Childhood Morbidity in Dutch General Practice

epidemiology and management

Morbiditeit bij kinderen in de huisartspraktijk

epidemiologie en beleid

Financial support by the Department of General Practice, Erasmus University Rotterdam is gratefully acknowledged

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Proefschrift

ter verkrijging van de graad van doctor aan de
Erasmus Universiteit Rotterdam
op gezag van de
Rector Magnificus

Prof.dr. S.W.J Lamberts

en volgens besluit van het College voor Promoties.

De openbare verdediging zal plaatsvinden op
woensdag 15 december 2004 om 11:45 uur

door

Joanne Bernardine Marie Otters
geboren te Culemborg

Promotiecommissie

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1. General introduction

Introduction

Children consult their general practitioner frequently and general practitioners deal with childhood morbidity in their surgery daily.[1 2] However, with the ageing of the population, children's health tends to become a neglected area in health research and health care research, which is unjustified considering that the children of today are tomorrow's adults and that many research questions in this field are still unanswered.[3]

Measuring and monitoring children's health is important for several reasons.[4 5]
Firstly, by measuring child's health over time, trends in childhood morbidity can be identified such as the emergence of new health problems or changing morbidity patterns.[7]
Consequently, this may necessitate a shift of priorities in order to optimise the current child health care. Moreover, knowledge about such trends is important because they prelude on possible trends in adolescence and adulthood.
Secondly, health and disease of the future population originates in childhood. For example, an increase of obesity of children has been reported throughout the developed world. If childhood obesity persists into adulthood,[6] this will directly lead to an increase of obesity related diseases in the population during the next decade.
Thirdly, the recognition of trends in childhood morbidity also offers opportunities for early preventive measures and early interventions. In the example of childhood obesity, one could think of a more active attitude of governments or primary health care workers in preventing the persistence of childhood obesity into adulthood.[8]

General practitioners in the Netherlands are gatekeepers for secondary medical care and all health problems in the population, for which professional help is sought, are presented primarily in general practice. Therefore, measurement of morbidity in Dutch general practice provides an overview of the health of the population and also provides insight in health care use. As Dutch general practitioners control specialty referrals, insight is also gained in the demand for secondary (outpatient) care.
The past decades are characterised by changes in children's socio-demographics and health care changes in the Netherlands,[11]and childhood morbidity presented in general practice and general practitioners' management may have changed accordingly.

The aim of this thesis is to present an overview of childhood morbidity in Dutch general practice (part I) and of general practitioners' management of diseases in childhood (part II), and also to evaluate changes in morbidity and management during the past decades. Moreover, the aim is to identify determinants of morbidity and changes in management in order to provide tools for improvement of clinical care and prevention of diseases.

To achieve these aims, data of two successive Dutch nation-wide surveys in general practice are studied (1987 and 2001).[9 10] More detailed information of these surveys is presented in **chapter 2**.

Part I

In **chapter 3** of this thesis, current childhood morbidity is measured and changes in morbidity are examined. Children's socio-demographics changed during the past decades and as previous survey studies have shown that childhood morbidity varies between rural and urban areas,[12 13] ethnic background,[14-18] and socio-economic status,[19 20] childhood morbidity presented in general practice will probably have changed.[7] Comparisons are made at a general level, but also at a disease-specific level. In **chapter 4**, acute tonsillitis, a frequently encountered disease in general practice, is examined in more detail.[21] Furthermore, in **chapter 5**, the health burden of injuries in children is measured. Children are injured accidentally often, but detailed information of the burden in children is lacking.[22 23] In part, this may be explained by the heterogeneity of injuries and methodological difficulties of injury research. Although research performed in secondary care settings provide some insight in determinants of childhood injuries,[24] additional and valuable information can be gained when data are collected in a primary care setting. Moreover, identifying child or family characteristics associated with unintentional injuries in primary care could provide healthcare workers with tools for prevention.[25 26] The concept of injury-proneness is studied in **chapter 6**. Although debated in the international literature,[27-29] there seems to be a certain group of children that experience repeated injuries. These children are studied in this chapter in an attempt to characterise these children that are at high risk for experiencing injuries.

Chapter 7 studies the daily health consequences of a 'modern disease', childhood obesity, because there is evidence that childhood obesity is increasing in the Netherlands.[30] The general perception is that obesity in children is a threat for future health but yields no immediate health consequences. Moreover, little is known about self perceived health or daily health problems in overweight or obese children.

Part II

This thesis also examines general practitioners' management and possible variations therein. In **chapter 8**, specialty referrals for all conditions and changes during the past decades are examined. Although a considerable proportion of all children in the general population are referred to a specialist each year,[11 31] detailed information on general practitioner referral patterns of children, which provides general practitioners and specialists a framework of their own practice, is scarce.[31-33] Moreover, even less information is available on how referral patterns evolve in time, which is a useful reference for the demand of secondary outpatient care, now and in the near future.

General practitioners' prescribing patterns are examined in **chapter 9**. Prescription of antibiotics is focussed on because these are prescribed often for children. [34 35]Although Dutch general practitioners are low antibiotic prescribers,[36 37] several nation-wide studies have reported an inappropriately high use of antibiotics.[38] As a considerable variation between general practitioners in antibiotic drug prescribing has been reported previously,[39 40] this is examined in detail as well.

Research aims

The research aims of this thesis are:

1. To describe morbidity patterns in children in Dutch general practice
    a) to identify changes between 1987 and 2001 and to assess whether changes are explained by socio-demographic changes in the childhood population
    b) to assess the burden of unintentional injuries in children and to identify children at risk for experiencing unintentional injuries
    c) to assess the health of overweight and obese children, compared with children without overweight and to assess which children are at risk for overweight or obesity

2. To describe general practitioners' management
    a) to examine referrals to specialists and changes with 1987
    b) to compare current antibiotic prescribing patterns with 1987, and to assess whether certain practice characteristics are associated with inappropriate antibiotic prescribing

These aims were achieved by studying data of the first and second national survey of Dutch general practice. The following chapter (2) describes the study design of both national surveys.

