Suicide Mortality in Japan: Analysis of the Unusual Secular Trends

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After the Second World War, suicide mortality in Japan suddenly increased to an extremely high level in the 1950s both in men and women. The male mortality began to increase again since the late 1960s, whereas the female mortality decreased after reaching a minor peak in 1973–74 (Japan Ministry of Health and Welfare 1984; Araki and Murata 1986b). These trends contrast with the remarkably constant rate in the USA during 1950–80 (US Centers for Disease Control 1985) and with the marked decline in Great Britain following detoxification of domestic gas after 1963 (Kreitman and Platt 1984). To date, however, no fully convincing explanation has been made for the unusual trends in suicide in Japan.

In a previous study (Araki et al. 1986), it was shown that suicide mortality was especially high in young persons in the mid 1950s in Japan; after a serious economic crisis (oil crisis) in late 1973, only the mortality in middle-aged men continued to increase despite the fact that the mortality in young and elderly persons declined. In this study, the cause-specific suicide death rate by age and sex during the period 1950–82 in Japan is analyzed; specific causes of suicide death responsible for these characteristics of age and sex in secular suicide trends are clarified.

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MATERIALS AND METHODS

Annual cause-specific suicide death rates (ICD classification, E950–959) by age (10-year spans) for the years 1950–82 were calculated from the following data in men and women in all Japan (Japan Ministry of Health and Welfare 1953–84): (1) annual suicide deaths by cause and age (5-year spans) and (2) annual population by age (5-year spans) based on the data of national population census in 1950, 1955, 1960, 1965, 1970, 1975 and 1980.

According to the characteristic changes in age-adjusted suicide death rates in men and women during 1950–82 (Araki and Murata 1986b), the cause-and age-specific suicide death rate was compared between the two of the following four time periods by the Wilcoxon's rank sum test in this study: (1) 1950–55, (2) 1956–67, (3) 1968–74 and (4) 1975–82. Secular trends in suicide rate were also analyzed by calculating the Spearman's rank correlation coefficient between suicide rate and calendar-year for each period.

RESULTS

Causes of suicide with increased mortality in mid 1950s

Secular trends in age-specific suicide death rates due to all causes (E950–959) are illustrated in Figs. 1–5. The rates due to two causes, i.e., poisoning by solid and liquid substances (E950) and run over by train and other means (E958, 9), suddenly increased in the mid 1950s in both young men and women (Figs. 1 and

![Fig. 1. Secular trends in age-specific suicide death rates due to poisoning by solid or liquid substances (E950) in men and women. □, □, 15–24 years; ■, ■, 25–34 years; ○, ○, 35–44 years; ●, ●, 45–54 years; △, △, 55–64 years; and ▲, ▲, 65 years and above. The vertical broken lines indicate the years 1956, 1968 and 1975.](image)
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The rate due to poisoning by solid and liquid substances in men aged 15-24 and 25-34 (Fig. 1) reached the highest level in 1955, and significantly decreased between the years 1956-67 and 1968-74 and between 1968-74 and 1975-82 ($p < 0.01$). Similarly, in women aged 15-24 and 25-34, the rate (E950) reached the maximal level in 1958 and successively decreased for the years 1956-67, 1968-74 and 1975-82 ($p < 0.01$). Furthermore, in all other age groups in both men and women, the rate (E950) also slightly increased in the mid 1950s and significantly decreased between the years 1956-67 and 1968-74 ($p < 0.01$); the rate further decreased between 1968-74 and 1975-82 in all age groups except 45-54 years in men and women ($p < 0.05$).

The suicide rate due to run over by train and other means in men and women aged 15-24 (Fig. 2) reached the highest level in 1955 and significantly decreased between the years 1956-67 and 1968-74 ($p < 0.01$). Similar but less conspicuous trends were observed in men aged 25-34 and 65 and above ($p < 0.05$).

**Causes of suicide with increased mortality in middle-aged men after oil crisis**

Suicide death rates due to five causes (E951, 2, E953, E954, E957 and E958, 9) in middle-aged men tended to increase significantly during the period 1975-82 (Figs. 2-4, Table 1). The Spearman’s rank correlation coefficient between suicide rate and calendar-year (Table 1) indicated that the rates due to hanging, strangulation and suffocation (E953) and jumping from high place (E957) in men aged
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Similarly, the rate due to submersion (E954) in men aged 35–44 significantly increased; the rates due to poisoning by domestic, car-exhaust and other gases (E951, 2) and run over by train and other means (E958, 9) in men aged 45–54 increased (Figs. 2–4, Table 1).

The rates due to hanging, strangulation and suffocation (E953) for the years 1975–82 in men aged 35–44 and 45–54 were significantly higher than those for 25–34, 35–44 and 45–54 progressively increased during this period. Similarly, the rate due to submersion (E954) in men aged 35–44 significantly increased; the rates due to poisoning by domestic, car-exhaust and other gases (E951, 2) and run over by train and other means (E958, 9) in men aged 45–54 increased (Figs. 2–4, Table 1).

