

# Measuring morbidity of children in the community: a comparison of interview and diary data

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|-------------------|--|
| <b>Background</b> | Little is known about the validity of estimates of morbidity experienced at home.  |
| <b>Methods</b>    | In the Dutch National Survey of Morbidity and Interventions in General Practice mothers of 1630 children answered a health interview and kept a health diary for 3 weeks (only the first 2 weeks were used). Children's symptoms were recorded during the interview using a check list and monitored in the health diary through open-ended questions.   |
| <b>Results</b>    | In the interview parents reported symptoms for 65% of their children and in the diary for 54% of children. Ear problems, colds, fever and weakness and anxiety were reported more often in the interview. Mother's mental health was assessed by the General Health Questionnaire; those scoring >4 were assessed as having impaired mental health and these parents reported symptoms for more children in the interview (81%) than in the diary (65%). For similar reference periods, the least educated mothers reported fewer children with symptoms in the diary (45%) than in the interview (66%). More highly educated mothers reported similarly in the diary (67%) and the interview (70%). |
| <b>Conclusion</b> | Both data collection methods yield different estimates of community morbidity. Explanations such as telescoping, the seriousness of the symptoms, the amount of psychological distress of the respondent, forgetfulness and literacy limitations are discussed. We recommend that diaries should not be used in less educated populations.   |
| <b>Keywords</b>   | Health interview, health diary, children, morbidity, data collection method, validity  |
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Most estimates of morbidity experienced at home by children are based on parental retrospective interviews. The reliability and validity of these so-called community morbidity estimates are difficult to assess, since comparable figures are hard to get. Previous research demonstrated that people tended to overreport events in retrospective data collection methods like health interviews compared to medical records, but that underreporting occurred as well.<sup>1–3</sup> For community morbidity a comparison of interview data with medical records is not available, since community morbidity is not registered in medical records. An alternative data collection method to measure community-based morbidity is through a health diary, in which people register symptoms on a daily basis. Several investigators have claimed that diary data are valid and reliable and yield a more

comprehensive view of community morbidity than other data collection methods, but empirical evidence is lacking.<sup>4,5</sup> The aim of this study was to compare estimates of community morbidity in one group of children assessed both by a retrospective interview and a health diary in two successive weeks.

Known factors that are related to morbidity estimates for children are age, gender, birth order and ethnic origin of the child, and educational level of the mother.<sup>6</sup> Coughlin stated that age, educational level and socioeconomic status of the respondent also influence reporting accuracy in retrospective interviews.<sup>7</sup> Sullivan *et al.* reported that people with low literacy skills (e.g. ethnic minorities) and lower educational levels have difficulty completing self-administered questionnaires such as diaries.<sup>8</sup> If these factors influence both morbidity estimates and reporting accuracy, then the estimates of community morbidity are probably considerably biased by the data collection method.

Furthermore, Mechanic argued that symptom reports are in part dependent on the respondent's mental state.<sup>9</sup> Kooiker demonstrated that symptom check lists in health interviews are

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sensitive to psychological distress rather than to physical illness alone.<sup>10</sup> For children, usually the mother is the respondent. Whether the mental state of the mother influences the responses for her children is unknown as yet, but crucial for evaluating the accuracy of the responses.

The following questions were addressed in this study. (1) Do a retrospective interview and a prospective diary (self-administered) yield comparable estimates of community morbidity of children? (2) Are these estimates influenced by the age, gender, birth order or ethnic origin of the child, the educational level or the mental state of the mother?

## Methods

In 1987 and 1988 the Dutch National Survey of Morbidity and Interventions in General Practice was carried out in a sample of 161 general practitioners (GPs).<sup>11</sup> In the Netherlands almost everybody is listed with one GP, thus the practice population of a GP can be used for community surveys. For this study we used data from two different measurement instruments: a health interview and a diary. Subjects were obtained by a random sample of 100 people from each practice list of the 161 participating GPs. The sample contained 2561 children aged 0–14 years. People were asked to participate through a letter from their GP. One of the parents was approached to fill in a structured questionnaire about their child (proxy interview). The interview addressed, among other items, health symptoms experienced in the past 2 weeks. The questionnaire had a response rate of 87% (2227 children). The parents of these 2227 children were also asked to keep a structured health diary for 3 weeks, starting the day after the interview. During this diary keeping period the interviewer phoned twice to motivate the respondent and solve any problems. Completeness was checked when collecting the diaries. The response rate for the diary was 81% (1805 children). We restricted the study population to those children for which the mother was the respondent, leaving 1630 children for whom both questionnaire and diary were completed by the mother.