References

1. Rowlands S, Moser K. Consultation rates from the general practice research database. Br J Gen Pract 2002;52:658-60.
2. Bruijnzeels MA, van Suijlekom-Smit LWA, van der Velden J, van der Wouden JC. The child in general practice, Dutch national survey of morbidity and interventions in general practice. Rotterdam: Erasmus University,1993.
3. Kohler L. Child public health. A new basis for child health workers. Eur J Public Health 1998;8:253-5.
4. Forrest CB. child health services research, Challenges and Opportunities. JAMA 1997;277:1787-1793.
5. Rigby MJ, Kohler LI, Blair ME, Metchler R. Child health indicators for Europe: a priority for a caring society. Eur J Public Health 2003;13(Suppl):38-46.
6. Fuentes RM, Notkola IL, Shemeikka S, Tuomilehto J, Nissinen A. Tracking of body mass index during childhood: a 15-year prospective population-based family study in eastern Finland. Int J Obes Relat Metab Disord 2003;27:716-21.
7. Fleming DM, Cross KW, Olmos LG, Crombie DL. Changes in practice morbidity between the 1970 and 1981 national morbidity surveys. Br J Gen Pract 1991;41:202-6.
8. Netherlands HCot. Overweight and obesity. The Hague: Health Council of the Netherlands, 2003.
9. Schellevis FG, Westert GP, de Bakker DH., Groenewegen PP, van der Zee J, Bensing JM. De tweede Nationale Studie naar ziekten en verrichtingen in de huisartsenpraktijk: aanleiding en methoden. Huisarts & Wetenschap 2003;46:7-12.
10. Foets M, van der Velden J, de Bakker D. Dutch national survey of general practice. A summary of the survey design. Utrecht, Netherlands: NIVEL, 1992.
11. Statistics Netherlands. Voorburg/ Heerlen, 2003.
12. Nicolai T. Epidemiology of pollution-induced airway disease: urban/rural differences in East and West Germany. Allergy 1997;52(Suppl):26-9; discussion 35-6.
13. Ng'ang'a LW, Odhiambo JA, Mungai MW, Gicheha CM, Nderitu P, Maingi B, et al. Prevalence of exercise induced bronchospasm in Kenyan school children: an urban-rural comparison. Thorax 1998;53:919-26.
14. Balarajan R, Yuen P, Soni Raleigh V. Ethnic differences in general practitioner consultations. BMJ 1989;299:958-60.
15. Bruijnzeels MA, van der Wouden JC, Foets M. General practice consultation in childhood in The Netherlands: sociodemographic variation. J Epidemiol Community Health 1995;49:532-3.

16. Saxena S, Eliahoo J, Majeed A. Socioeconomic and ethnic group differences in self reported health status and use of health services by children and young people in England: cross sectional study. BMJ 2002;325:520.
17. Versluis-van Winkel SY, Bruijnzeels MA, Lo Fo Wong SH, van Suijlekom-Smit LW, van der Wouden JC. No difference in frequency of family practitioner consultation by Turkish, Surinam and Moroccan 0-14-year-old children from Dutch children, but difference in reason for contact (Dutch). Ned Tijdschr Geneeskd 1996;140:980-4.
18. Smaje C, Grand JL. Ethnicity, equity and the use of health services in the British NHS. Soc Sci Med 1997;45:485-96.
19. Saxena S, Majeed A, Jones M. Socioeconomic differences in childhood consultation rates in general practice in England and Wales: prospective cohort study. BMJ 1999;318:642-6.
20. Yuen P, Balarajan R. Unemployment and patterns of consultation with the general practitioner. BMJ 1989;298:1212-4.
21. van Suijlekom-Smit LW, Bruijnzeels MA, van der Wouden JC, van der Velden J, Visser HK, Dokter HJ. For which health problems in children is the family physician consulted and how often? (Dutch). Ned Tijdschr Geneeskd 1995;139:1684-9.
22. Pickett W, Streight S, Simpson K, Brison RJ. Injuries experienced by infant children: a population-based epidemiological analysis. Pediatrics 2003;111:e365-70.
23. Satcher D. From the Surgeon General. JAMA 2000;284:950.
24. Haynes R, Reading R, Gale S. Household and neighbourhood risks for injury to 5-14 year old children. Soc Sci Med 2003;57:625-36.
25. Towner E, Dowswell T, Jarvis S. Updating the evidence. A systemic review of what works in preventing childhood unintentional injuries: Part 2. Inj Prev 2001;7:249-53.
26. Towner E, Dowswell T, Jarvis S. Updating the evidence. A systematic review of what works in preventing childhood unintentional injuries: part 1. Inj Prev 2001;7:161-4.
27. Wright P. Is saying NO to 'accident proneness' throwing the baby out with the bathwater? Inj Prev 1997;3:79-80.
28. Langley J. The "accident prone" child -- the perpetration of a myth. Aust Paediatr J 1982;18:243-6.
29. Langley JD. 'Accident proneness': statistical and practical significance. Inj Prev 1997;3:80-1.
30. Hirasing RA, Fredriks AM, van Buuren S, Verloove-Vanhorick SP, Wit JM. Increased prevalence of overweight and obesity in Dutch children, and the detection of overweight and obesity using international criteria and new reference diagrams (Dutch) Ned Tijdschr Geneeskd 2001;145:1303-8.
31. Van Suijlekom-Smit LW, Bruijnzeels MA, van der Wouden JC, van der Velden J, Visser HK, Dokter HJ. Children referred for specialist care: a nationwide study in Dutch general practice. Br J Gen Pract 1997;47:19-23.

32. Van den Bosch WJHM, Bor H, van Weel C. Verwijzen van kinderen in vier huisartspraktijken. Huisarts Wet 1992;45:267-71.
33. Surender R, Bradlow J, Coulter A, Doll H, Brown SS. Prospective study of trends in referral patterns in fundholding and non-fundholding practices in the Oxford region, 1990-4. BMJ 1995;311:1205-8.
34. Ferris TG, Saglam D, Stafford RS, Causino N, Starfield B, Culpepper L, et al. Changes in the daily practice of primary care for children. Arch Pediatr Adolesc Med 1998;152:227-33.
35. Majeed A, Moser K. Age- and sex-specific antibiotic prescribing patterns in general practice in England and Wales in 1996. Br J Gen Pract 1999;49:735-6.
36. Molstad S, Lundborg CS, Karlsson AK, Cars O. Antibiotic prescription rates vary markedly between 13 European countries. Scand J Infect Dis 2002;34:366-71.
37. Cars O, Molstad S, Melander A. Variation in antibiotic use in the European Union. Lancet 2001;357:1851-3.
38. Schirm E, van den Berg P, Gebben H, Sauer P, De Jong-van den Berg L. Drug use of children in the community assessed through pharmacy dispensing data. Br J Clin Pharmacol 2000;50:473-8.
39. Van der Ven-Daane I, Van der Ven M, Bruijnzeels MA et al. Het voorschrijven van antibiotica aan kinderen in de huisartspraktijk. Huisarts Wet 1992;35:272-4.
40. Mainous AG, 3rd, Hueston WJ, Love MM. Antibiotics for colds in children: who are the high prescribers? Arch Pediatr Adolesc Med 1998;152:349-52.

