

# **Risk Perception: Canadian Opinions on Nuclear and Medical Technologies Pre- and Post- Fukushima.**

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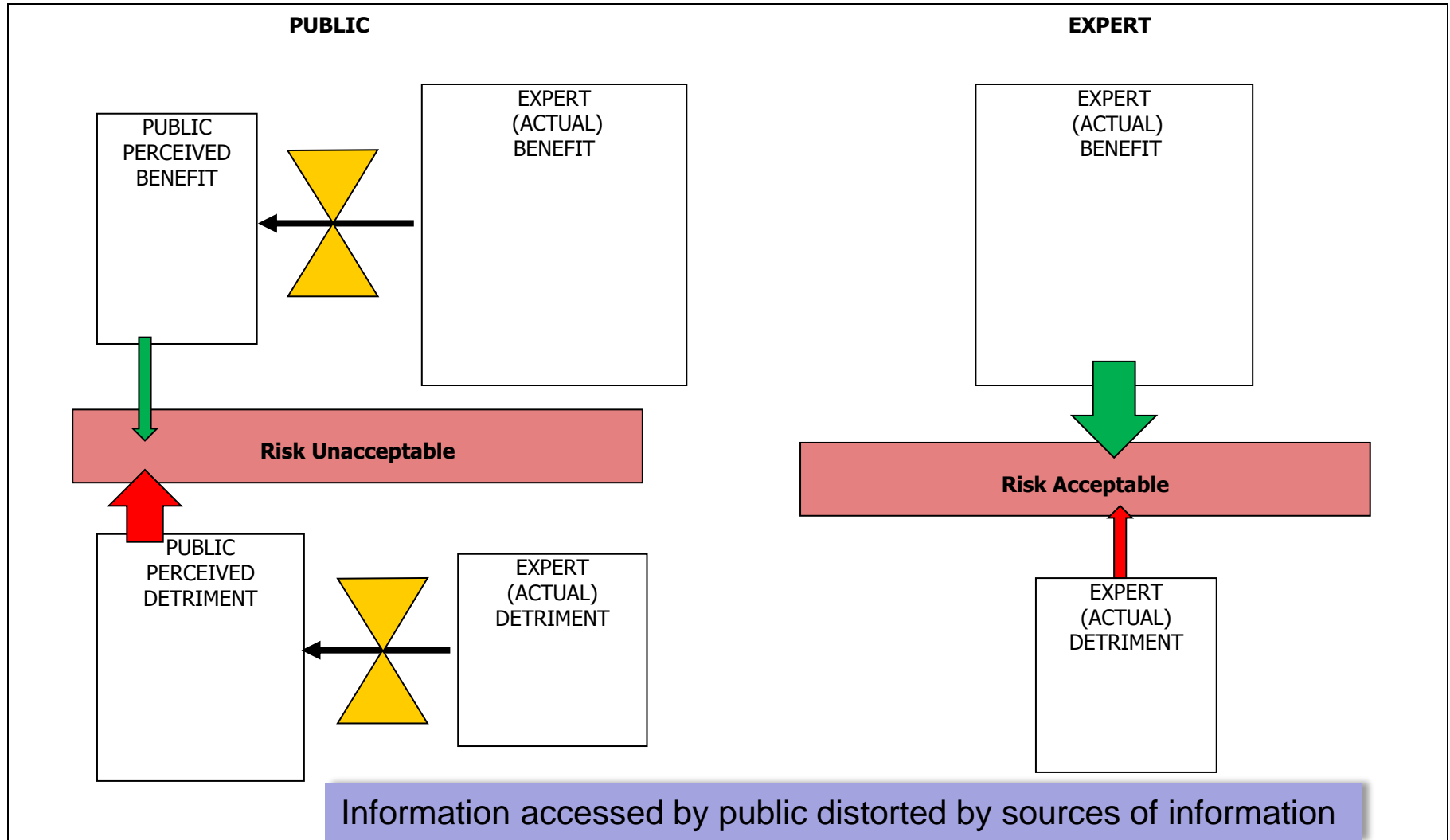
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# Benefits and detriments

- Willingness to accept risk involves a balance between perceived personal benefit and detriment
- Possible benefits include:
  - Financial
  - Risk
  - Environmental and other
- Possible detriments include:
  - Financial
  - Risk
  - Environmental and other
- Perceptions may be distorted by information sources

# Risk perception Model



# Survey statements

- The survey consisted of 24 statements
  - 12 related to nuclear and 12 to medical
  - for each radiation 6 positive and 6 negative statements
  - These statements were presented as a line bar. The individual would be required to respond by placing a mark along the line according to how much they agree or disagree with that statement

1) Canada is the best country in the world.

Strongly Disagree ◆————— X —————◆ Strongly Agree

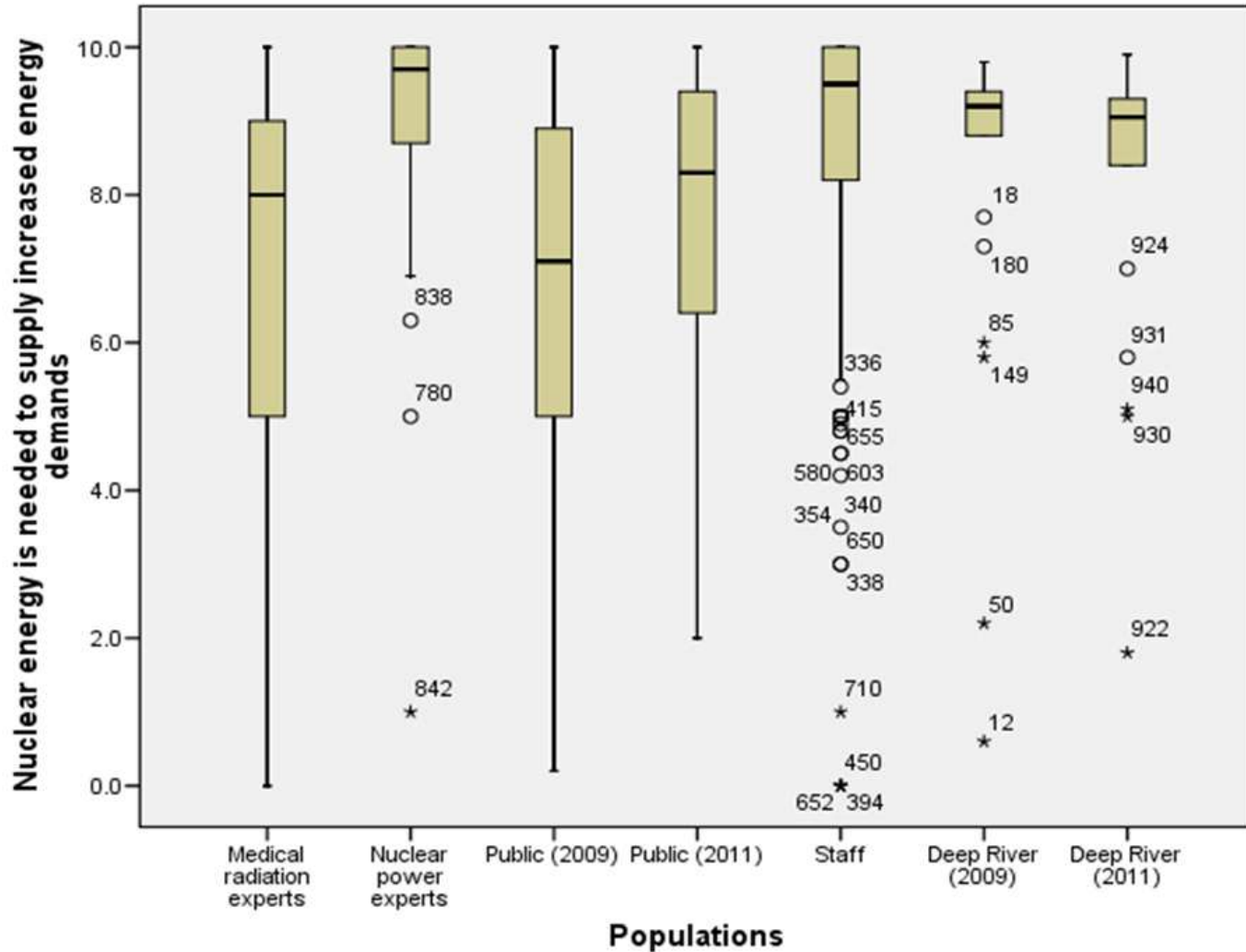
- The opinions of public and experts then compared
- Groups: Canadian Public 2009 and 2011, Experts, Staff, Deep River Residents 2009 and 2011