The rates due to hanging, strangulation and suffocation (E953) for the years 1975–82 in men aged 35–44 and 45–54 were significantly higher than those for

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**Table 1. Spearman’s rank correlations between age- and cause-specific**

<table>
<thead>
<tr>
<th>Cause (ICD number)</th>
<th>15–24</th>
<th>25–34</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poisoning by solid or liquid substances (E950)</td>
<td>−0.619</td>
<td>−0.357</td>
</tr>
<tr>
<td>Poisoning by domestic, car-exhaust or other gases (E951, 2)</td>
<td>−0.970**</td>
<td>−0.905**</td>
</tr>
<tr>
<td>Hanging, strangulation or suffocation (E953)</td>
<td>−0.690</td>
<td>0.762*</td>
</tr>
<tr>
<td>Submersion (drowning) (E954)</td>
<td>−0.881**</td>
<td>−0.500</td>
</tr>
<tr>
<td>Firearms or explosives (E955)</td>
<td>−0.667</td>
<td>−0.405</td>
</tr>
<tr>
<td>Cutting or piercing instruments (E956)</td>
<td>−0.595</td>
<td>−0.476</td>
</tr>
<tr>
<td>Jumping from high place (E957)</td>
<td>0.095</td>
<td>0.786*</td>
</tr>
<tr>
<td>Run over by train or other means (E958, 9)</td>
<td>−0.357</td>
<td>0.048</td>
</tr>
<tr>
<td>All causes (E950–959)</td>
<td>−0.755*</td>
<td>−0.647</td>
</tr>
</tbody>
</table>

* *p < 0.05; ** p < 0.01.

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**Fig. 3. Secular trends in male age-specific suicide death rates due to hanging, strangulation or suffocation (E953) and submersion (drowning, E954).** Signs and vertical lines same as in Fig. 1.
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*annual suicide death rate and calendar-year during 1975-82 in men*

<table>
<thead>
<tr>
<th>Age</th>
<th>35-44</th>
<th>45-54</th>
<th>55-64</th>
<th>≥65</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-0.333</td>
<td>0.357</td>
<td>0.190</td>
<td>0.405</td>
</tr>
<tr>
<td></td>
<td>-0.214</td>
<td>0.762*</td>
<td>0.048</td>
<td>-0.810*</td>
</tr>
<tr>
<td></td>
<td>0.762*</td>
<td>1.000**</td>
<td>0.262</td>
<td>-0.976**</td>
</tr>
<tr>
<td></td>
<td>0.786*</td>
<td>0.262</td>
<td>-0.024</td>
<td>-0.833*</td>
</tr>
<tr>
<td></td>
<td>0.096</td>
<td>0.476</td>
<td>0.500</td>
<td>-0.347</td>
</tr>
<tr>
<td></td>
<td>0.429</td>
<td>-0.143</td>
<td>-0.214</td>
<td>-0.357</td>
</tr>
<tr>
<td></td>
<td>0.786*</td>
<td>0.905**</td>
<td>-0.119</td>
<td>0.119</td>
</tr>
<tr>
<td></td>
<td>0.571</td>
<td>0.976**</td>
<td>0.286</td>
<td>0.143</td>
</tr>
<tr>
<td></td>
<td>0.958**</td>
<td>1.000**</td>
<td>0.383</td>
<td>-0.976**</td>
</tr>
</tbody>
</table>

Fig. 4. Secular trends in male age-specific suicide death rates due to poisoning by domestic, car-exhaust or other gases (E951, 2) and jumping from high place (E957). Signs and vertical lines same as in Fig. 1.

1956-67 and 1968-74 (p < 0.01, Fig. 3). Similarly, the rates due to run over by train and other means (E958, 9) for the years 1975-82 in men aged 25-64 were significantly higher than those for 1968-74; the rates due to domestic, car-exhaust and other gases (E951, 2) for 1975-82 in men aged 15-64 were higher than those for 1950-55, 1956-67 and 1968-74; and the rates due to jumping from high place (E957) for 1975-82 in all age groups were higher than those for 1950-55, 1956-67 and 1968-74 (p < 0.05, Figs. 2 and 4).
In addition, in men aged 45–54, the suicide rates due to two other causes, i.e. firearms and explosives (E955) and cutting and piercing instruments (E956), for the years 1975–82 were significantly higher than those for 1968–74; the rate due to the latter cause (E956) for 1975–82 was also higher than that for 1956–67 ($p < 0.05$, Fig. 5).

**DISCUSSION**

Suicide death rates due to two causes, i.e. poisoning by solid and liquid substances (E950) and run over by train and other means (E958, 9), in young persons remarkably increased in the mid 1950s. Therefore, these factors were responsible for the sudden increase in suicide death in the mid 1950s in Japan.

In the 1950s in Japan, sleeping pills became easily available at pharmacies; the number of young persons who were protected by the police in the street because of drug abuse drastically increased (Japan Ministry of Health and Welfare 1961; Iga et al. 1978). These events provoked serious social problems and led to the formulation of a new national regulation of drug-control in 1961 (Japan Ministry of Health and Welfare 1961). Hereafter, probably due to a strict statutory control, availability of drugs decreased; in consequence, suicide rate due to poisoning by solid and liquid substances (E950) declined.

On the other hand, there is no fully convincing explanation for the increase in suicide due to run over by train and other means (E958, 9) in the mid 1950s. Further studies are needed to investigate the psychobehavioural interaction.

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**Fig. 5.** Secular trends in male age-specific suicide death rates due to firearms or explosives (E955) and cutting or piercing instruments (E956). Signs and vertical lines same as in Fig. 1.
between the two causes of suicide death (E950 and E958, 9) in young people.

During the period 1975–82, suicide death rates due to five causes (E951, 2, E953, E954, E957 and E958, 9) in middle-aged men continued to increase. Similarly, the rates due to six causes including E955 and E956 in middle-aged men were significantly higher for the years 1975–82 than for 1968–74. By contrast, the rates due to all causes in young and elderly men, aged 15–24 and 65 and above, remained unchanged or even decreased significantly during the period 1975–82 (Table 1). According to our study (Araki and Murata 1986a), low income was positively related to suicide mortality for middle-aged men in both 1970 and 1975 in Japan. All these findings suggest that the increase in suicide death rate in middle-aged men during 1975–82 resulted from the decline in economy following the oil crisis.

Acknowledgments

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References