2. Study Design

Study designs of the first and second Dutch national survey of general practice

The second Dutch national survey of general practice was conducted in 2001, in succession of the first national survey which was performed in 1987. This thesis is based on data of the second survey. Moreover, in several chapters data of both national surveys are compared. Both surveys were designed and performed by the Netherlands Institute for Health Services Research (NIVEL). The designs of the surveys are roughly comparable (scheme):

Participating practices, general practitioners and practice populations

Second national survey	**First national survey**
12 months survey in 2001	3 months survey in 1987
Participating general practitioners and practices	
195 general practitioners in 104 practices participated. Of these, 61 practices were already existing 'LINH' practices, and therefore familiar with continuous registration. The other 43 practices were recruited on the basis of several characteristics to ensure national representativity.	161 general practitioners in 103 practices participated, a non-proportional stratified random sample of Dutch general practitioners.
Nationwide representativity	
Participating general practitioners were representative for age and gender. Practices were representative for settlement in region, urban or rural area and deprived areas. There was an underrepresentation of single-handed practices.	Participating general practitioners were representative for age and gender There was an underrepresentation of single-handed practices in rural and deprived areas.

Overall study population: all patients registered in the practices	
The study population consisted of 395,271 patients and can be considered a dynamic cohort, with patients entering and leaving the study population during the registration period. Patients were representative for the Dutch population of 2001.	The study population consisted of 332,303 patients and is a closed or fixed cohort. Because of the underrepresentation of deprived and urban areas, the patient population was weighed to the Dutch population of 1987 to correct this underrepresentation. There was an underrepresentation of ethnic minorities.
Study population studied in this thesis	
Children aged 0-17 years were studied, a total of 82,053 children.	Children aged 0-17 years were studied, a total of 86,577 children.

Population characteristics and measures

Baseline characteristics of the study population such as age and gender were derived from practice files. Other characteristics were obtained by mailed questionnaire and filled out by patients or by children themselves, if older than 12 years of age. For both surveys the response rate was 70-90% for different variables. From the non-responders, age and gender, and type of health insurance, was derived from practice files.

Ethnicity

If either parent was born in Turkey, Africa, Asia (except Japan and Indonesia), Central or South America, their children were considered to be of non-western origin in this study (in accordance with the classification of Statistics Netherlands). All other children were grouped into a baseline group, defined as western children. Hence, among children of western origin are children from the native population and children from parents born in western countries.

Socio-economic status

In both surveys the classification of socio-economic status were based on parents' level of education and occupation.

Second national survey	First national survey
Registration of morbidity	
During 12 months, in practice computers	During 3 months on specially designed registration forms. To correct for seasonal fluctuation of morbidity, general practitioners were divided into four groups and each group registered during one of the four consecutive three-months periods.

Of all contacts (including out-of-hours consultations) between patients and practice, the diagnoses made by general practitioners were registered during the study period. If a child presented with more than one health problem during a consultation, these health problems were registered separately. Both surveys were episode orientated, which means that consultations concerning the same health problem were grouped into one disease episode. A consultation concerning a new health problem, according to the general practitioner, marks the beginning of a new episode.

Coding of episodes by ICPC	
General practitioners coded disease episodes themselves in practice computers using ICPC	Specially trained NIVEL clerks coded all disease episodes using ICPC

Registration of referrals and prescription

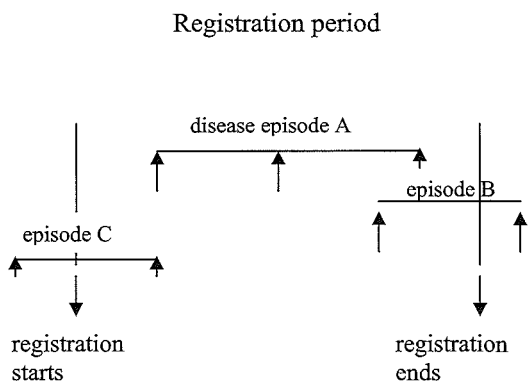
All referrals to primary or secondary care were registered with the referring diagnoses and specialty referred to. A distinction was made for new referrals (when a child was referred for a specific health problem for the first time). In the second survey only new referrals to secondary care were registered. All prescribed drugs were coded by ATC and by diagnosis the prescription was issued for.

Issues comparing both surveys

Considerable effort has been put into optimizing comparability of both surveys; however, some methodological differences between both surveys are inevitable.
The following differences must be considered when comparing data of both surveys:

1. Difference in study period
In 1987, general practitioners registered during three months; in 2001, general practitioners registered during 12 months.
Incidence rates are calculated by dividing the number of new disease episodes by 1000 person years. If several consultations for the same health problem are made in time; difficulties can occur when comparing both surveys.

This is illustrated in the figure:



Disease episodes A and B are classified as new episodes; disease episode C is coded as existing episode. From this figure it becomes clear that in the shorter registration period, it will occur more often that episodes are coded as existing than in the survey of 2001 with a 12 months registration period. This could result in an underestimation of incidence rates in 1987, if yearly incidence rates are computed from 3-month incidence rates.

However, because most illness in children is acute, the majority of the disease episodes in children consist of a single general practitioner contact. Indeed, in both surveys 83% of the new episodes consist of one general practitioner contact only. So, fortunately, when comparing annual incidence rates in children this difference in registration period is of minor importance.

