A short introduction to epidemiology

Chapter 3: Prevalence studies

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Birth

End of Follow up

Death

other death

lost to follow up

“non-diseased”

symptoms

severe disease
Study Design Options

- All epidemiological studies are (or should be) based on a particular population (the *source population*) followed over a particular period of time (the *risk period*)
- The different study design options differ only in how the source population is defined and how information is drawn from this population and time period
Incidence and Prevalence

- **Incidence** is the number of new cases of the condition over a specified period of time.
- **Prevalence** is the number of cases of the condition at a particular point in time.
Chapter 3

Prevalence studies

• Reasons for doing a prevalence study
• Prevalence studies
• Example of a prevalence study
• Prevalence case-control studies
Reasons for Doing a Prevalence Study

• To assess the burden of disease in a population and to assess the need for health services
• To compare the prevalence of disease in different populations
• To examine trends in disease prevalence or severity over time
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\[ \frac{P}{1-P} = I \times D \]

\[ N(1-p) \times I \]

Non-cases

[N(1-P)]

Cases

[NP]

\[ \frac{NP}{D} \]

P = prevalence
I = incidence
D = duration
N = population
Prevalence Studies

- Number (proportion) of people with the disease at a particular point in time
- Under certain assumptions:
  \[ \frac{P}{1-P} = ID \]
  \[ \text{POR} = \frac{I_1 D_1}{I_0 D_0} \]
- Therefore differences in prevalence may be due to differences in incidence, differences in duration, or both
## A Hypothetical Prevalence Study

<table>
<thead>
<tr>
<th></th>
<th>Exposed</th>
<th>Non-exposed</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases</td>
<td>909</td>
<td>476</td>
<td></td>
</tr>
<tr>
<td>Non-cases</td>
<td>9091</td>
<td>9524</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>10,000</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>Prevalence</td>
<td>0.0909</td>
<td>0.0476</td>
<td>1.91</td>
</tr>
<tr>
<td>Prevalence odds</td>
<td>0.1000</td>
<td>0.0500</td>
<td>2.00</td>
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Prevalence studies

- Reasons for doing a prevalence study
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International Study of Asthma and Allergies in Childhood
The Organisation of ISAAC

EXECUTIVE and STEERING COMMITTEE

including

REGIONAL COORDINATORS

NATIONAL COORDINATORS

COLLABORATING CENTRES
Phases

I. Initial overview of the international distribution of the prevalence and severity of asthma, rhinitis, and eczema in childhood

II. Further studies of aetiologic questions will include skin tests for atopy, measurements of lung function and bronchial reactivity, serum IgE levels, physical examination, genetic markers, aeroallergens at home, and clinical management

III. Repetition of Phase One after at least 3 years to determine trends in the prevalence and severity of these diseases
### Phase One methods

<table>
<thead>
<tr>
<th><strong>Design</strong></th>
<th>Multi-centre prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Study area</strong></td>
<td>Areas with populations differing in lifestyle and environmental exposure</td>
</tr>
</tbody>
</table>
| **Study population** | 13-14 year old school children  
6-7 year olds (strongly recommended) |
| **Sample size**    | 3,000 children (minimum 1,000) |
| **Study period**   | July 1992 - December 1995 |
Phase I core instruments:

- written questionnaires, one page each, on the prevalence and severity of asthma, rhinitis, and eczema for self-completion in 13 - 14 year olds (compulsory)

- video questionnaire on the prevalence and severity of asthma for self-completion by 13 - 14 year olds (recommended)

- written questionnaires, one page each, on the prevalence and severity of asthma, rhinitis, and eczema for self-completion by parents of 6 - 7 year olds (recommended)
## Study Centres and Participants
### 13-14 Year Age Group

<table>
<thead>
<tr>
<th>Region</th>
<th>Centre</th>
<th>Participants</th>
<th>Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>10</td>
<td>31,007</td>
<td>93%</td>
</tr>
<tr>
<td>Asia-Pacific</td>
<td>35</td>
<td>103,818</td>
<td>94%</td>
</tr>
<tr>
<td>Eastern/Northern Europe</td>
<td>17</td>
<td>57,300</td>
<td>90%</td>
</tr>
<tr>
<td>Eastern Mediterranean</td>
<td>10</td>
<td>27,460</td>
<td>92%</td>
</tr>
<tr>
<td>Latin America</td>
<td>16</td>
<td>46,545</td>
<td>93%</td>
</tr>
<tr>
<td>North America</td>
<td>5</td>
<td>12,460</td>
<td>81%</td>
</tr>
<tr>
<td>Oceania</td>
<td>10</td>
<td>31,311</td>
<td>91%</td>
</tr>
<tr>
<td>Western Europe</td>
<td>51</td>
<td>132,998</td>
<td>84%</td>
</tr>
<tr>
<td><strong>Global Total:</strong></td>
<td><strong>155</strong></td>
<td><strong>463,801</strong></td>
<td><strong>92%</strong></td>
</tr>
</tbody>
</table>
12 Month Period Prevalence of Asthma Symptoms in 13-14 Year Old Children

- ≥20%
- 10 to <20%
- 5 to <10%
- <5%
Key Findings From ISAAC

• English-speaking countries have the highest asthma prevalence in the world
• There is little variation within the English-speaking countries
• Other countries in Latin America are also high
• There is a Northwest-Southeast gradient within Europe
Key Findings From ISAAC

- There is an inconsistent correlation of asthma prevalence with affluence (as measured by GNP).
- There are some areas (West/East Germany, Hong Kong/Guangzhou) with major prevalence differences within the same ethnic group.
- There is a weak and inconsistent association between asthma prevalence and that of other “atopic” conditions such as rhinitis and eczema.
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**Prevalence**

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### A Hypothetical Prevalence Case-Control Study

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<td>Asthma cases</td>
<td>909</td>
<td>476</td>
<td></td>
</tr>
<tr>
<td>Non-cases</td>
<td>676</td>
<td>709</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1585</td>
<td>1185</td>
<td></td>
</tr>
<tr>
<td>Prevalence odds</td>
<td>1.345</td>
<td>0.671</td>
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</table>
Prevalence Case-Control Studies

This *prevalence case-control study* yields the same estimate as would have been obtained by a prevalence study but with a much smaller number of participants because we include *all* of the prevalent cases but only a *sample* of the non-cases.
Prevalence Case-Control Studies

Oliveti et al (1996), prevalence case-control study of asthma in inner city African-American children

- **Cases**: physician diagnosed asthma with recent symptoms
- **Controls**: non-asthmatics using the same hospital-based clinic
- **Exposures**: perinatal factors
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