Abstract

- Studies of depression prevalence are plagued by striking but unexplained differences in prevalence between cities, for example:
  - EURODEP: 24.2% depression in Ashburn, USA; 10.6% in Zaragoza, Spain
  - ECA: 14.6% depression in Ashburn, USA; 6.2% in Zaragoza, Spain
- For both studies, high correlations were found between depression prevalence and sunrise time, averaged over one year.
- Average sunrise time is determined primarily by a city’s east-west position within its time zone.
- This suggests that simply shifting time-zone boundaries, or switching to Daylight Saving Time year-round, could reduce depression prevalence.

Introduction

- EURODEP Programme: Geriatric Depression in 9 European Cities:
  - Striking, unexplained differences in prevalence between cities
  - 1° in depression prevalence: London 14.6% vs. Zaragoza 6.2%
  - Epidemiologic Catchment Area (ECA) Study of affective disorder prevalence in 5 U.S. centres:
  - Similar unexplained differences in depression prevalence:
    - 1° depression prevalence: Philadelphia 14.6% vs. Nebraska 6.2%
- Overall differences in prevalence likely due to:
  - Different age groups: EURODEP > ECA > 50
  - Different tools:
    - EURODEP: Geriatric Mental State (structured interview)
    - ECA: Diagnostic Interview Schedule (structured interview)
  - Different diagnostic criteria:
    - EURODEP: AGECAT unstructured diagnostic algorithm
    - ECA: DSM-IIIR criteria
- I explored whether the differences in depression prevalence within each study could be accounted for by differences in sunrise times from one city to another.

Method

- For each city, sunrise times, averaged over one year, were calculated as follows:
  - Obtain coordinates (latitude and longitude) for each city:
  - Obtain a table of daily sunrise times for each set of coordinates for a whole year (1999)
  - Using a spreadsheet, convert sunrise times to decimal values, then average over one year.
- Plot each city’s depression prevalence against its average sunrise time.
- Statistics: Pearson product-moment correlations

Results

- EURODEP depressive neurosis prevalences and average sunrise times appear in Table 1 and are plotted in Figure 1:
  - Pearson product-moment correlation: R = –0.776 (P < 0.0139)
- Examination of figure 1 suggests that two cities, Berlin and Liverpool, are outliers. Replotting without these two cities (Figure 2) demonstrates the extent to which they are outside of the pattern formed by the other 7 cities:
  - Pearson correlation (7 cities): R = –0.995 (P < 0.0001)
- ECA one-year depression prevalences and average sunrise times appear in Table 2 and are plotted in Figure 3:
  - Pearson correlation: R = –0.977 (P < 0.004)

Table 1. Depression Prevalence and Average Sunrise Time, EURODEP Programme

<table>
<thead>
<tr>
<th>Centre</th>
<th>Depressive Neurosis (%)</th>
<th>Average Sunrise Time (hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amsterdam, Netherlands</td>
<td>10.1</td>
<td>6.653</td>
</tr>
<tr>
<td>Berlin, Germany</td>
<td>10.9</td>
<td>5.965</td>
</tr>
<tr>
<td>Dublin, Ireland</td>
<td>11.1</td>
<td>6.271</td>
</tr>
<tr>
<td>Liverpool, United Kingdom</td>
<td>8.3</td>
<td>7.008</td>
</tr>
<tr>
<td>London, United Kingdom</td>
<td>14.4</td>
<td>6.671</td>
</tr>
<tr>
<td>Munich, Germany</td>
<td>13.0</td>
<td>6.914</td>
</tr>
<tr>
<td>Verona, Italy</td>
<td>12.9</td>
<td>6.551</td>
</tr>
<tr>
<td>Zaragoza, Spain</td>
<td>10.7</td>
<td>6.953</td>
</tr>
</tbody>
</table>

Average sunrise time for London’s capital, Reykjavik, was used.

Figure 1. EURODEP Programme: Depressive Neurosis Prevalence vs. Average Sunrise Time

<table>
<thead>
<tr>
<th>City</th>
<th>Depressive Neurosis (%)</th>
<th>Average Sunrise Time (hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Haven, Connecticut</td>
<td>3.4</td>
<td>6.758</td>
</tr>
<tr>
<td>Baltimore, Maryland</td>
<td>1.9</td>
<td>6.608</td>
</tr>
<tr>
<td>St Louis, Missouri</td>
<td>2.6</td>
<td>5.918</td>
</tr>
<tr>
<td>Piedmont County, North Carolina</td>
<td>1.7</td>
<td>6.135</td>
</tr>
<tr>
<td>Los Angeles, California</td>
<td>3.2</td>
<td>5.902</td>
</tr>
</tbody>
</table>

Table 2. One-year Depression Prevalence and Average Sunrise Time, ECA Study

Table 3. ECA Study: One-year Depression Prevalence vs. Average Sunrise Time

References