2. ICPC coding differences

In 1987, ICPC coding was performed by trained clerks; in 2001, the coding was performed by general practitioners themselves. This resulted in some coding differences between both surveys. It appeared that in the second survey a higher proportion of diagnoses were coded with symptom ICPC codes (codes 0-29) such as diarrhoea (D11) or cough (R05).
It is hypothesized that in the first survey, the workers tended to code disease episodes with disease specific diagnoses such as infectious diarrhoea (D70) or as acute upper airway infection (R74) more often. These coding differences between the surveys must be considered when comparing occurrence of specific diseases. Especially if incidence rates of infrequent diseases are evaluated interpretation must be carried out with caution.

3. Use of the weight factor in 1987

Because of the underrepresentation of deprived and urban areas in the survey of 1987, the population was weighed to correct for morbidity presented in these areas. In common disorders in children such as respiratory tract infections, comparability of rates between both surveys will be more valid. However, in rare diseases the weight factor may lead to skewed rates.

Conclusion

Comparing morbidity between both surveys in children is reliable, provided that common and frequent diseases are compared, or, if comparison is made on ICPC chapter level.

Part I

Childhood morbidity in general practice: epidemiology

3. Changing morbidity patterns in Dutch general practice: 1987-2001

Abstract

Objective To examine the presentation and pattern of childhood morbidity in general practice compared with fourteen years ago, against the background of changing demography and increasing ethnic heterogeneity in children.

Methods We used data of all children aged 0-17 years from two cross-sectional surveys performed in 1987 and 2001 in general practice in the Netherlands. The total number of children in the practices participating in these surveys was 86,577 children in 1987 and 82,053 children in 2001. Consultation rates of children in general practice were compared. Childhood morbidity was assessed by episodes of disease, coded according to the International Classification of Primary Care (ICPC). Childhood morbidity in 1987 and 2001 was examined by comparing the distribution of episodes among ICPC chapters stratified by ethnicity, and by comparing incidence rates of most frequently presented diseases.

Results Childhood consultation rates have decreased from 2.7 visits a year per child in 1987 to 2.1 in 2001. The distribution of episodes among ICPC chapters has also changed. Respiratory problems are still the most frequently presented health problem in children but the proportion has decreased from 25.5% in 1987 to 23.3% in 2001. Skin problems were presented more often (23% in 2001 versus 17.8% in 1987), and western children more often presented with skin problems with than respiratory problems in 2001. Incidence rates of most respiratory diseases have decreased and specific skin diseases (such as dermatomycosis, impetigo and eczema) were diagnosed more often.

Conclusion In the Netherlands, childhood morbidity has changed parallel with changing childhood demographics. Skin diseases have become more important in general practice and respiratory problems are declining.

Introduction

Changes in childrens' sociodemographic characteristics and in child health service characterise the past decades in the Netherlands. Whereas the birth rate of the native population has been decreasing, the higher birth rate and influx of ethnic populations has increased the racial and ethnic heterogeneity of the childhood population, particularly in urban areas.[1] Currently, it is estimated that more than 13% of all 0-17 year olds belong to ethnic minority groups, compared with less than 7% 15 years ago.

During the last decade, several changes have occurred in the Dutch Health Service. For example, in 1993 a vaccination scheme for Haemophilus influenza type B was implemented, which led to an impressive decrease of invasive Haemophilus influenzae infections.[2] Another development related to childhood morbidity is the world wide increase of asthma and allergy-related diseases, which is related to the now generally accepted hygiene theory.[3 4]

All these changes may affect childrens' morbidity patterns presented in general practice. Surveys have shown that the presentation of childhood morbidity varies between rural and urban areas[5 6], as well as with social class[7-9] and ethnic background.[10] Little is known, however, about the extent to which changes in childhood population and health care over time have affected the daily practice of the general practitioner. Assessing trends in childhood morbidity presented to the general practitioner is relevant for all primary care workers, as it provides insight in the dynamics of changing prevalence and incidence of diseases over time.
This study investigated the incidence of childhood morbidity in Dutch general practice compared with fourteen years ago, in the context of changes in child health care and sociodemographic changes, and assessed whether changes in childhood morbidity can be explained by changes in childhood sociodemographics.

Methods

Data were analysed from the second Dutch national survey of morbidity and interventions which was performed by the Netherlands Institute for Health Services Research (NIVEL) in 2001.[11] A secondary analysis using data from the first Dutch national survey (1987) was performed.[12] Details of both surveys are summarised in table 1.

Table 1. Design survey 1987 and survey 2001

	First National Survey	**Second National Survey**
Period	1987	2001
Registration period	3 months	1 year
GPs and practices	161 GPs, 103 practices	195 GPs, 104 practices
underrepresentation:	deprived areas, single-handed practices	single-handed practices
Study Population total:	332,303	394,192
(0-17 years):	86,577	82,053 (mid-time population)
underrepresentation:	ethnic minorities	-
Data Collection	episode orientated using ICPC	
	on registration forms	in practice computers
	ICPC coding by specially trained clerks	ICPC coding by general practitioner

Participating practices and general practitioners

Survey 1987

In the first national survey, a non-proportionally stratified sample of all registered Dutch general practitioners was randomly selected to participate in the study: a total of 161 general practitioners in 103 practices. The participating general practitioners and practices were representative for Dutch general practitioners and practices of 1987 with respect to age and gender. However, there was an underrepresentation of single-handed practices and of practices in deprived areas.

Survey 2001

In the second survey, 195 general practitioners in 104 practices participated in the study. The participating general practitioners and practices were representative for Dutch general practitioners and practices of 2001 with respect to age and gender and location deprived areas. However, there was an underrepresentation of single-handed practices (32% instead of 44% nationwide).

Eight practices participating in the second survey were excluded from this analysis for the following reasons: in two practices the extraction of morbidity data from practice computers failed due to technical reasons; one practice registered only during three months; five other practices were excluded because of insufficient quality of the morbidity registration.

Study population

Survey 1987

The total study population of the first survey consisted of 332,303 patients, a 2.3% sample of the Dutch population of 1987. A weighting formula was applied to correct for underrepresentation of the population in deprived areas. For this study data from 86,577 children aged 0-17 years were used.

Survey 2001

The total practice population in the second survey consisted of 394,192 patients, a 2.5% sample of the Dutch population. The study population is representative of the Dutch population for age, gender, degree of urbanisation, social class and ethnic minority groups. For this study data were analysed from 82,053 children aged 0-17 years (mid-time population).