The health interview included a check list of 42 pre-coded symptoms. For each symptom parents could indicate whether it had bothered their child during the last fortnight. For the health diary parents received a 21-page booklet with a simple one-page questionnaire to complete each day. For this study the following questions were relevant: 'did your child have any symptoms relevant to his/her health today?' If so, the parents were asked to describe the symptom in their own words, up to a maximum of two different symptoms per day. Symptoms that lasted more than one day were afterwards combined into episodes of illness. Since the reference period in the interview was 2 weeks, we considered the first 2 weeks of the health diary. An episode of illness was included if the first day with symptoms reported fell within the first 2 weeks.

Ideally we wanted to compare the nature of the morbidity reported by both methods to check on any differences. But since the amount of symptoms per health problem that could be reported was much higher on the check list in the interview than on the diary, we had to restrict this comparison to one symptom per child. Taking into account these different assessments of community morbidity, we were able to compare two things. First, the occurrence of *any* symptom during the 14-day period and

second, the nature of the *most pronounced* symptom reported in the 2 weeks. We ranked the symptoms from most pronounced (somatic) to least pronounced (psychosomatic) in the following order: ear problems, musculoskeletal problems, diarrhoea, fever, cold/flu, stomach problems, headache, tiredness, vomiting, toothache, other problems (rest group), weakness and anxiety. If more symptoms were reported, we only considered the most pronounced. Consequently, all other (less pronounced) symptoms were neglected.

Age, gender, birth order, ethnic origin of the child, and educational level and mental state of the mother were determined in the health interview. Age was grouped into three categories: 0–4, 5–9 and 10–14 years. Birth order was divided into firstborn and those born subsequently. Maternal educational level was categorized into three classes: low (elementary education), middle (continued/secondary education) and high (higher/university education). The mental state of the mother was assessed by the General Health Questionnaire (28-item version) in the interview.<sup>12</sup> We considered a respondent with a score higher than four as having an impaired mental state.

We tested whether the methods yielded the same estimates (overall and broken down by the factors) by means of Pearson  $\chi^2$  test of association with a 5% threshold for statistical significance. Because of differences due to the methods, the occurrence of specific symptoms was tested by means of a binomial test of proportions.

## Results

The characteristics of the 1630 children for whom both morbidity estimates were available, are presented in Table 1.

Table 1 Main characteristics of the research population (N = 1630)

|  | #    | %   |
|--|------|-----|
| Total  | 1630 | 100 |
| <b>Age (years)</b>                                 |      |     |
| 0–4  | 514  | 32  |
| 5–9  | 575  | 35  |
| 10–14  | 541  | 33  |
| <b>Gender</b>                                      |      |     |
| Boys   | 889  | 54  |
| Girls  | 741  | 46  |
| <b>Birth order</b>                                 |      |     |
| Firstborn  | 751  | 46  |
| Later born   | 879  | 54  |
| <b>Ethnic origin of the child<sup>a</sup></b>      |      |     |
| Dutch  | 1410 | 95  |
| Non-Dutch  | 75   | 5   |
| <b>Educational level of the mother<sup>a</sup></b> |      |     |
| Low  | 179  | 11  |
| Middle   | 1237 | 77  |
| High   | 189  | 12  |
| <b>Mental state of the mother</b>                  |      |     |
| GHQ-score <5                                       | 1401 | 86  |
| GHQ-score >4                                       | 229  | 14  |

<sup>a</sup> Education of the mother 25 missing cases; ethnic origin 145 missing cases.

