J-value results on evacuation, relocation and countermeasures after a big nuclear accident

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Chernobyl: first relocation in 1986

- **116,000** evacuated from 30-km zone by September 1986
- 7-month gain in life expectancy so J-value was 3 times too high
- Only **17,000** people should have been relocated (J = 1)
Chernobyl: second relocation in 1990

Dark orange areas relocated after 1990

~1000 km
Chernobyl: second relocation in 1990

- The State All-Union and Republican Programme: relocation of **220,000** people at a cost of 42,000 roubles per person
- Gain in life expectancy was just 21 days
- \( J = 21 \), so over 20 times too expensive
- **None** of these 220,000 people should have been relocated
Fukushima Daiichi: evacuation worse than radiation

- **160,000** evacuees
- **1,121** deaths in the first 3 years from physical and mental exhaustion following evacuation (assumed to be the over 70s)
- Average loss of life expectancy was **27 days**
- Compare radiation dose averted by evacuation
- Average loss would have been **19 days**
Fukushima Daiichi: remedial measures: urban decontamination

- 110,000 houses in Fukushima City
- 7-fold dose reduction
- Loss of life expectancy averted: 35 days
- J = 0.04 so well worth doing
Post-Chernobyl sheep restrictions in UK

- Restrictions imposed on the movement, sale and slaughter of sheep on 9,700 farms in North Wales, Cumbria, Scotland and Northern Ireland
Removing the sheep restrictions in 2012

- Number of restricted farms had fallen to 300 by 2010, when the Food Standards Agency was asked to report on whether they could be lifted altogether
- The FSA calculated this was reasonable
- But should the restrictions have been lifted earlier?
<table>
<thead>
<tr>
<th>Category</th>
<th>Number of people</th>
<th>Life extension (hh:mm:ss)</th>
<th>J-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSA report</td>
<td>2,150</td>
<td>1:34:00</td>
<td>230</td>
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<tr>
<td>Representative person (ICRP)</td>
<td>1,670,000</td>
<td>00:36</td>
<td>58</td>
</tr>
</tbody>
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The UK sheep restrictions were such poor value for money by 2010 that it is clear that they should have been dropped much earlier.