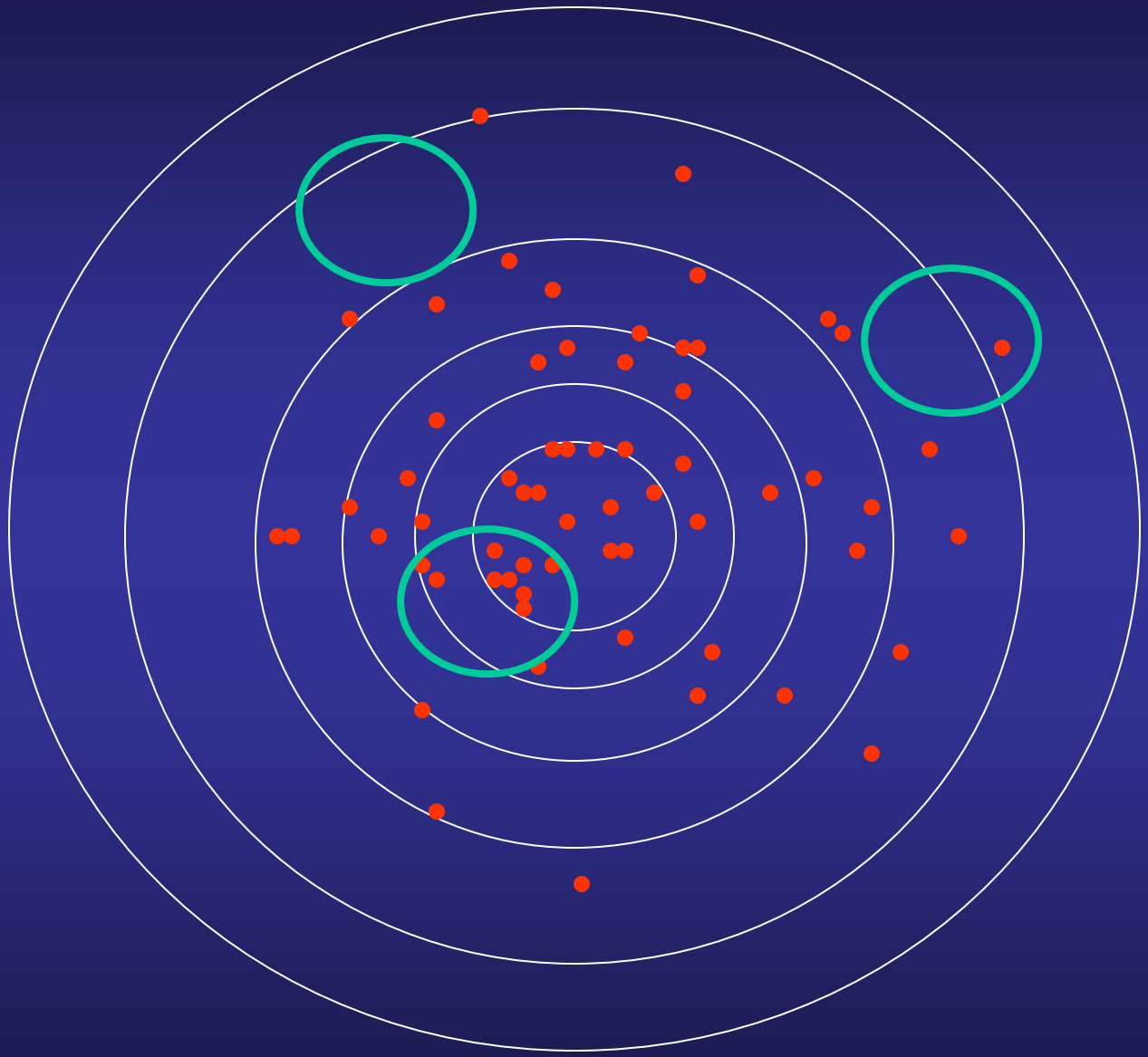
- Common disease
- Usually more common with age
- Long latency
- Usually has one or more known risk factors
- Has a random component
  - differences in rates often due to chance

# Why is it so hard??

- Most cancers can be caused by more than one type of exposure
- The same exposure can occur in different settings
- Long latency obscures the connection to exposure
- Usually no way to determine the cause in an individual case