Registration of morbidity data

During the study period all physician-patient contacts were registered. Each contact with the general practitioner is defined as one consultation and during one consultation a child could present with more than one health problem. All health problems presented within one consultation were recorded separately. Both surveys were episode orientated, meaning that different consultations concerning the same health problem are linked to one episode. A consultation concerning a new health problem marks the beginning of a new episode. If there were several consultations in a single episode, the

last diagnosis made is considered the diagnosis of the episode. Diagnoses made by the general practitioner were coded using the International Classification of Primary Care (ICPC-1).[13] Out-of-hours consultations were also registered.

Registration period survey 1987

General practitioners were divided into four groups and each group registered all contacts between patient and practice on registration forms during one of the four consecutive 3-month periods during 1987, thus taking into account seasonal variation. Diagnoses made by the general practitioner were coded afterwards by specially trained clerks.

Registration period survey 2001

In the period 2001, general practitioners registered all contacts during one year in practice computers, and coded the diagnosis themselves.

Population characteristics and measures

Baseline characteristics of the study population such as age and gender were derived from practice files. Other characteristics were obtained by a mailed questionnaire and filled out by parents or by the children themselves if they were older than 12 years. The response rate of both surveys ranged from 70% to 90% for different variables.

Ethnicity

Ethnicity was derived from country of birth from either parent. If either parent was born in Turkey, Africa, Asia (except Japan and Indonesia), Central or South America, their children were considered to be children of non-western origin in this study (in accordance with the classification of Statistics Netherlands). All other children were defined as western children. Hence, among children of western origin are children from the native population and children from parents born in other western countries.

Analysis

All data of children aged 0-17 years were analysed from both surveys. Consultation rates were calculated by dividing the number of consultations by the number of children years followed. Rates of diseases in general practice were calculated by dividing the number of episodes by the number of children years followed. Incidence rates were calculated by evaluating all new health problems. Differences in incidence rates of most frequent new diagnoses made were tested assuming a Poisson distribution. The statistical package SPSS 11.0 was used for analyses.

Results

Study populations of both surveys

The study population of the first survey consisted of 86,577 children, of which 34,217 (39.5%) consulted the general practitioner during the 3-month study period. They presented with a total of 50,692 health problems (mean: 2.3 health problems per child per year). The study population of the second survey consisted of 82,053 children aged 0-17 years, of which 60,082 (72%) consulted their general practitioner at least once during the study year. They presented 147,376 health problems (mean: 1.8 health problems per child per year).

Consultation rates

In 1987 children on average had 2.7 consultations per child per year; the consultation rate for non-western children was 2.9. Consultation rates in 2001 decreased; the mean annual childhood consultation rate in 2001 was 2.1; and 2.3 for non-western children.

All episodes of disease

Table 2 shows the distribution of all episodes of disease among the ICPC chapters for 1987 and 2001.

Table 2. All episodes of disease among the ICPC chapters, 1987 and 2001.

ICPC chapter	Survey 1987		Survey 2001	
	Total	(%)	Total	(%)
A General	7,951	(15.6%)	11,545	(7.8%)
B Blood	653	(1.3%)	1,438	(1.0%)
D Digestive tract	4,044	(8.0%)	11,934	(8.1%)
F Eye	1928	(3.8%)	6,040	(4.1%)
H Ear	3,856	(7.6%)	13,176	(8.9%)
K Circulatory tract	242	(0.5%)	689	(0.5%)
L Musculoskeletal tract	4,740	(9.3%)	14,730	(10.0%)
N Nervous system	881	(1.7%)	3,598	(2.4%)
P Psych. Problems	887	(1.7%)	3,849	(2.6%)
R Respiratory tract	12,975	(25.5%)	34,363	(23.3%)
S Skin diseases	9,026	(17.8%)	33,968	(23.0%)
T Metabolism	615	(1.2%)	1,285	(0.9%)
U Urinary tract	662	(1.3%)	2,783	(1.9%)
W Pregnancy/ labour	883	(1.7%)	3,338	(2.3 %)
X Female tract	684	(1.3%)	2,622	(1.8%)
Y Male tract	358	(0.7%)	1,492	(1.0%)
Z Social problems	306	(0.6%)	525	(0.4%)
Total	50,692	(100%)	147,376	(100%)

In both surveys health problems concerning the respiratory (R) tract were presented most frequently, followed by skin problems. The proportion of respiratory diseases presented in general practice has decreased from 25.5% in 1987 to 23.3% 2001, whereas the proportion of episodes concerning the skin has increased from 17.8% in 1987 to 23% in 2001. In 2001 fewer episodes were coded with a general or unspecified diagnosis from the A chapter than in 1987(7.8% vs. 15.6%, respectively).

All episodes of disease by ethnic background

Figures 1a,b show the distribution of the episodes among western and non-western children in 1987 and 2001.Western children consulted their general practitioner more often with skin problems in 2001 than with respiratory problems, which was the most frequent diagnosis in 1987. Non-western children were most frequently seen in general practice with respiratory problems in 2001, and this was also the case in 1987.

Figure 1a. Distribution of all episodes of disease, stratified by western and non-western children, survey 1987