# Nuclear positive statements

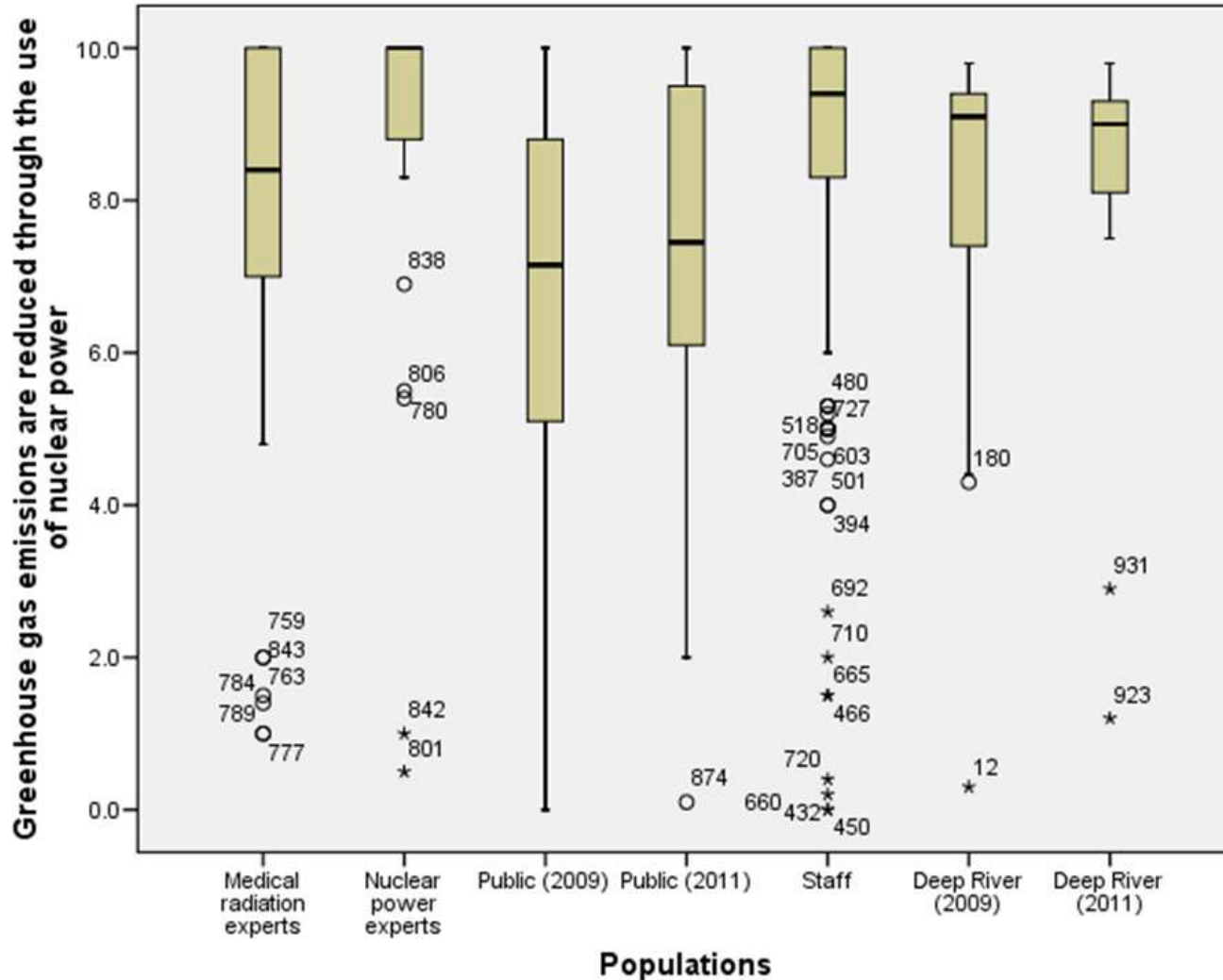
|             | Statement  | Public 2009 | Public 2011 | Expert     | AECL staff |
|-------------|--|-------------|-------------|------------|------------|
| 1           | Low greenhouse gas emissions                         | 6.9         | 7.6         | 8.9        | 8.9        |
| 2           | Needed to meet energy demands                        | 6.7         | 7.8         | 9.0        | 8.8        |
| 3           | Public and worker doses are acceptable               | 6.4         | 7.4         | 8.9        | 8.4        |
| 4           | Nuclear plants needed to produce medical isotopes    | 7.4         | 7.6         | 7.8        | 8.0        |
| 5           | Cheaper than renewable sources (like wind and solar) | 5.0         | 6.8         | 8.3        | 7.3        |
| 6           | "Green" energy production                            | 5.2         | 6.4         | 8.4        | 7.5        |
| <b>Mean</b> |  | <b>6.3</b>  | <b>7.3</b>  | <b>8.5</b> | <b>8.2</b> |