# Question 2

- Experience with cluster investigation

# Should clusters be investigated?

- "*To summarise, I would recommend that we spend less time reacting to reports of disease clustering, less time trying to detect general patterns of disease clustering, and less time developing new methods to conduct these activities.*"

  Ken Rothman, 1990 *AJE 1990;132(Suppl 1):S6-S13*

- "*It is fair to state that extensive efforts to find causes of community cancer clusters have not been successful. There are fundamental shortcomings to our current methods of investigating community cancer clusters.*"

  Goodman et al, 2012 *Critical Reviews in Toxicology2012;42(6):474–490*

# Why bother?


Darwin
Cairns
Townsville
Brisbane
Gold Coast
Perth
Newcastle
Wollongong
Adelaide
Canberra
Albury
Bendigo
Ballarat
Melbourne
Hobart
500 km
300 mi
© d-maps.com

# Cancer types involved

| | |
|---|---|
| • Breast | 5 |
| • Brain | 1 |
| • Bladder | 1 |
| • Colon | 1 |
| • Kidney | 1 |
| • Myeloma | 1 |
| • Multiple | 8 |

# Settings involved

| | |
|---|---|
| • Office setting | 4 |
| • University | 2 |
| • Industry | 2 |
| • Public service | 2 |
| • Research institute | 2 |
| • Residential care | 2 |
| • Fire station | 2 |
| • Art Gallery | 1 |
| • School | 1 |

# When do concerns arise?

# When do concerns arise?

- Concerning exposures
- Unusual cancer type
- Young people
- Not giving initial concerns appropriate consideration
- Industrial relations or community issues

# When should concerns about cancer clusters be raised?

- Number of cases?
- Type of cancer?
- Ages of affected persons?
- Type of exposures?
- Never?

# When should concerns about cancer clusters be raised?

- Number of cases?.....Usually need more than just a few
- Type of cancer?
- Ages of affected persons?
- Type of exposures?

# When should concerns about cancer clusters be raised?

- Number of cases?.....Usually need more than just a few
- Type of cancer?.....Rare or unusual cancers; same type
- Ages of affected persons?
- Type of exposures?

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- Number of cases?.....Usually need more than just a few
- Type of cancer?.....Rare or unusual cancers; same type
- Ages of affected persons?.....Young people
- Type of exposures?

# When should concerns about cancer clusters be raised?

- Number of cases?.....Usually need more than just a few
- Type of cancer?.....Rare or unusual cancers; same type
- Ages of affected persons?.....Young people
- Type of exposures?.....Known carcinogens; known connection to identified cancers

# Challenges

# Challenges

- Lack of information about exposure
- Uncertainty about case definition
- Incomplete case identification
- Uncertainty about population at risk

# Challenges

- Interpretation of statistical tests
- Public perception that there must be a problem
- Context
- Other agendas
- Ethics restrictions / requirements

# Response

# Response

- Prompt response
- Explain the challenges
- Emphasis on exposures and case characteristics rather than (just) on rates
- Involve all interested parties (reference group)
- Regular feedback

# Driscoll's four principles for investigating cancer clusters

# Important principle 1

- Cancer cluster investigations are socio-scientific phenomena

- "Good science" is not enough

- Good science AND good communication and consultation is required

# Important principle 2

- If no concerning exposures are found but there is a high rate.....

  …….. it is almost certain that the high rate was due to chance (or to multiple unrelated causal factors)

- If still concerned, need to study another workplace/community with a similar exposure

# Important principle 3

- If rate is not high but concerning exposures are found.....

……Fix the exposures!

# Important principle 4

- When concerns about a cancer cluster arise, the cancers nearly always turn out not to be (or almost certainly not to be) related to ‘clustered’ work (or community) exposures

BUT....it is important to still ‘investigate’ properly


Two stage approach

# Two stage approach

Stage 1: review of past and current exposures

Stage 2: epidemiological analysis of cancer cases

Stage 1 and Stage 2 usually overlap

Good communication throughout

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Stage 1: review of past and current exposures

Stage 2: epidemiological analysis of cancer cases

Stage 1 and Stage 2 usually overlap

Good communication throughout

# The key aspects

# The key aspects

- Focus on the exposures and the concerns of the individuals
- Listen to ALL concerns and address them to the extent possible
- Communicate early and often
- "*Instead, we should focus more on exposure assessment and, where indicated, cleanup.*"

  Ken Rothman 1990 *AJE 1990;132(Suppl 1):S6-S13*
- "A duty of care was seen to be met when the investigation was extended beyond carcinogens that would account for the cluster to all carcinogens that were worrying those affected."