**Table 2** Percentage of children having any symptom and reporting of most pronounced symptom in a 14-day period determined by a health interview and diary

|                                | Interview<br>% | Diary<br>% | Sign <sup>a</sup> |
|--------------------------------|----------------|------------|-------------------|
| Children having any symptom    | 65             | 54         | <0.01             |
| <b>Most pronounced illness</b> |                |            |                   |
| Ear problems                   | 10             | 3          | <0.01             |
| Musculoskeletal problems       | 6              | 7          | >0.01             |
| Diarrhoea                      | 6              | 8          | <0.01             |
| Fever                          | 5              | 3          | <0.01             |
| Colds/flu                      | 22             | 18         | <0.01             |
| Stomach problems               | 3              | 2          | <0.05             |
| Headache                       | 4              | 4          | >0.05             |
| Tiredness                      | 2              | 2          | >0.05             |
| Vomiting                       | 0              | 0          | >0.05             |
| Toothache                      | 1              | 1          | >0.05             |
| Other problems                 | 2              | 7          | <0.01             |
| Weakness                       | 1              | 0          | <0.05             |
| Anxiety                        | 3              | 0          | <0.05             |

<sup>a</sup> Statistical significance assessed by  $\chi^2$ .

Table 2 shows that parents reported the occurrence of symptoms for more children in the interview (65%) than in the diary (54%). Subdivided by most pronounced illness, parents reported substantially more ear problems, colds/flu and weakness and anxiety in their children as having occurred during the 2 weeks in the interview than in the diary. In the diary, only diarrhoea was reported more often.

Table 3 shows the influence of child and maternal features on the occurrence of any illness as determined by both instruments. Given the lower occurrence in the diary, age and gender of the child yielded no modifying effect. Parents reported more problems for the firstborn and non-Dutch children, but of similar magnitude in both instruments. The last two factors, maternal mental state and educational level, influenced symptom occurrence differently in the interview than in the diary. In case of a higher GHQ-score, both instruments registered more children with any illness. However, the difference in children with any symptom between the respondents with a normal and a higher GHQ-score was larger in the interview (19%) than in the diary (13%), although this was not statistically significant. The most notable difference between the instruments was found for educational level of the mother. In the interviews the percentages of children with symptoms were almost equal over the various educational categories, whereas in the diary a clear gradient became apparent. The least educated mothers reported fewer children with symptoms in the diary (45%) compared to the interview (66%) as well as compared to the highly educated mothers in the diary (67%), whereas the highly educated mothers reported comparable figures in the interview and diary. To check whether any symptom was systematically under-reported in the diary by the least educated mothers, we compared the distributions of most pronounced symptoms by maternal educational level. We observed more or less similar distributions for each category of educational level,

**Table 3** Comparison of reporting any illness during 2 weeks in an interview and a 2-week diary by 1805 parents by child's age, gender, birth order, ethnic origin and educational level and mental state of the mother

|  | Interview<br>% | Diary<br>% | Sign <sup>a</sup> |
|--|----------------|------------|-------------------|
| Total                                  | 65             | 54         |                   |
| <b>Age (years)</b>                     |                |            |                   |
| 0-4                                    | 66             | 57         |                   |
| 5-9                                    | 66             | 53         |                   |
| 10-14                                  | 64             | 53         | >0.05             |
| <b>Gender</b>                          |                |            |                   |
| Boys                                   | 65             | 55         |                   |
| Girls                                  | 65             | 54         | >0.05             |
| <b>Birth order</b>                     |                |            |                   |
| Firstborn                              | 69             | 57         |                   |
| Later born                             | 62             | 52         | >0.05             |
| <b>Ethnic origin of the child</b>      |                |            |                   |
| Dutch                                  | 64             | 54         |                   |
| Non-Dutch                              | 67             | 60         | >0.05             |
| <b>Educational level of the mother</b> |                |            |                   |
| Low                                    | 66             | 45         |                   |
| Middle                                 | 65             | 54         |                   |
| High                                   | 70             | 67         | <0.05             |
| <b>Mental state of the mother</b>      |                |            |                   |
| GHQ-score <5                           | 63             | 53         |                   |
| GHQ-score >4                           | 82             | 66         | >0.05             |

<sup>a</sup> Statistical significance assessed by  $\chi^2$ .

so no specific symptom was underreported by least educated mothers.

## Discussion

The main conclusion of this study is that a health interview and a self-administered diary yielded different estimates of community morbidity. The same mothers reported more morbidity for their children in the interview than in the diary. Age, gender, birth order and ethnic origin of the child did not influence the reporting of morbidity in both methods differently. The mental state of the mother and, most importantly, the educational level of the mother influenced the comparability. Impaired mental state in the mother yielded somewhat more morbidity as reported in the interview. A low maternal educational level yielded much less morbidity in the diary, whereas a high maternal educational level yielded equal estimates of morbidity in interview and diary.

