The cancer risk among exposed workers in the nuclear center in Świerk, Poland

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built in 1956
Nuclear workers in Świerk

- data from 1956 to 2001
  - 10 years of cancer incubation time
- dosimetric data of 4606 workers
  - effective doses
  - equivalent doses to hands
- dosimetric and medical data of 575 workers
  - information about cancer status
Cancers

- In the medical cohort (575 workers) there are 47 cancer cases.
- In the group of 47 cancer workers there are 21 people who received $\geq 0.5$ mSv.
- The average cumulative dose per worker is 34 mSv (effective dose) and 17 mSv (equivalent dose to hands).
Results – odds ratio

- **taking effective doses only:**
  \[ \text{OR} = 0.90 \ (0.62-1.18, \ 68\% \ CI) \]

- **taking both effective and equivalent to hands doses:**
  \[ \text{OR} = 0.94 \ (0.65-1.23, \ 68\% \ CI) \]

- **statistically nonsignificant decrease** of cancer incidences by \((10.4 \pm 27.6)\%\) and \((6.0 \pm 28.8)\%\) respectively
Results – lack of cancers

- no cancer case is detected among 52 workers who received maximal cumulative doses (from 35 mSv to 653 mSv)
- no cancer case is detected among 43 workers who were chronically irradiated during more than 12 years (max. 26 years)
The graph represents the number of workers exposed to chronic irradiation (≥ 0.5 mSv) and their corresponding number of cancers. The x-axis indicates different ranges of chronic irradiation years, while the y-axis shows the number of workers. The diagram is divided into two sections: gray for cancers and black for no cancers.
Thank you!

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Adjustment for sex

- **Adjusted Odds Ratio**
  - taking effective doses only:
    \[ \text{AOR} = 0.86 \ (0.58-1.14, \ 68\% \ CI) \]
  - taking both effective and equivalent to hands doses:
    \[ \text{AOR} = 0.97 \ (0.65-1.29, \ 68\% \ CI) \]
  - among workers who received \( \geq 0.5 \text{ mSv} \)
Comparing with external population

- for irradiated group ($\geq 0.5$ mSv):
  \[ \text{SIR} = (32.2 \pm 8.3)\% \]
- for non-irradiated group (controls):
  \[ \text{SIR} = (34.3 \pm 8.1)\% \]
- External population: SIR = 100%
- No healthy worker effect (?)
Table 4: Final results of the analysis as OR (odds ratio) with different criteria of dose sensitivity threshold and a type of dose. The uncertainties show one standard deviation (68% CI). The last column presents the average cumulative dose per worker.

<table>
<thead>
<tr>
<th>The dose sensitivity threshold (the definition of significant dose)</th>
<th>OR (odds ratio of cancer incidence)</th>
<th>Average cumulative dose [mSv]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dose sensitivity threshold for effective dose or equivalent dose to hands</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5 mSv(^a, b)</td>
<td>0.94 (0.65-1.23)(^b)</td>
<td>33.3 (body)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17.3 (hands)</td>
</tr>
<tr>
<td>1 mSv</td>
<td>0.90 (0.62-1.19)</td>
<td>37.7 (body)</td>
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<tr>
<td></td>
<td></td>
<td>19.7 (hands)</td>
</tr>
<tr>
<td>5 mSv</td>
<td>0.94 (0.61-1.27)</td>
<td>56.3 (body)</td>
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<tr>
<td></td>
<td></td>
<td>29.8 (hands)</td>
</tr>
<tr>
<td>10 mSv</td>
<td>0.82 (0.48-1.15)</td>
<td>73.1 (body)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>39.5 (hands)</td>
</tr>
<tr>
<td>Dose sensitivity threshold for effective dose only (^c)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5 mSv(^a)</td>
<td>0.90 (0.62-1.18)</td>
<td>34.0 (body)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[17.6 (hands)]</td>
</tr>
<tr>
<td>1 mSv</td>
<td>0.86 (0.59-1.14)</td>
<td>38.9 (body)</td>
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<td></td>
<td>[20.1 (hands)]</td>
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<tr>
<td>5 mSv</td>
<td>0.87 (0.55-1.19)</td>
<td>58.1 (body)</td>
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<td>[29.8 (hands)]</td>
</tr>
<tr>
<td>10 mSv</td>
<td>0.60 (0.33-0.88)</td>
<td>76.3 (body)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[39.8 (hands)]</td>
</tr>
</tbody>
</table>

\(^a\) - the threshold of dose sensitivity (0.5 mSv) is taken as a default one in the presented paper.

\(^b\) – this case was precisely described in table 3.