  Bernard Stewart 2007 *MJA 2007; 187: 178–180*


What causes cancer?

# What causes cancer?

- International Agency for Research on Cancer (IARC)
- Group 1: Definitely causes cancer in humans
- Group 2A: Probably causes cancer in humans
- Group 2B: Possibly causes cancer in humans
- Group 3: Not enough evidence to decide
- Group 4: Does not cause cancer in humans

# ABC Toowong building

# ABC - background

- Concerned staff
- Management perceived as slow to react
- Initial investigation focused on personal risk factors
- Staff more concerned and unhappy!

# Known external risk factors for breast cancer

- Ionizing radiation
- Alcohol intake
- Post-menopausal oestrogen intake
- Shift work?

# Known external risk factors for breast cancer

- Ionizing radiation
- Alcohol intake
- Post-menopausal  oestrogen intake
- Shift work?

# ABC – what did the study team do?

- Set up a reference group
- Reviewed relevant scientific literature
- Interviewed affected women
  - work and workplace
  - known risk factors for breast cancer
- Rate of breast cancer in the Toowong female workforce
- Investigated the site for possible contamination
  - known or suspected environmental risk factors for breast cancer
  - other carcinogens

# ABC – what was found?

- 10 women diagnosed with breast cancer whilst working at Toowong
- Many cases in younger women
- Rate six times higher than expected
- Initial probability – “one in a million chance”
- Adjusted probability – “one in 25 chance”
- Suggestion of increasing risk with increasing length of employment

BUT……

# ABC – what was found?

NO exposures of concern

# ABC – what was concluded?

- Real increase in breast cancer rate
- “Highly unlikely” to be due to known exposures
- Unlikely to be due to increased personal risk factors
- Excluded all plausible environmental explanations
  - No need for further investigations on site
- Conduct similar studies in other ABC offices

# ABC – what was the outcome?

- The ABC building was abandoned.

- What would you have done?????

# Question 3

- ABC Toowong response

# Breast cancer cases at ABC Melbourne office

**By Lexi Metherell for AM**

AM abc.net.au/am >

Posted Thu Jul 9, 2009 7:19am AEST
Updated Thu Jul 9, 2009 10:15am AEST

**Confirmation of three recent cases of breast cancer at the ABC's Southbank office in Melbourne has revived fears of another cancer cluster at the broadcaster.**

It has been less than three years since the ABC abandoned its Queensland headquarters in the Brisbane suburb of Toowong, after an unusually large number of staff there developed breast cancer.

Experts say it is impossible to tell whether another cluster is emerging, but it is unlikely to be anything more than a tragic coincidence.

Experts say it is impossible to tell whether another cluster is emerging (ABC News: Giulio Saggin, file photo)

**Map:** Southbank 3006

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**Map:** Southbank 3006

# ABC Women's Health Study



## A study of breast cancer risk among ABC female employees in Australia

In May 2005, an apparent cluster of breast cancer cases was suspected among female employees at the Toowong Australian Broadcasting Corporation (ABC) site in Brisbane, QLD.

Two subsequent investigations in 2006 found a significantly higher than expected number of breast cancer cases among female employees based at the studio. The ABC management then commissioned Cancer Council NSW – an independent, non-Government organisation - to undertake a national study to investigate if this increased risk of breast cancer was also present in other studios across Australia.

The aim of the study was to determine if there was a higher rate of breast cancer among female ABC employees nationally, compared to the wider Australian population.

Our research showed that ABC employees (outside of QLD) had the same breast cancer risk as the rest of the Australian population. This shows that the apparent cancer cluster found in Toowong was not a widespread problem faced by other ABC studios.



http://www.cancercouncil.com.au/editorial.asp?pageid=2406

## Study Methodology

Cancer Council researchers investigated how long employees worked at the ABC, and

# Breast cancer risk among female employees of the Australian Broadcasting Corporation in Australia

Freddy Sitas, Dianne L O'Connell, Cathelijne H van Kemenade, Mark W Short and and Kun Zhao


## ABSTRACT

**Objective:** To determine whether there is an excess risk of breast cancer among female employees of the Australian Broadcasting Corporation (ABC), especially outside Queensland, compared with women in the general populations of the states and territories.