Scale: Strongly Disagree = 0, Strongly Agree = 10

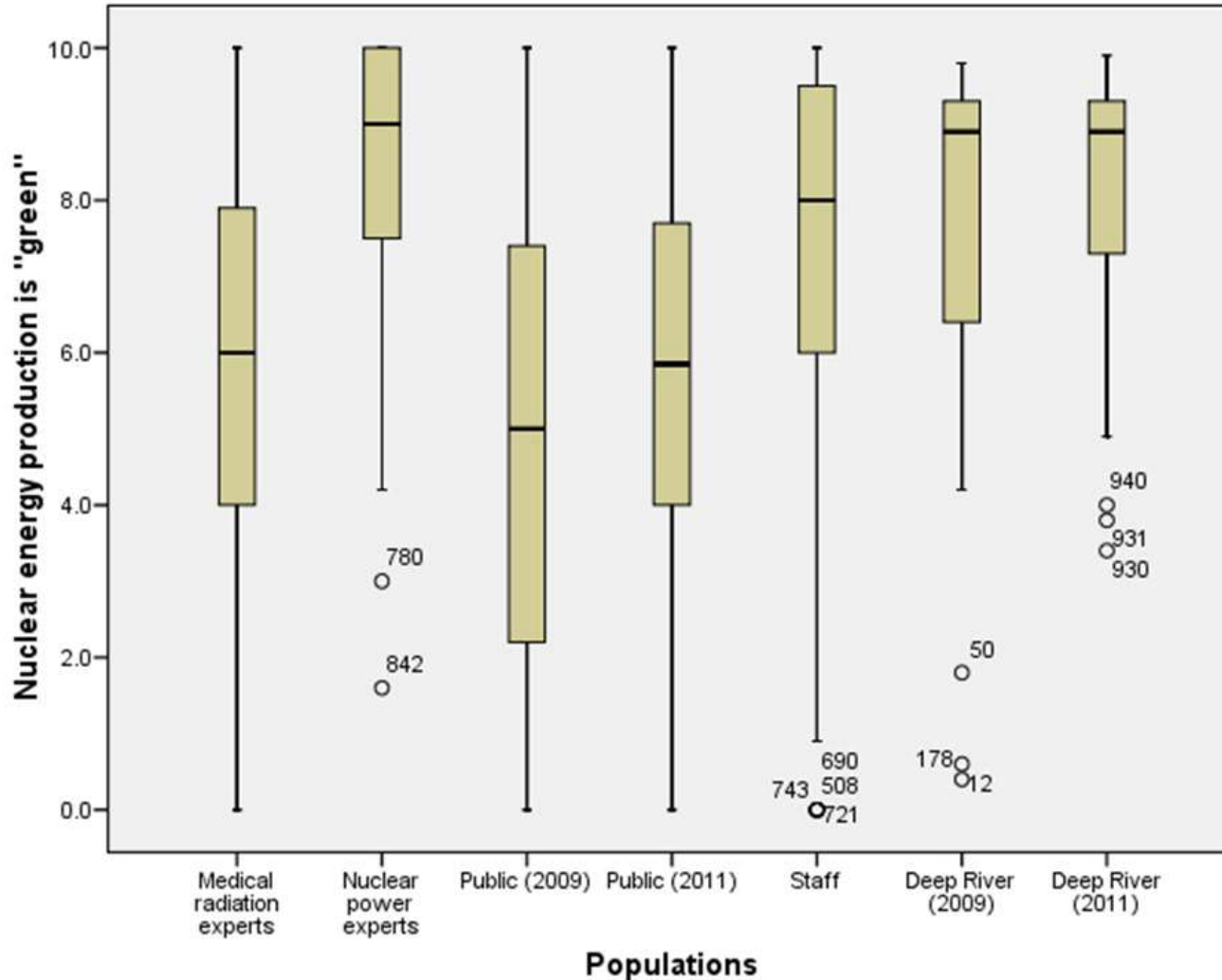
# Nuclear energy is required



# Greenhouse gases reduced



# Nuclear energy is green



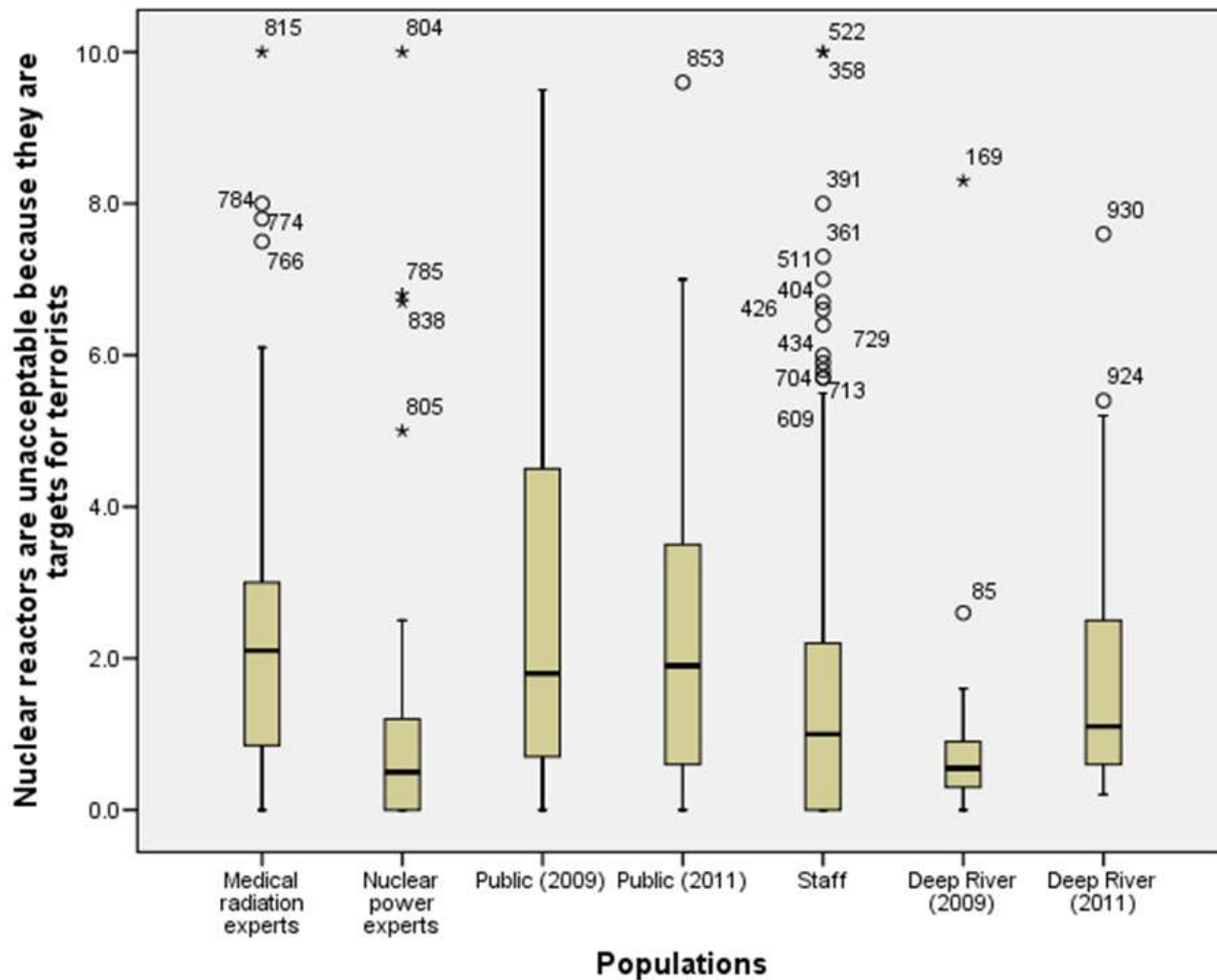


# Nuclear negative statements

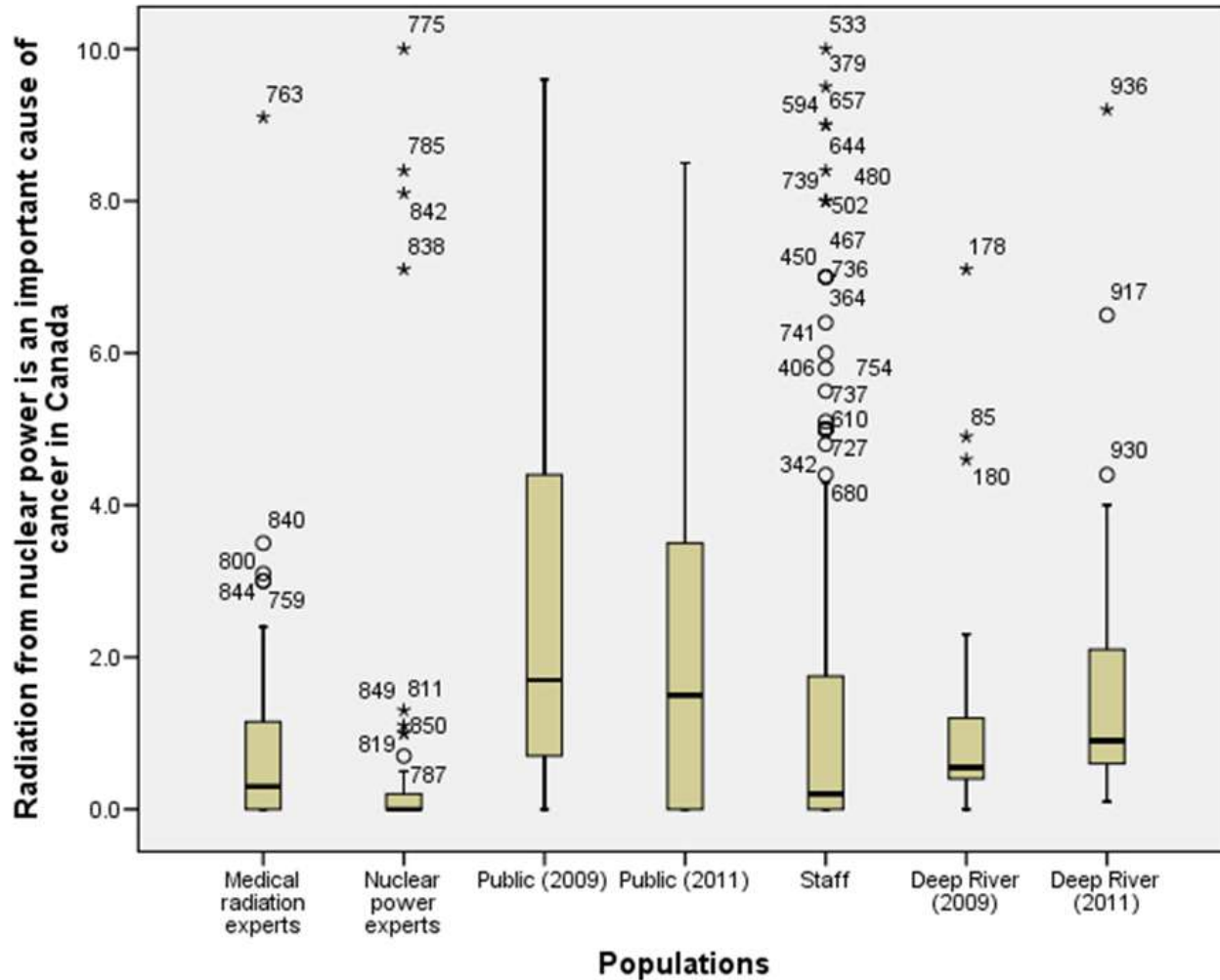
|             | Statement  | Public 2009 | Public 2011 | Expert     | AECL staff |
|-------------|--|-------------|-------------|------------|------------|
| 1           | Proliferation risk                                       | 3.4         | 3.1         | 2.1        | 2.4        |
| 2           | Target for terrorists                                    | 2.5         | 2.2         | 1.2        | 1.5        |
| 3           | Nuclear reactors are dangerous because of meltdown       | 4.4         | 4.1         | 2.7        | 3.7        |
| 4           | Nuclear radiation important cause of cancer              | 2.6         | 2.1         | 0.9        | 1.2        |
| 5           | Waste cannot be stored safely                            | 4.7         | 4.0         | 1.5        | 2.6        |
| 6           | Nuclear radiation is more dangerous than other radiation | 4.2         | 3.2         | 1.2        | 2.4        |
| <b>Mean</b> |  | <b>3.6</b>  | <b>3.1</b>  | <b>1.6</b> | <b>2.3</b> |