The difference in morbidity estimates questions the validity of both instruments. Both instruments are assumed to measure the same community morbidity over a specific period. Our first major finding, that in the interview more and different morbidity is reported than in the diary, contradicts this assumption. Also, these results contradict the statements of Verbrugge and Dahlquist who claimed that a diary yields more symptoms ('a more comprehensive picture') than an interview.<sup>4,5,13</sup> Since

we lack a gold standard for measuring community morbidity, we do not know what the true prevalence is in this group of children. Also after excluding mothers with less education and an impaired mental state, the differences between both methods remained. Therefore, we cannot say which instrument is most valid. Several mechanisms may cause higher estimates for specific morbidity categories in an interview than in a diary. First, a forward telescoping effect in an interview causes more morbidity in general because respondents recall events as having occurred more recently than they actually did. Further it is established that more obvious illnesses are recalled better than less serious illnesses, an effect even more pronounced in proxy interviews. Together this results in a parent reporting greater morbidity from serious problems.<sup>14</sup> The higher prevalences of the illnesses, ear problems, fever and colds/flu in the interview supported the presence of this mechanism. The different manner of reporting symptoms (filling in a check list in the interview versus an open-ended question in the diary) causes a non-uniform definition of symptoms. A check list of symptoms in an interview, being an aid to recall minor symptoms, encompasses more (trivial) symptoms than a respondent would probably consider when answering an open-ended question in a diary. Our data showed that trivial symptoms as weakness and anxiety (symptoms on the check list) were reported only in the interview and not in the diary. It is probable that parents did not consider these symptoms as health problems suitable for the health diary.

Our data also demonstrate that the mental state of the respondent resulted in more problems being reported in the interview than in the diary. In contrast to previous speculation that the mental state only affects symptom check list scores, we demonstrated that this relation was also present for the open-ended question diary data, though less notable.<sup>10,15</sup>

Finally, reporting more morbidity in the interview could also be a consequence of structurally reporting less morbidity in the diary, for which a common cause is simply forgetting to fill in the diary each day.

The second major finding is that the reported morbidity in the diary is highly related to the educational level of the mother. Based on diary data only, the conclusion would be that children from mothers with higher educational levels have more health problems. This conclusion totally contradicts the established fact that children from mothers with lower educational levels (as indicator for lower socioeconomic groups) have more health problems than children from mothers with higher educational levels.<sup>6</sup> Together with the absence of the relation in the interview data, we must conclude that these diary-based community morbidity estimates are seriously biased. These results support the conclusion of Sullivan *et al.* that, due to literacy limitations, self-administered questionnaires should not be used in less educated people.<sup>8</sup>

Due to the stepwise inclusion of mothers, selection bias may have been introduced at several stages. The first selection was caused by the non-response to the interview. We cannot check whether this selection has any impact because data on this group of non-responders was lacking. Other non-response studies of survey data have demonstrated that people from lower socioeconomic groups (e.g. less educated mothers) refuse to participate more often. A second potential source of bias were the parents who answered the health interview but refused to

keep the diary. Additional analyses showed that less educated parents and parents belonging to an ethnic minority refused to keep the diary more often. A third potential source of bias was the exclusion of fathers as respondents. Supplementary analyses showed that no differences were found in response rates between fathers and mothers. In conclusion, the higher percentages of non-responders in the less educated group further support our conclusions that the validity of the self-reported data in less educated groups is dubious.

A limitation of the presented material is that the instruments referred to different time periods, which might cause an invalid comparison. Because the time periods were short (2 weeks) and successive, we assumed that this limitation did not cause any problems.

A second limitation is that, in the diary, people reported a maximum of two health problems per day, whereas in the interview people ticked 42 symptoms on a check list covering perhaps more health problems. To deal with this incompatibility of methods we assumed that both methods registered at least the most pronounced health problem. Hence, we restricted the analysis on the nature of the symptoms to the most pronounced health problem per child. The order of pronounced health problems was set arbitrarily, because parents did not have to indicate the relative importance of the health problems. So, the absolute prevalences of the health problems are probably incorrect. Nevertheless, we were only interested in the comparison of the prevalences and these results showed that, besides the overall difference in the reporting of any symptom, the comparisons differed by specific symptoms. Thus, we conclude that also the reporting of specific symptoms is subject to various methodological biases.

We must conclude that prevalence estimates of community morbidity of children reported by their mothers are strongly affected by the data collection method used.

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