**Design, setting and participants:** We used an occupational cohort design. Information from ABC staff records was linked with data from state and territory cancer registries to identify female employees of the ABC with an incident, histologically confirmed breast cancer. Data linkage was complemented by a self-report method. We included a cohort of ABC female employees who had developed breast cancer at any time between 1994 and 2005, during their employment or after cessation of employment with the ABC. The standardised incidence ratio (SIR) was calculated as the number of women at the ABC observed with breast cancer divided by the expected number based on population rates in each state and territory. Tests for heterogeneity were performed to examine the variation of breast cancer risk between states and territories.

**Results:** Out of 5969 women who were permanently employed either part-time or full-time at the ABC between 1994 and 2005, 48 eligible women with breast cancer were identified. An excess risk of breast cancer among ABC female employees in Queensland (identified in an earlier study) was reconfirmed. No excess risk of breast cancer was observed among ABC staff diagnosed in states outside Queensland (SIR, 1.01 [95% CI, 0.72–1.38]), or in Australia as a whole (including Queensland) (SIR, 1.12 [95% CI, 0.83–1.49]). There was no significant heterogeneity in breast cancer risk among states and territories once Queensland was excluded from the analysis ($P = 0.39$).

**Conclusion:** No statistically significant excess risk of breast cancer in ABC female employees was found across the Australian states and territories as a whole compared with their respective population incidences. A statistically significant increased risk of breast cancer was found among ABC female employees in Queensland, consistent with the findings in an earlier report.


MJA 2010; 192: 651–654

*For editorial comment, see page 629*

In May 2005, an apparent breast cancer cluster was identified among female employees at the Toowong site of the Australian Broadcasting Corporation (ABC) in Brisbane, Queensland. In July 2006, an Independent Review and Scientific Investigation Panel found a sixfold increase in breast cancer incidence among ABC female employees at Toowong compared with the Queensland general population, but no evidence of exposure to any known or suspected environmental risk factors.[1]

The Panel reasoned that, if there was an unknown or undetected aspect of work or the working environment at ABC Toowong that could have contributed to the observed increased risk of breast cancer, it might also be present in ABC studios elsewhere in Australia.[1] Absence of an increased risk elsewhere would provide reassurance that this is not a systemic problem. Presence of an increased risk would justify more extensive investigation into possible causes.

We conducted a nationwide study to determine whether there is an excess risk of breast cancer among female employees of the ABC, especially outside Queensland, compared with rates in state and territory general populations.

## METHODS

We used methods for an occupational cohort analysis.[2] ABC employee records were linked to data from the National Cancer Statistics Clearing House (NCSCH), operated by the Australian Institute of Health and Welfare (AIHW). The number of cases observed among female employees was compared with the expected number of cases based on the background incidence of

over. Due to the uncertainty of start and cessation dates for casual staff, analyses were restricted to permanent employees (part-time and full-time).

### Case definition

Because of uncertainty about exposure to risk factors in other occupations after leaving the

For the method that involved counting cases diagnosed only during employment at the ABC, a case was defined as any permanent ABC female employee diagnosed with a primary invasive breast cancer within the study period while employed at the ABC.

Selection criteria for primary breast cancer cases were as follows:

# ABC cancer rate 'not abnormal'

Posted Tue Aug 25, 2009 11:01am AEST
Updated Thu Aug 27, 2009 11:25am AEST

**A report into the incidence of breast cancer within the ABC has found staff across Australia do not face a higher risk of being diagnosed with the disease, compared to the rest of the population.**

The national broadcaster abandoned its Toowong studios in Brisbane in late 2006 because of a breast cancer cluster.

Professor Bruce Armstrong led the investigation into the ABC cancer cluster at Toowong.

A study by the Cancer Council New South Wales released today found staff in all states, except Queensland, do not face a higher risk of the disease than the rest of the population.

It shows 48 out of almost 6,000 female employees had breast cancer between 1994 and 2005.

The number of cases expected nationally is 42.8.

Professor Armstrong says the results released today from the national study are "enormously reassuring".

He says there is no need to continue looking into breast

work force.