Scale: Strongly Disagree = 0, Strongly Agree = 10

# Targets for terrorists



# Important cause of cancer

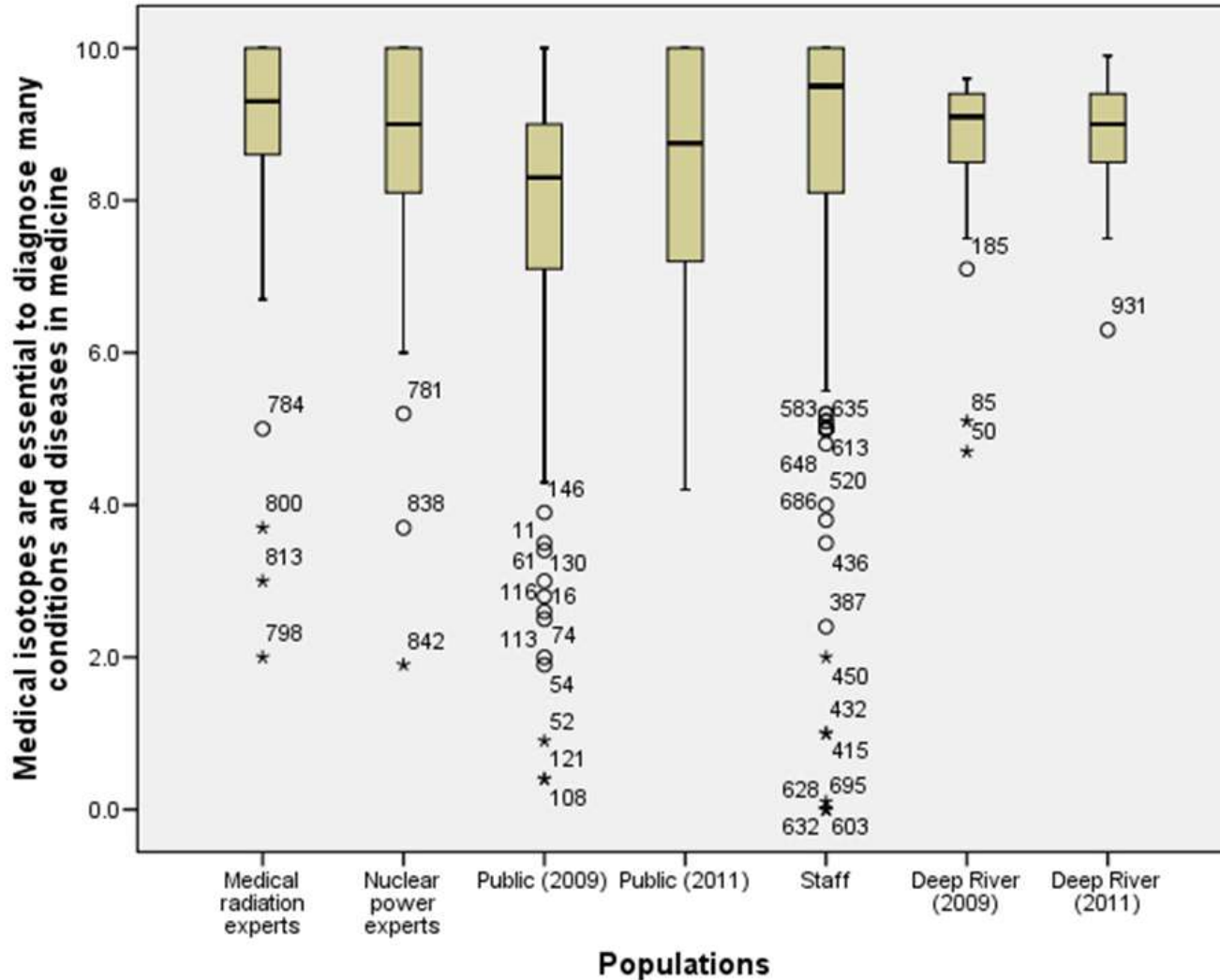


# Medical positive statements

|             | Statement                              | Public 2009 | Public 2011 | Expert     | AECL staff |
|-------------|--|-------------|-------------|------------|------------|
| 1           | Isotopes needed to diagnose diseases   | 7.8         | 8.5         | 8.8        | 8.7        |
| 2           | X-rays reduce cancer deaths            | 7.5         | 8.1         | 8.2        | 8.3        |
| 3           | Radiotherapy reduces cancer recurrence | 6.2         | 7.2         | 8.5        | 7.4        |
| 4           | Only X-rays can detect broken bones    | 4.5         | 5.2         | 5.2        | 4.6        |
| 5           | Medical doses unlikely to cause cancer | 6.4         | 7.3         | 6.8        | 7.0        |
| 6           | Radiotherapy needed to treat cancer    | 6.8         | 7.1         | 8.8        | 7.6        |
| <b>Mean</b> |  | <b>6.5</b>  | <b>7.2</b>  | <b>7.7</b> | <b>7.3</b> |