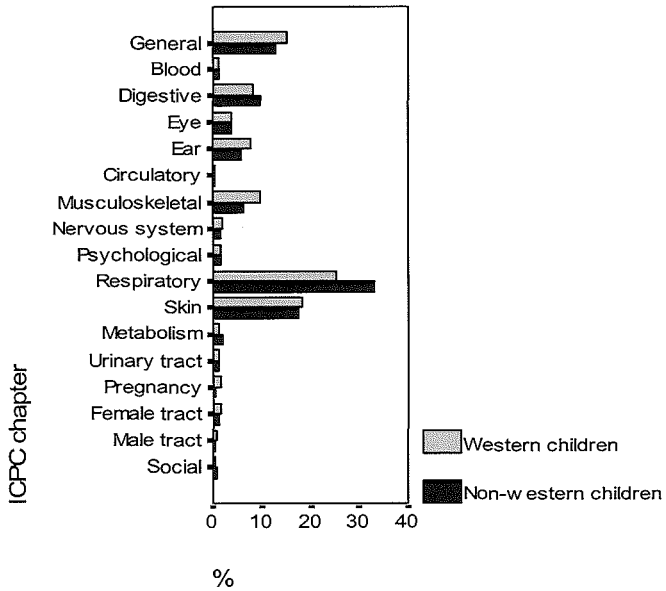
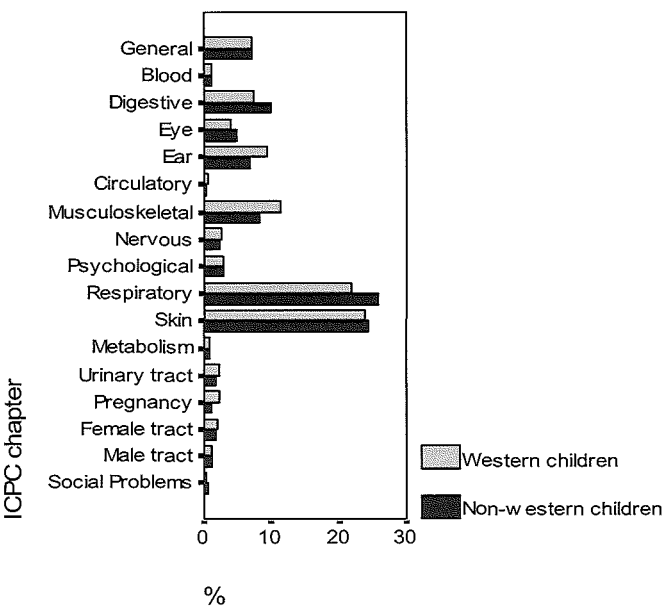


Figure 1b. Distribution of all episodes of disease, stratified by western and non-western children, survey 2001



Top 20 diagnoses

Table 3 shows differences in presented health problems in more detail by comparing the incidence rates of the top-20 new diagnoses made by the general practitioner in 2001. Incidence rates of these diagnoses are presented for 1987 with corresponding ranking number. The difference in incidence rates of all diagnoses was tested, comparing incidence rates of 2001 with 1987. Except for the diagnoses 'cut/laceration' (S18) and 'serous otitis media'(H72), incidence rates of the top-20 diagnoses of 2001 were statistically significantly different from those in 1987. In the second survey these diagnoses comprised 42% of all episodes of disease in children. The incidence rates for most respiratory diseases have decreased by 50% or more. Incidence rates and ranking for dermatomycosis, impetigo, constitutional eczema and conjunctivitis increased significantly in 2001.

Table 3. Incidence rates of 20 most frequent diagnosis (per 1000 person years)

ICPC Diagnosis	**National survey 1987**		**National survey 2001**	
	Incidence rate	**rank**	**Incidence rate**	**rank**
R74 Acute respiratory tract infection	209.2	1	95.7	1
H71 Acute otitis media	92.8	2	60.5	2
R05 Cough	42.7	9	51.0	3
S03 Warts	45.6	6	34.3	4
R78 Acute bronchitis	61.3	3	26.3	5
S74 Dermatomycosis	20.9	16	25.4	6
S88 Eczema NEC	33.1	11	22.9	7
D73 Gastrointestinal infection	36.7	10	21.0	8
S84 Impetigo	16.5	23	20.5	9
F70 Infectious conjunctivitis	9.4	41	20.4	10
S18 Cut, laceration	23.4	14	20.3	11
R76 Acute tonsillitis	44.9	7	19.0	12
A03 Fever	7.0	52	18.8	13
S87 Constitutional eczema	11.2	36	16.5	14
U71 Urinary tract infection	18.6	19	15.5	15
A04 General weakness	9.0	42	15.0	16
H72 Serous otitis media	14.8	25	14.3	17
A77 Viral infection	48.1	5	13.9	18
R96 Asthma	18.8	18	13.3	19
W11 Oral anticonception	6.7	53	12.7	20

Discussion

This large and representative survey shows that childhood morbidity, presented in general practice in the Netherlands, has changed considerably during the past decades. In general, children visited the general practitioners' office less often and presented with fewer and different health problems in 2001 than in 1987.

Consultation rates

In the survey of 2001, children consulted their general practitioner less often, the mean consultation rate decreased from 2.7 in 1987, to 2.1 consultations per year in 2001. This is surprising because in light of the increasing workload and demand for care nowadays in Dutch general practice,[14] one would expect equal or even higher consultation rates. This decrease in consultation rate can not be explained by registration differences between both surveys: in 2001 the routinely collected electronic patient files were used for registration of consultations and no additional effort was required to register consultations; in 1987 the more elaborate registration on paper forms would rather have led to an underestimation and not overestimation of consultation rates. Moreover, our findings are consistent with other national data sources,[1] which also showed a decline in consultation rates in children.

Morbidity patterns

Nowadays skin diseases are presented almost as often as respiratory tract diseases. Compared with 1987, fewer health problems concerning the respiratory tract are presented, but there are significantly more skin diseases (Table 2). In 2001, non-western children still consult their general practitioner most often with respiratory problems, but for western children skin diseases appear to be the main health problem. To our knowledge this ethnic difference in morbidity presented to general practitioners has not been reported previously. Furthermore, from table 3 it becomes clear that the incidence rates of skin diseases (e.g. dermatomycosis, impetigo and allergic skin diseases) have increased substantially. We hypothesized an increase of allergic skin diseases and our results are compatible with reported trends of increasing allergic skin diseases.[15 16] However, trends of increasing incidence rates of impetigo and dermatomycosis in general practice have not been reported earlier. The increasing use of day-care and

after-school activities in the Netherlands might explain the increase of these infectious skin diseases.

The number one diagnosis made by general practitioners continues to be upper respiratory tract infections, but the incidence rate has decreased considerably (Table 3). There are various possible explanations. First, the vaccination for Haemophilus Influenzae type B could also have led to a decreasing incidence rate of respiratory tract diseases.[2] Another explanation could be that it is not the incidence rates for respiratory tract problems that have decreased, but the consultation rates for respiratory tract problems have decreased. Whatever the reason we can only speculate that, for example, parents nowadays are better informed how to handle respiratory problems themselves and consult general practice less often with these infections. Also, in recent years the cost of prescribed cough medicine is no longer reimbursed by health insurance, which could have been the reason for consulting the general practitioner during the first survey.