The ABC abandoned its Toowong studios in Brisbane in late 2006. (ABC News: Giulio Saggin, file photo)

**Video:** Cancer study clears ABC workers of higher risk (7pm TV News QLD)

**Map:** Toowong 4066

**Related Link:** ABC Women's Health Study

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http://abc.com.au/news/stories/2009/08/25/2665993.htm?site=news

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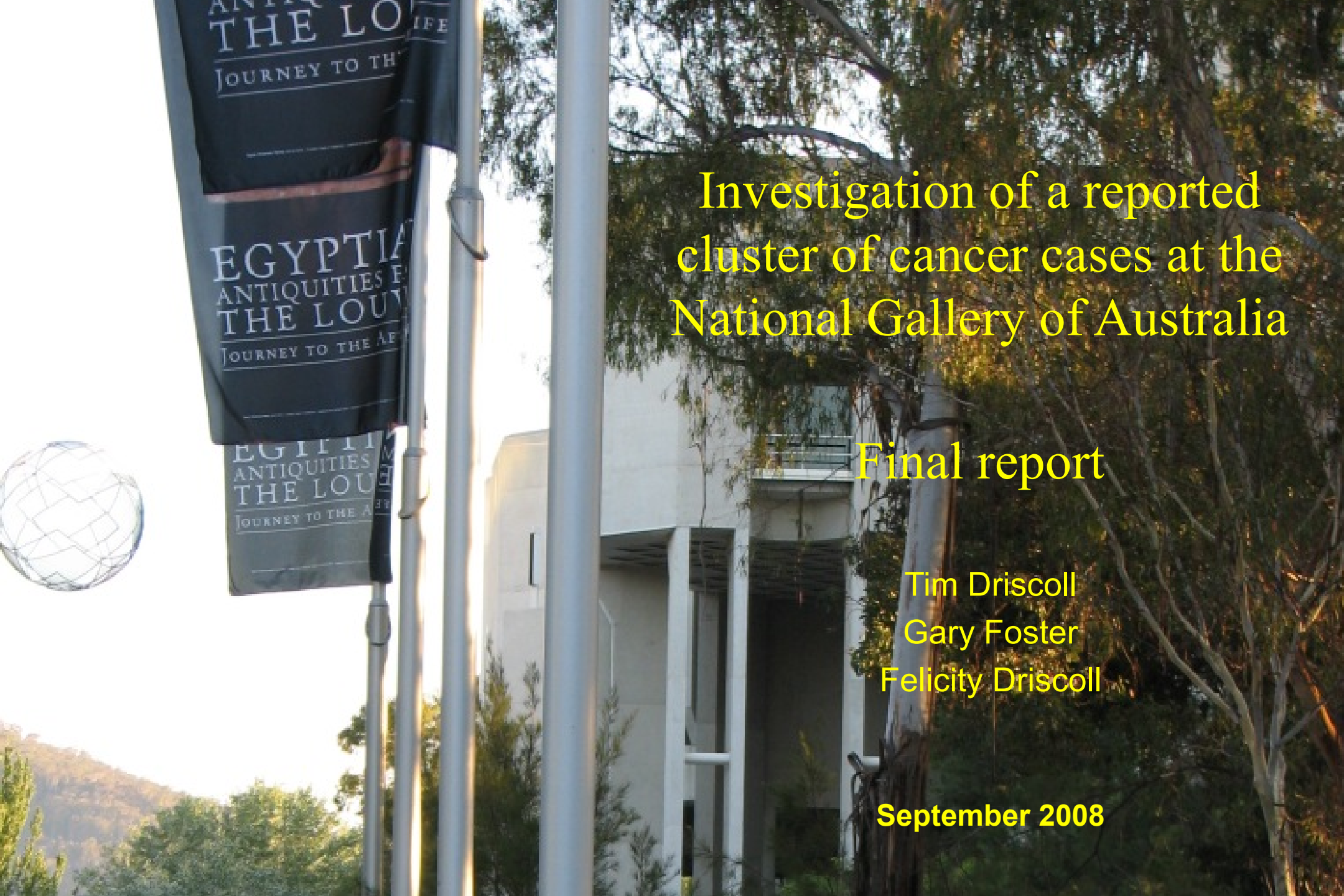
National Gallery




# Investigation of a reported cluster of cancer cases at the National Gallery of Australia

## Final report

Tim Driscoll
Gary Foster
Felicity Driscoll

**September 2008**

# National Gallery - background

- Concerned staff
- Management perceived as slow to react
- Initial investigation very limited
- Staff more concerned and unhappy!