Scale: Strongly Disagree = 0, Strongly Agree = 10

# Medical isotopes required

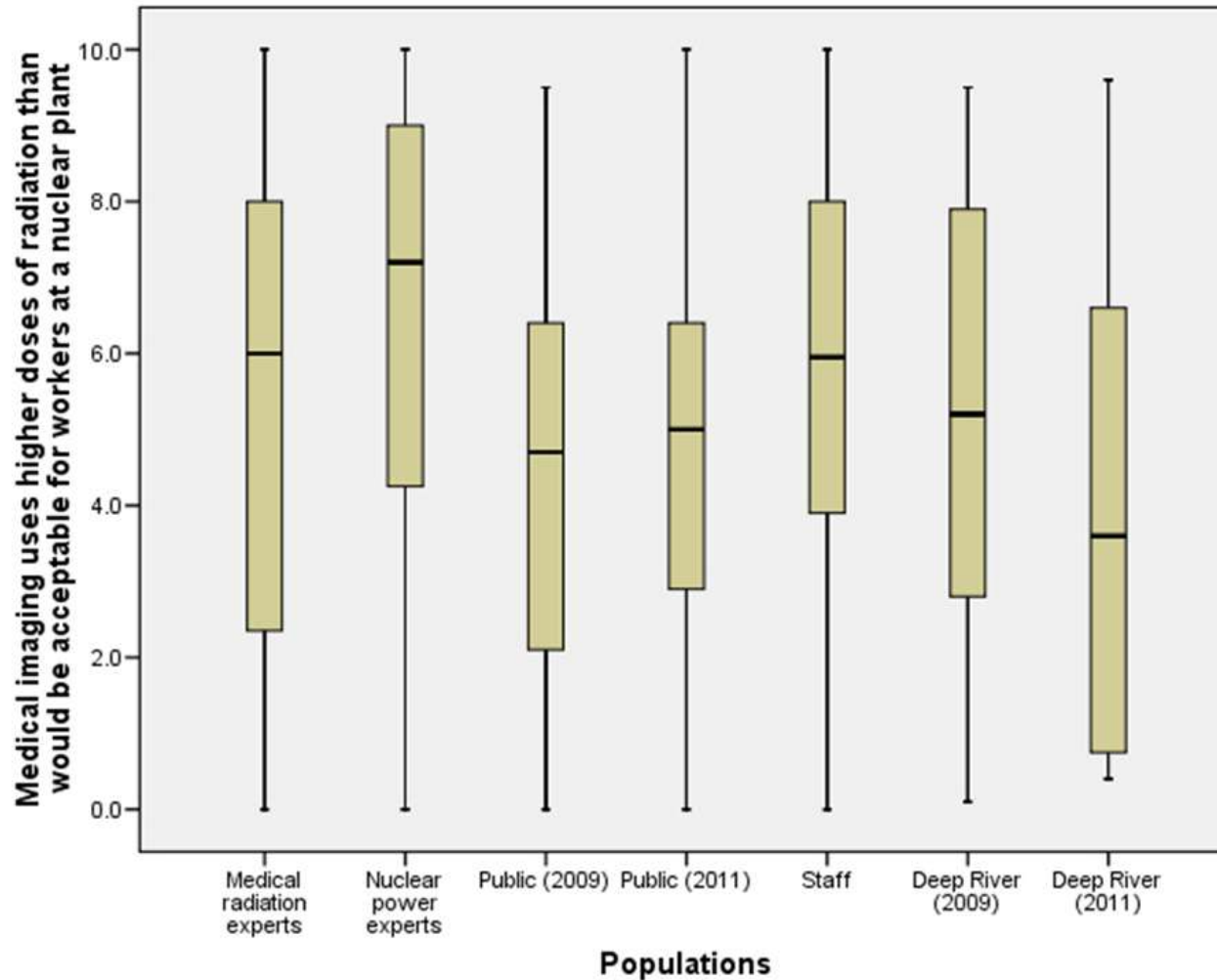


# Medical negative statements

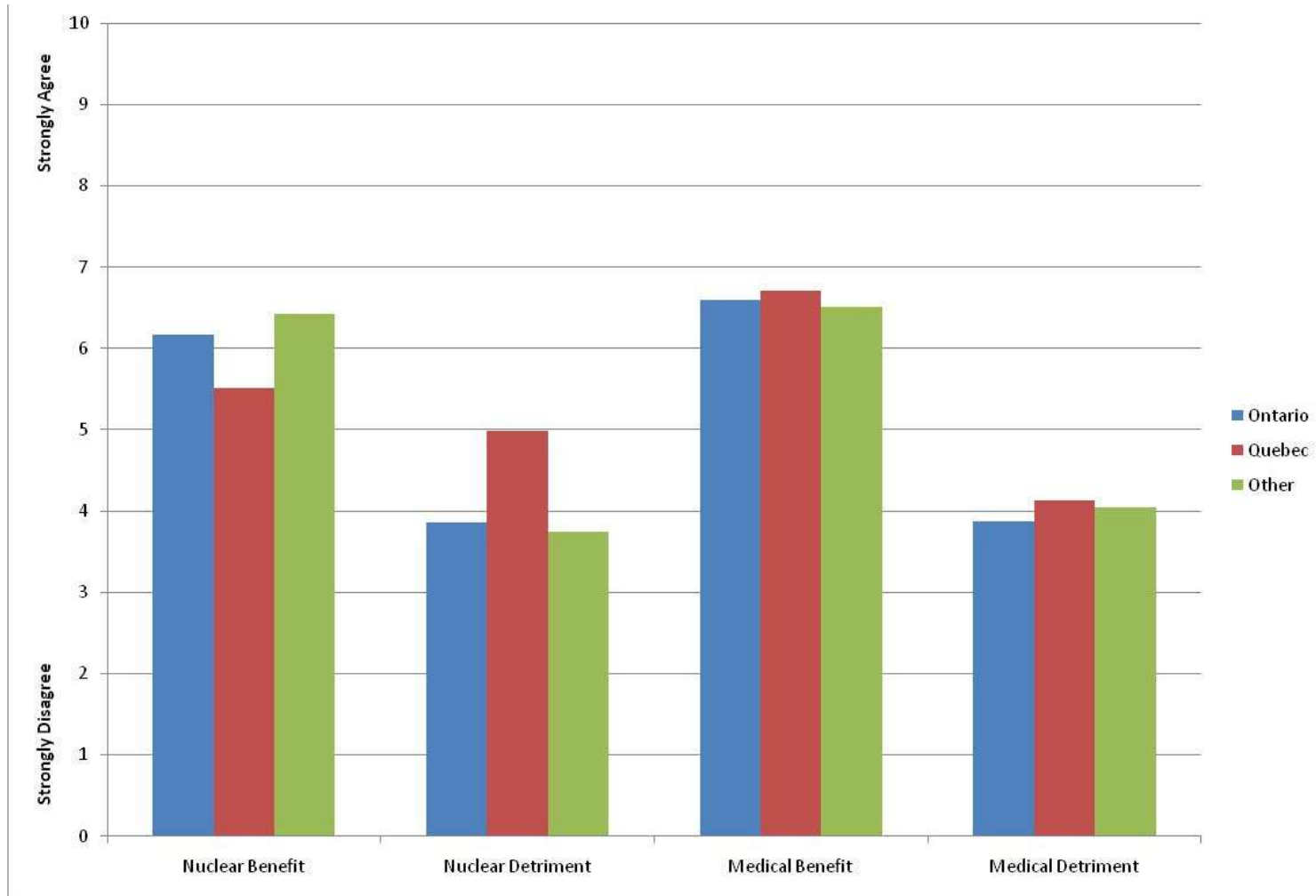
|             | Statement  | Public 2009 | Public 2011 | Expert     | AECL staff |
|-------------|--|-------------|-------------|------------|------------|
| 1           | MRI should replace X-rays  | 5.0         | 5.2         | 4.5        | 5.2        |
| 2           | Medical radiation an important cause of cancer                   | 2.6         | 2.4         | 2.0        | 1.8        |
| 3           | Tests using isotopes irradiate cells needlessly                  | 3.4         | 2.9         | 2.2        | 2.6        |
| 4           | Medicine uses higher doses of radiation than OK at nuclear plant | 4.6         | 4.5         | 5.3        | 5.6        |
| 5           | Diagnostic imaging may cause more cancer                         | 3.4         | 2.9         | 3.9        | 2.7        |
| 6           | X-rays cause medical problems (like cancer)                      | 3.6         | 3.9         | 6.0        | 3.5        |
| <b>Mean</b> |  | <b>3.8</b>  | <b>3.6</b>  | <b>4.0</b> | <b>3.6</b> |