This study had some limitations. Firstly, data from the first Dutch survey had to be weighted in order to correct for morbidity presented in urban areas, which could result in less precise estimates of infrequent diseases. However, in this report only the most frequent diseases are reported separately. Secondly, ICPC coding was not performed in the same way in both surveys and this could explain the difference in episodes in the general chapter A. Also, the proportion of symptom diagnoses, such as cough (R05) and fever (A03), is higher in the survey of 2001. We assume that coding by clerks in the first survey more often led to a diagnosis-specific ICPC code, than in the second survey where general practitioners coded themselves. These differences should be considered when comparing incidence rates of both surveys, and may explain part of the difference in incidence rate of these symptom diagnoses (Table 3).

Only few studies have assessed trends in childhood morbidity over time. Ferris et al. showed changes in childhood primary care during two decades, which were associated with an increase of ethnic and racial diversity.[17] The results of our study also imply that with the increasing heterogeneity of the Dutch childhood population morbidity patterns are also changing. This is important, not only for the daily practice of general practitioners and for the general practitioner vocational training programmes but also has wider consequences for the National Health Service. Primary healthcare workers

should be aware of the declining consultation rates for respiratory problems and increasing importance of skin diseases. For example, more dermatological expertise could be implemented in the vocational training programme and Continuing Medical Education programmes for general practitioners. Dermatologists may also expect more referrals for children.

Conclusion

Parallel with the increasing ethnic heterogeneity in the childhood population and changes in child health care, childhood morbidity presented in general practice has changed over the past fifteen years. Most striking are the increasing incidence rates of skin diseases in children and the decreasing proportion of respiratory tract problems presented in general practice.

References

1. Statistics Netherlands. Statistisch Jaarboek 2002. Voorburg/ Heerlen; 2002.
2. Conyn-van Spaendonck MA, Veldhuijzen IK, Suijkerbuijk AW, Hirasing RA. Significant decline of the number of invasive Haemophilus influenzae infections in the first 4 years after introduction of vaccination against H. influenzae type B in children (Dutch) Ned Tijdschr Geneeskd 2000;144:1069-73.
3. Martinez FD. The coming-of-age of the hygiene hypothesis. Resp Research 2001;2:129-32.
4. Strachan DP. Family size, infection and atopy: the first decade of the "hygiene hypothesis". Thorax 2000;55(Suppl 1):S2-10.
5. Nicolai T. Epidemiology of pollution-induced airway disease: urban/rural differences in East and West Germany. Allergy 1997;52(Suppl):26-9.
6. Allen C, Palta M, D'Alessio DJ. Incidence and differences in urban-rural seasonal variation of type 1 (insulin-dependent) diabetes in Wisconsin. Diabetologia 1986;29:629-33.
7. Mustard CA, Frohlich N. Socioeconomic status and the health of the population. Med Care 1995;33 (Suppl):DS43-54.
8. Fleming DM, Charlton JR. Morbidity and healthcare utilisation of children in households with one adult: comparative observational study. BMJ 1998;316:1572-6.
9. Egbuonu L, Starfield B. Child health and social status. Pediatrics 1982;69:550-7.
10. Saxena S, Eliahoo J, Majeed A. Socioeconomic and ethnic group differences in selfreported health status and use of health services by children and young people in England: cross-sectional study. BMJ 2002;325:520.
11. Westert GP, Schellevis FG, de Bakker DH, Groenewegen PP, Bensing JM, van der Zee J. Monitoring health inequalities through General Practice: the Second Dutch National Survey of General Practice. Eur J Publ Health, in press.
12. Foets M, van der Velden J, de Bakker D. Dutch national survey of general practice. A summary of the survey design. Utrecht, Netherlands: NIVEL, 1992.
13. Lamberts H, Wood M, Hofmans-Okkes I. The International Classification of Primary Care in the European Community, with a multilanguage layer. First edition. Oxford: Oxford University Press, 1987.
14. Harmsen JA, Bernsen RM, Bruijnzeels MA, Bohnen AM. General practitioner's workload: objective increase in 9 practices in Rotterdam and surroundings, 1992-1997 and an extrapolation to 2005 (Dutch). Ned Tijd Genknde 2001;145:1114-8.

15. Aberg N, Hesselmar B, Aberg B, Eriksson B. Increase of asthma, allergic rhinitis and eczema in Swedish schoolchildren between 1979 and 1991. Clin Exp Allergy 1995;25:815-9.
16. Williams HC. Is the prevalence of atopic dermatitis increasing? Clinical and Exp Dermatol 1992;17:385-91.
17. Ferris TG, Saglam D, Stafford RS, Causino N, Starfield B, Culpepper L, et al. Changes in the daily practice of primary care for children. Arch Pediatr Adolesc Med 1998;152:227-33.

4. Acute tonsillitis in children in Dutch general practice

Abstract

Objective To assess whether changes occurred in incidence rates and management of acute tonsillitis among children in the age of 0-17 years in Dutch general practice.
Methods A comparison was made between two national surveys in Dutch general practice (1987 and 2001) among children aged 0-17 years. Incidence rates were compared by age, sex, degree of urbanisation and socio-economic status. To assess the management of the general practitioner, we differentiated in a wait-and-see policy, prescription and referral to hospital.
Results The incidence rate per 1000 person years was 44.9 in 1987 against 19.1 in 2001. In 2001, a wait-and-see policy was found more often compared with 1987 (34% versus 20% respectively) and fewer broad-spectrum antibiotics were prescribed.
Conclusion We found a decreasing incidence of acute tonsillitis among children in Dutch general practice. General practitioners' management of this disease has changed and is now more in accordance with the Dutch guideline for general practice.

Introduction

Sore throat is a common reason for parents to consult the general practitioner with their child. For children, it is the fourth most common complaint presented in general practice,[1] and the underlying disease is often an acute tonsillitis.[2] In general, this infection has a viral origin.[3] In the early 90's of the previous century, a declining incidence rate of acute tonsillitis was reported.[4] Therefore, it is of interest to assess whether incidence rates of this disease decreased further and to assess the magnitude of this decline.