# National Gallery – what did the study team do?

- Set up a reference group
- Reviewed relevant scientific literature
- Workplace investigation for carcinogens
- Interviewed workers (but not all cases)
- Number, rate, type and characteristics of cancer in current and past workers

# National Gallery - exposures

| IARC Group 1 |
| --- |
| Asbestos |
| Benzene |
| Cadmium |
| Environmental tobacco smoke |
| Ethylene oxide |
| Formaldehyde |
| Radium |
| Wood dust |
| X-rays |

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| IARC Group 2A |
| --- |
| Diesel fumes |
| Epichlorohydrin |
| Polycyclic aromatic hydrocarbons |
| Tetrachloroethylene |

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| Radium |
| Wood dust |
| X-rays |

| IARC Group 2A |
| --- |
| Diesel fumes |
| Epichlorohydrin |
| Polycyclic aromatic hydrocarbons |
| Tetrachloroethylene |

| IARC Group 2B |
| --- |
| Carbon black |
| Carbon tetrachloride |
| Cobalt |
| Dichloromethane |
| Dichlorvos |
| Extremely low-frequency electro-magnetic fields |
| Magenta |
| Potassium bromate |
| Synthetic mineral fibres |
| Welding fumes |

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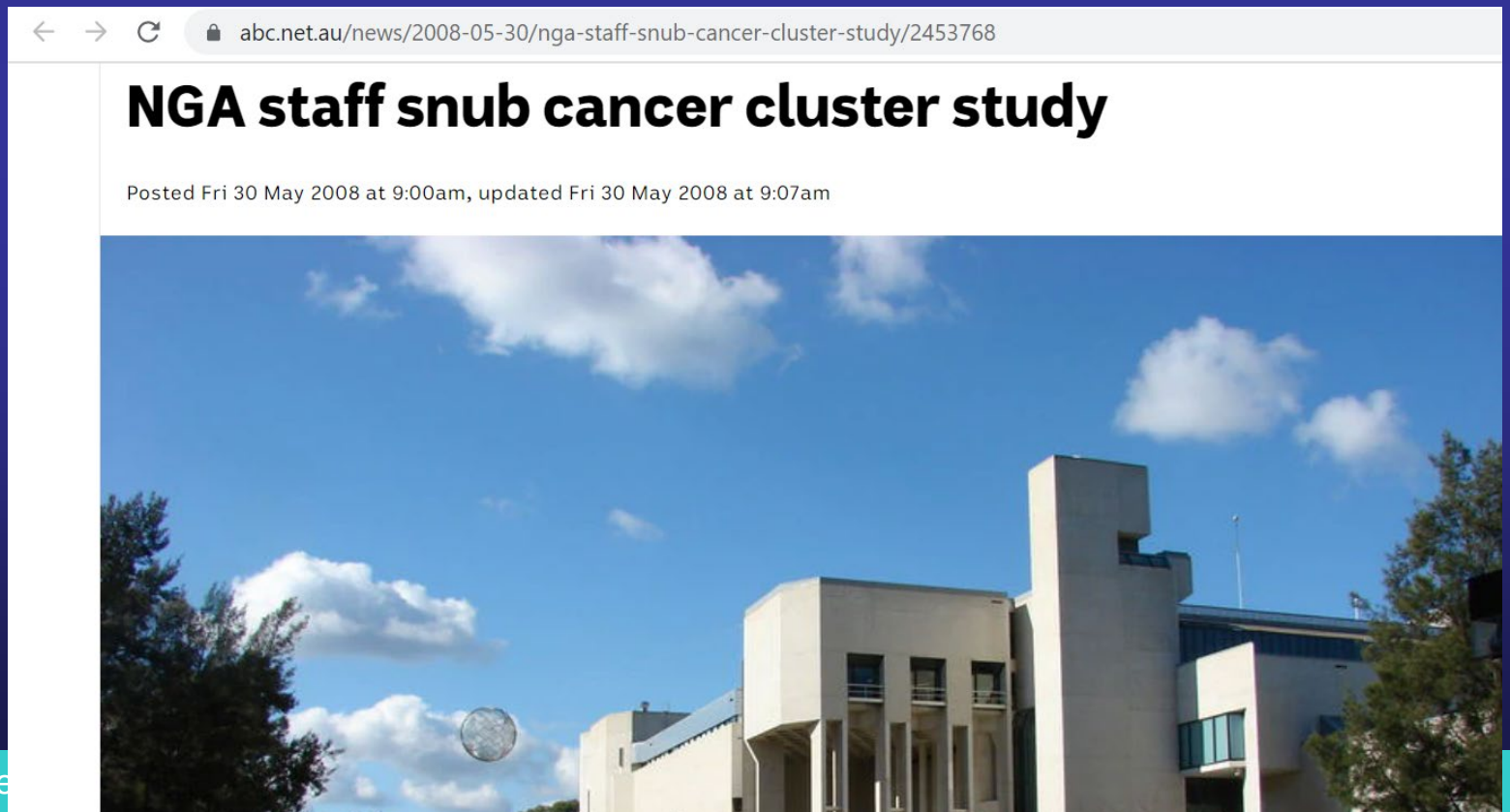
# National Gallery – what did the staff think?

