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Published in:
The American Journal of Psychiatry

DOI:
10.1176/ajp.154.11.1605

Link to publication

Citation for published version (APA):

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Long-Term Mental Health Effects of the Chernobyl Disaster: An Epidemiologic Survey in Two Former Soviet Regions

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Objective: This study assessed the long-term mental health effects of the nuclear accident at Chernobyl.

Method: Two population samples (N=3,044), one from the Gomel region, close to the accident site, and one from Tver, 500 miles away, were studied 6 1/2 years after the event with the use of a variety of self-report questionnaires and a standardized psychiatric interview.

Results: The prevalence of psychological distress and DSM-III-R psychiatric disorders was exceptionally high in both regions. Scores on the self-report scales were consistently higher in the exposed region; however, a higher risk of DSM-III-R psychiatric disorders could be demonstrated only among women with children under 18 years of age in the exposed region.

Conclusions: A substantial long-term mental health effect of the Chernobyl incident was demonstrated, mainly at a subclinical level.

(Am J Psychiatry 1997; 154:1605–1607)
TABLE 2. Mental Health Problems in the Gomel and Tver Regions 6 1/2 Years After the Chernobyl Disaster

<table>
<thead>
<tr>
<th>Measure</th>
<th>Prevalence (%)</th>
<th>Odds Ratio</th>
<th>95% CI</th>
<th>Adjusted Odds Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-item General Health Questionnaire score ≥2d</td>
<td>64.8</td>
<td>48.1</td>
<td>1.93c</td>
<td>1.69-2.22</td>
<td>2.03c</td>
</tr>
<tr>
<td>Brief Scales for Anxiety and Depression</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety subscale score ≥4</td>
<td>46.1</td>
<td>43.8</td>
<td>1.10</td>
<td>0.73-1.66</td>
<td>1.18</td>
</tr>
<tr>
<td>Depression subscale score ≥3</td>
<td>40.9</td>
<td>26.6</td>
<td>1.91c</td>
<td>1.23-2.97</td>
<td>2.36c</td>
</tr>
<tr>
<td>Total score ≥3</td>
<td>36.1</td>
<td>27.5</td>
<td>1.49</td>
<td>0.95-2.32</td>
<td>1.84c</td>
</tr>
<tr>
<td>Bradford Somatic Inventory score ≥17</td>
<td>51.1</td>
<td>29.7</td>
<td>2.47c</td>
<td>1.60-3.80</td>
<td>3.16c</td>
</tr>
<tr>
<td>DSM-III-R disordersd</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mood disorders</td>
<td>16.5</td>
<td>12.8</td>
<td>1.36</td>
<td>0.77-2.41</td>
<td>1.57</td>
</tr>
<tr>
<td>Anxiety disorders</td>
<td>12.6</td>
<td>18.5</td>
<td>0.60</td>
<td>0.35-1.04</td>
<td>0.70</td>
</tr>
<tr>
<td>Any disorder</td>
<td>35.8</td>
<td>37.1</td>
<td>0.95</td>
<td>0.64-1.41</td>
<td>1.08</td>
</tr>
</tbody>
</table>

aSignificant difference between groups ($\chi^2$=14.78, df=1, p<0.001).
bSignificant difference between groups ($\chi^2$=18.77, df=4, p<0.001).
cStatistically significant difference between groups ($\chi^2$=13.57, df=3, p=0.01).
dSignificant difference between groups ($\chi^2$=46.16, df=2, p<0.001).

The results of phase 2 assessments were weighted back to their distribution in the phase 1 sample by using the sampling rates as weights. To enhance statistical power, DSM-III-R categories were combined into three main groups: mood disorders, anxiety disorders, and any covered DSM-III-R diagnosis. Odds ratios and adjusted odds ratios (adjusted for potential confounding by sociodemographic variables) were calculated, with site of the study as the main predictor. Log likelihood ratios were calculated for all female subjects to assess whether adding the interaction between 1) being a mother with children under 18 years of age and 2) living in the affected region (Gomel) would significantly improve the fit of the model without the interaction term. The Bonferroni-Holm correction was used to adjust for multiple pairwise comparisons.

RESULTS

Table 1 shows the sociodemographic characteristics of the two phase 1 samples. The Tver sample contained significantly more women, more divorced and widowed persons, and fewer persons with higher education.

Table 2 presents the prevalence estimates and odds ratios for each of the outcome measures. Respondents from the Gomel region had significantly higher scores on all three psychiatric symptom scales, with the exception of the anxiety subscale of the Brief Scales for Anxiety and Depression. However, no statistically significant differences were found for the prevalence of DSM-III-R disorders. Mood disorders were nonsignificantly more prevalent in the Gomel sample, mainly because of higher rates of depression not otherwise specified in Gomel (4.1% versus 1.0%). Anxiety disorders were more common in Tver, particularly general anxiety disorder (10.6% versus 4.1%). Posttraumatic stress disorder was seen more frequently in Gomel (2.4% versus 0.4%), but none of the respondents linked their complaints directly to the disaster. Most of these differences was statistically significant.

Adding the interaction between being a mother and living in Gomel improved the fit of the logistic model significantly for the Brief Scales for Anxiety and Depression anxiety subscale score ($\chi^2$=13.44, p<0.05), for any DSM-III-R disorder ($\chi^2$=79.84, p<0.05), and for DSM-III-R anxiety disorders ($\chi^2$=15.44, p<0.001). These results indicate that for these outcomes, being a mother was a risk factor in Gomel but not in Tver.

DISCUSSION

The aim of the study was to assess the long-term effects of the Chernobyl nuclear disaster on the mental health status of a severely affected population. The study shows high levels of psychopathology in the two regions studied, with significantly higher levels among the exposed population, especially among mothers with children under 18 years of age. The results corroborate earlier research on the mental health consequences of this disaster, which showed higher scores on the 12-item...
General Health Questionnaire among exposed women but not among men (4). Our study now shows that higher levels of distress may be demonstrated among the entire adult population. At the level of clinically significant psychopathology, which has not been studied earlier, the differences appear to be limited to specific risk groups, especially mothers with young children.

A major limitation of our study was the sampling procedure, which excluded people who were institutionalized, on sick leave, or on maternity leave. This may have led to an underestimation of the prevalence of disorders (e.g., of psychotic disorders). However, it seems justified to compare these samples because of the standardized approach to sample selection and data collection in the two regions. Also, there were sociodemographic differences between the exposed and the unexposed groups. The somewhat higher odds ratios after adjustment for these variables suggests that these differences have minimized differences in mental health status between the two samples. Finally, selective migration from the disaster area may have attenuated differences in mental health between the two regions.

Despite these limitations, our findings clearly suggest a substantial impact of the Chernobyl disaster on mental health among the affected population as long as 6.5 years after the event. The study confirms the observations following the Three Mile Island nuclear incident in 1979 and suggests that nuclear disasters, with their long-term physical health implications, may be more likely to induce chronic psychopathology than other disasters. The effects appear to be limited mainly to subclinical distress. However, in view of the higher rates of clinical pathology observed among mothers with young children in the exposed region, one may speculate that psychiatric symptoms among these women are fostered by genuine concern about the health of their children, (e.g., about the risk of thyroid cancer). Further research in this area and public health programs to mitigate the mental health consequences among this risk group are needed.

REFERENCES

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