Scale: Strongly Disagree = 0, Strongly Agree = 10

# Medical doses higher than occupational

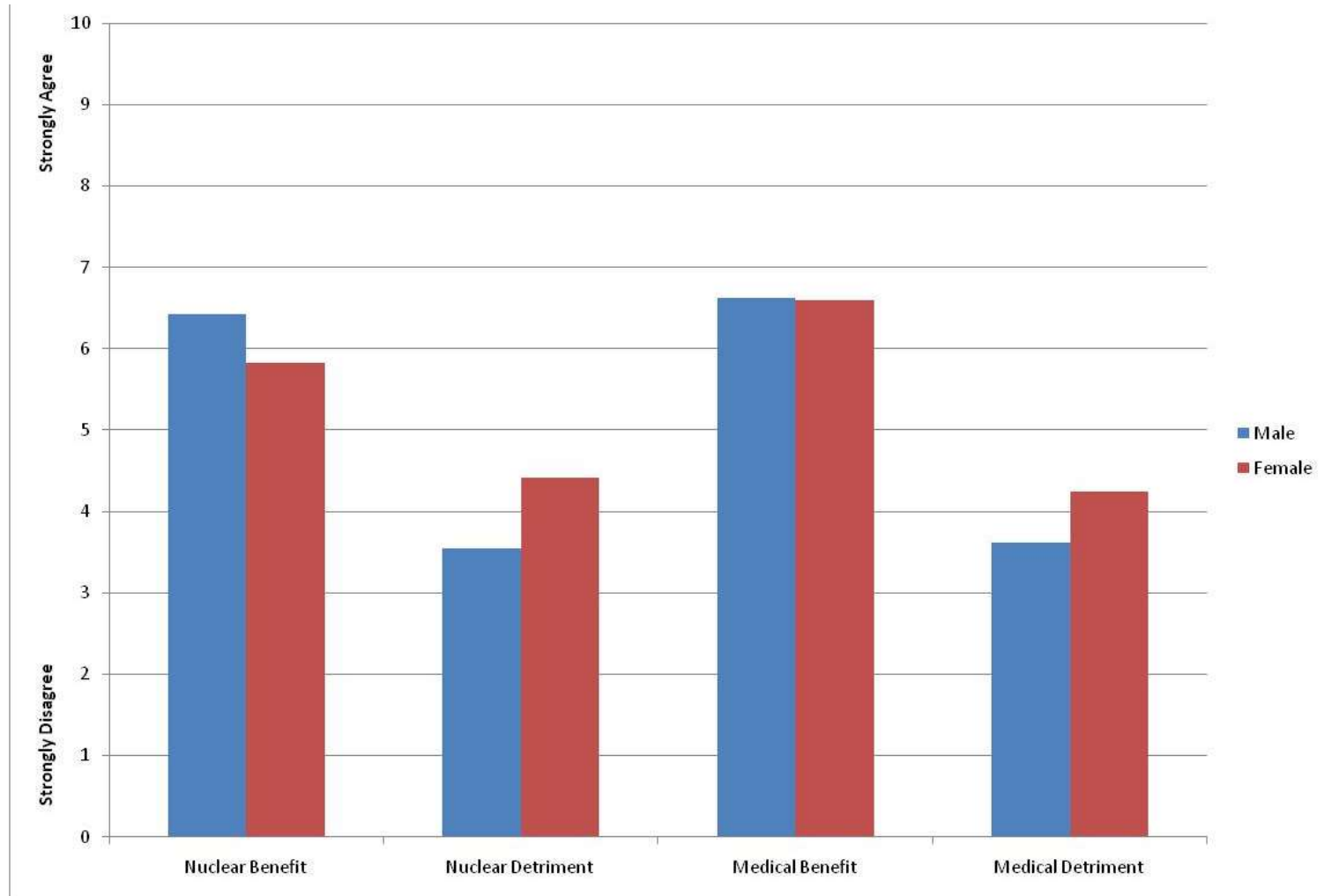


# Mean results by province

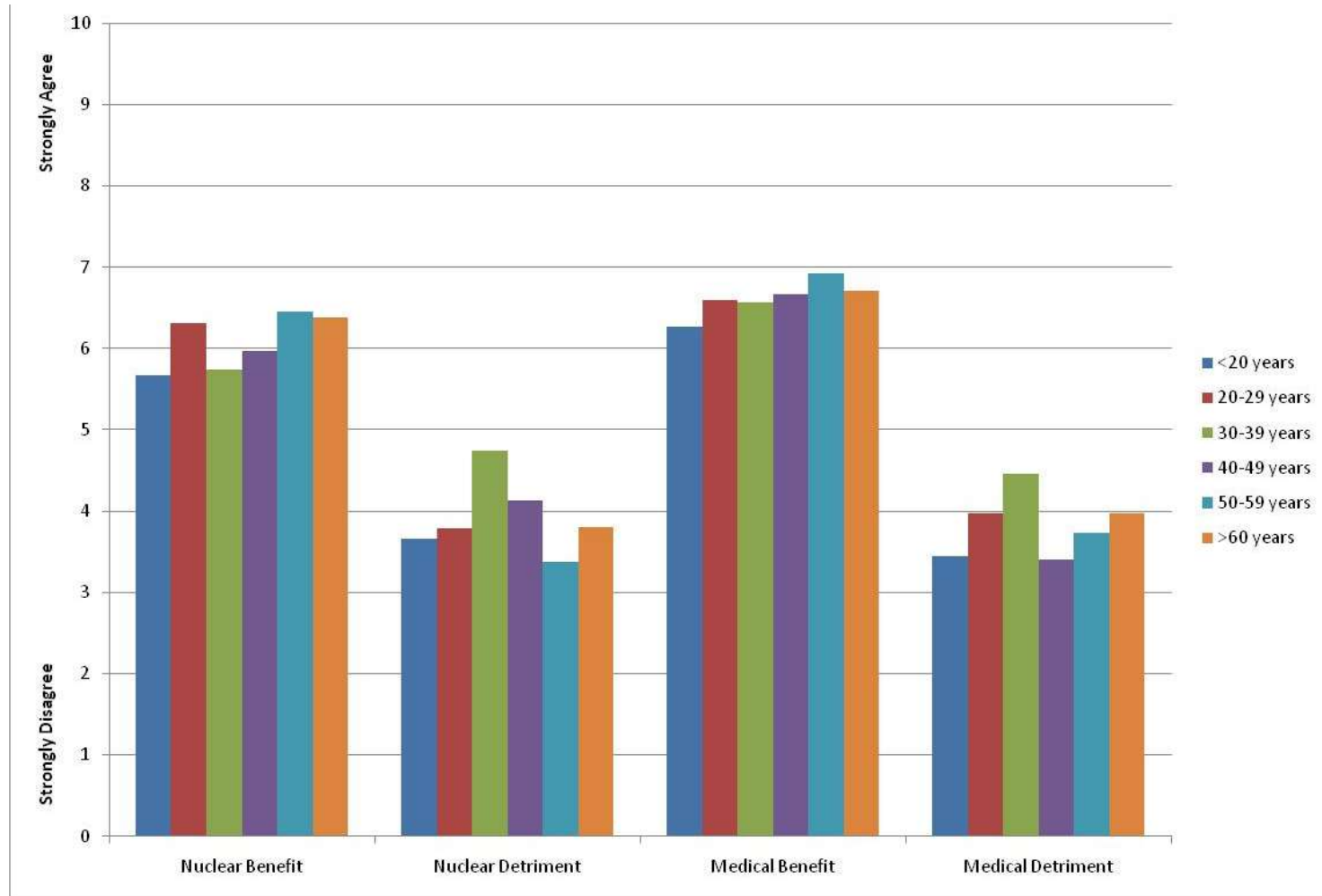




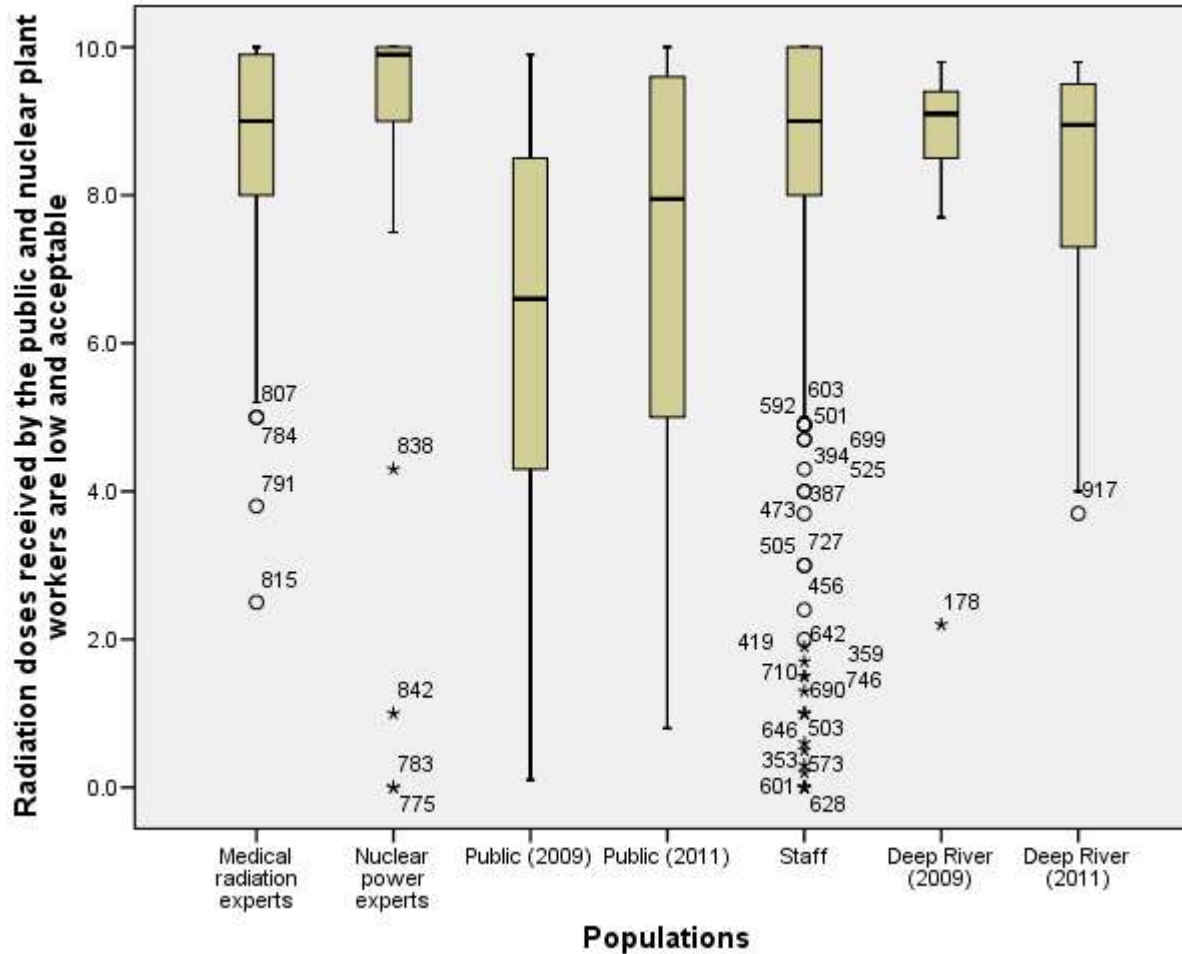
# Mean results by gender



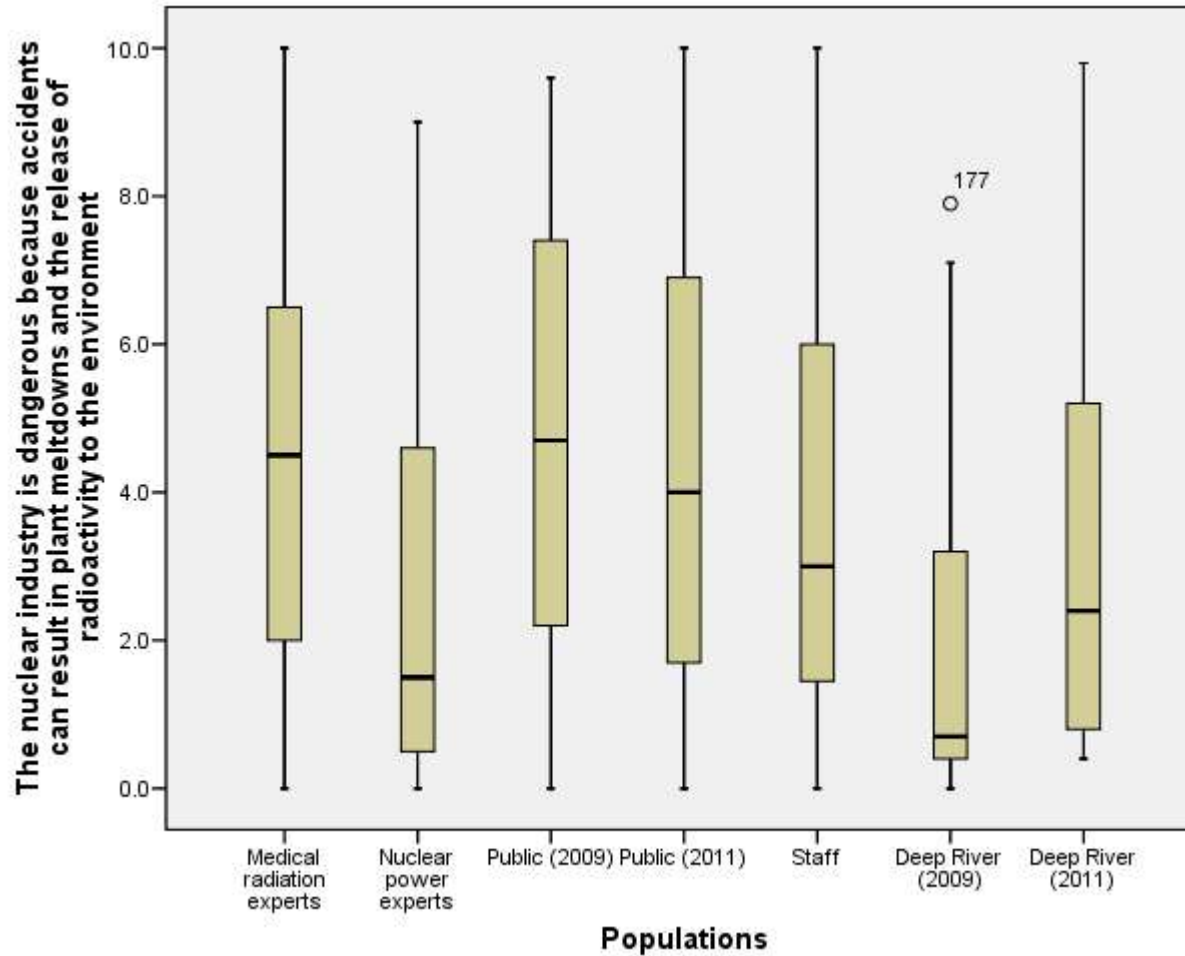
# Mean results by age



# Fukushima response 1



# Fukushima response 2



# Fukushima effect?

| Benefits |      |         | Detriments |      |         |
|----------|------|---------|------------|------|---------|
| Nuclear  |      | Medical | Nuclear    |      | Medical |
| 2009     | 2011 | 2011    | 2009       | 2011 | 2011    |
|          |      |         |            |      |         |
|          |      |         |            |      |         |
|          |      |         |            |      |         |
|          |      |         |            |      |         |
|          |      |         |            |      |         |
|          |      |         |            |      |         |
|          |      |         |            |      |         |

# Conclusions

- Medical radiation experts tend to perceive benefits and detriments the same way as public
- Nuclear experts agree with medical experts on medical statements
- All experts and public tend to agree on medical statements indicating little information distortion
- All are less supportive of nuclear benefit statements and more supportive of detriment statements than nuclear experts indicating receipt of unbalanced information
- No major effects of age on opinions but women and Quebec citizens less supportive of nuclear
- Nuclear workers are less supportive of nuclear technology than the nuclear experts – indicating training need!
- Between August 2009 and August 2011 nuclear benefit scores increased and nuclear detriment scores all decreased indicating no significant impact of Fukushima on public attitudes to nuclear power.

# 2006 UK results

|                          | ← Agree    | Disagree → |
|--------------------------|------------|------------|
| Clean                    | E ←————→ P |            |
| Safe                     | E ←————→ P |            |
| Reliable                 | E ←————→ P |            |
| Environmentally friendly |            | E ←————→ P |
| Secure supply            | E ←————→ P |            |
| Cheap                    |            | E ↔ P      |
| Cancer causing           |            | P ←————→ E |
| Proliferation risk       |            | P ←————→ E |
| Unnecessary              |            | P ←————→ E |
| Catastrophe              | P ←————→ E |            |
| Terrorist target         |            | P ←————→ E |
| Unmanageable wastes      | P ←————→ E |            |

More active media and stronger anti-nuclear lobby in the UK?

 **AECL EACL**