http://www.abc.net.au/news/2008-05-30/nga-staff-snub-cancer-cluster-study/2453768



# National Gallery – what was found?

- 57 current and former workers diagnosed with cancer
- Types with the highest numbers were the most common community cancer types
- All cancers.....No increase
- Lung cancer.....40% increase (very likely due to chance)
- Bowel cancer.....6% increase (very likely due to chance)
- Bowel cancer (security guards).....Increased risk (very likely due to individual risk factors)

# National Gallery – what was found?

- Lots of carcinogens
- No exposures at a level that would meaningfully increase risk

# National Gallery – what was concluded?

- Very unlikely that any of the cancers identified in Gallery staff members were related to exposures experienced while working in the Gallery building
- No further investigation of the issue considered necessary
- Re-design the loading dock

# National Gallery – what was the outcome?

- The loading dock was demolished as part of renovations
- The new loading dock is very well designed
- No further issues re cancer

http://workplaceohs.com.au/hazards/work-health/news/nga-staff-reassured-by-cancer-cluster-findings#.U9gr9fmSz2E

http://www.smh.com.au/news/national/gallery-in-clear-over-cancer-cluster/2008/10/02/1222651267647.html

# National Gallery – what was the outcome?

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# National Gallery – what was the outcome?

http://www.smh.com.au/news/national/gallery-in-clear-over-cancer-cluster/2008/10/02/1222651267647.html

This was published 12 years ago

## Gallery in clear over cancer cluster

By **Joyce Morgan**
October 3, 2008 — 10.00am

Save

THE National Gallery of Australia has been cleared of causing cancer among its staff.

A two-year study has found that cancer rates among employees were little different to those in the wider community. But it acknowledged that among security guards the incidence of bowel cancer was three times the national average

# Question 4

- NGA response


# ABC vs National Gallery

# ABC vs National Gallery

| ABC | National Gallery |
| --- | --- |
| • Management “slow” | • Management “slow” |
| • Staff dissatisfaction | • Staff dissatisfaction |
| • Single cancer type | • Different cancer types |
| • Common type | • Common types |
| • Young age | • Typical age |
| • High rate | • No raised rate |
| • No worrying exposures | • No worrying exposures |
| • Moved | • Stayed |

# Advantages and disadvantages

# Advantages of investigation

- Provide reassurance that carcinogenic exposures in the setting are CURRENTLY not present or are well controlled

OR

- Identify exposures that are not well controlled so they can be FIXED

# Advantages of investigation 2

- Provide insight into whether PREVIOUS carcinogenic exposures in the setting were likely or not likely to be responsible for identified cancers
- Provide guidance regarding whether the identified occurrence of cancer is or isn't unusual
- Provide a forum for concerns to be addressed
- There is little choice - the concerns rarely disappear!

# Disadvantages of investigation

- In many cases the rate of cancer will not be shown to be higher (i.e. there is no “cluster”)
- A causal connection to an exposure is very rarely identified
- Commonly costly in terms of time and resources
- The final outcome is commonly not definitive


游客止步

# Change what you can change

- Stop smoking
- Decrease alcohol intake
- Exercise regularly
- Eat plenty of vegetables and fruit
- Maintain appropriate weight
- Restrict sun exposure

# Conclusions 1

- Cancer is a common disease.

- Cancer “clusters”:
  - are expected due to random variation
  - are usually not caused by occupational or environmental exposures
  - are very rarely due to unknown exposures
  - must not be dismissed without investigation of some sort
  - good communication is essential

# Conclusions 2

- Prompt response
- Explain the challenges
- Emphasis on exposures and case characteristics rather than just on rates
- Involve all interested parties
- Regular feedback
- Change what you can change