The guideline 'acute sore throat' of the College of Dutch General Practitioners, which was published first in 1990 and revised in 1999, recommends a wait and see policy in patients that have a low risk for complications and in patients without serious co-morbidity.[5,6] A systematic review of the literature showed that there are several effective drugs to alleviate the symptoms of a sore throat.[7]
Antibiotics are prescribed often for acute tonsillitis, although antibiotics shorten the symptomatic disease course only by several hours.[8,9] Therefore, a wait and see policy is justified. If an antibiotic is prescribed for acute tonsillitis, narrow-spectrum antibiotics such as phenethicillin or phenoxymethylpenicillin are the antibiotics of first choice according to the guideline.[6] In the international literature there is no consensus as when to refer a child with tonsillitis to secondary care. In the Dutch guideline, referral to secondary care is recommended if a child experiences more than three episodes of acute tonsillitis in one year.

It is well known that children in urban areas and children from lower socio-economic class consult general practice more often,[10] and this is probably associated with a poorer health in these children.[11] Also, incidence rates of many infectious diseases vary by age and gender.[4] This should also be considered, when describing occurrence of acute tonsillitis.

By using data from the first (1987) and second (2001) national survey in Dutch general practice, we addressed the following research questions:

- What is the incidence rate of acute tonsillitis in children presented in general practice in 2001, compared with 1987?
- What are the differences in the occurrence of acute tonsillitis by age, gender, degree of urbanisation or socio-economic class?
- Has general practitioners' management changed in 2001, compared to 1987?

Methods

Data of children aged 0-17 years were used from the first and second national survey of Dutch general practice, carried out by the Netherlands Institute for Health Services Research (NIVEL).

First national survey

During the first survey data were collected in 103 general practices (161 general practitioners). The general practitioners were divided into four groups of approximately 40 general practitioners, and each group registered all contacts between patient and practice during one of the four consecutive three-month periods.[12] Details of each contact (e.g. diagnosis, referral and prescription) were registered on specially designed forms. The diagnoses were coded by trained clerks using ICPC (International Classification of Primary Care).[13]

Second national survey

104 practices (195 general practitioners) participated in the second survey.[14] Data were collected in practice computers and the general practitioners coded the diagnosis themselves with ICPC. Each practice registered during one year. Data of eight practices were excluded from analysis, because of insufficient quality of the morbidity data.

Episodes of disease

Both national surveys were episode orientated which provides more reliable and comparable rates of disease. An episode is a period of illness for which the general practitioner is consulted. In this study, all new episodes of acute tonsillitis were assessed (ICPC code R76). For both surveys, incidence rates were calculated per 1000 person years.

To address the second research question, children were divided into four age groups: 0-4 years, 5-9 years, 10-14 years and 15-17 years. Degree of urbanisation was based on the number of inhabitants and was classified into four groups: 'the three large cities (The Hague, Amsterdam and Rotterdam)'; 'other cities > 50,000 inhabitants'; '30-50,000 inhabitants' and < 30,000 inhabitants'. Child's socio-economic status was based on occupation and level of education of either parent and classified in three groups: high, middle and low. [15]

We used multivariate Poisson regression analysis to assess the association between these characteristics and the incidence rates of acute tonsillitis in 2001 (SAS 8.2, procedure GENMOD).

To examine general practitioners' management, drug prescriptions and referrals to medical specialists were evaluated.

Drug prescription was assessed in five categories of different drug prescriptions: narrow-spectrum antibiotics; broad-spectrum antibiotics, pain medications such as acetaminophen and salicylates, symptomatic airway medications (e.g. decongestives) and a group which included all other drug prescriptions. Narrow-spectrum antibiotics included phenethicillin and other narrow-spectrum penicillins; broad-spectrum antibiotics included tetracyclins, macrolides, cephalosporins and broad-spectrum penicillins.

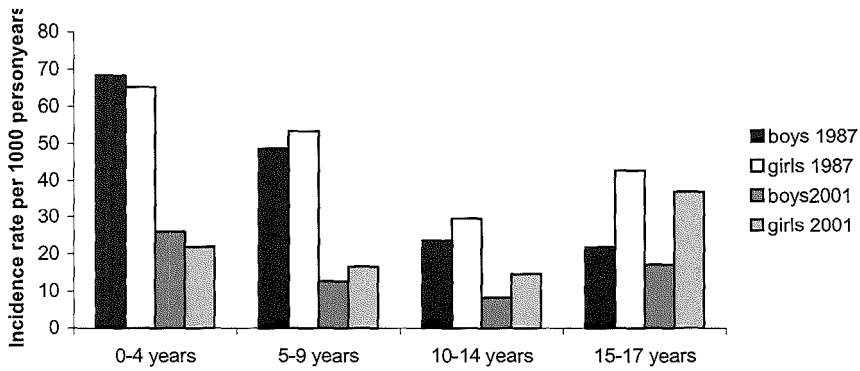
In the analysis of referrals to secondary care, we did not include the number of episodes preceding the referral because of the limited registration period in the first survey.

Results

Incidence rates

The total number of children aged 0-17 years was 86,577 in 1987 (3 months registration period), and 82,053 in 2001 (12 months registration period). The number of new episodes of acute tonsillitis was 971 in 1987, and 1561 in 2001. We calculated the incidence rate per 1000 person years for both surveys: 44.9 in 1987 and 19.1 in 2001. In 2001, the incidence rate decreased with more than 50%. Figure 1 shows incidence rates by age and gender.

Figure 1. Incidence rates of acute tonsillitis in 1987 and 2001 by age and gender



In both surveys, incidence rates in the 0-4 year old children were slightly higher in boys than in girls, whereas in the older children, girls had higher incidence rates.
Table 1 shows the results of the multivariate analysis (2001). Adjusted for the other demographic variables, incidence rates were highest in girls, in age groups 0-4 and 15-17 years, with residence in the large cities and from the lower socio-economic class.

Table 1. Incidence rates 2001, results multivariate analysis

	relative incidence rate†	**95% confidence interval**
Gender		
boys	.70	.61 - .80
girls (reference category)	1.00	-
Age categories		
0-4 years	.91	.77 – 1.08
5-9 years	.47	.39 - .57
10-14 years	.38	.31 - .46
15-17 years (reference category)	1.00	-
Degree of urbanisation		
< 30,000 inhabitants	.69	.52 - .91
30 – 50,000 inhabitants	.69	.51 - .94
> 50,000 inhabitants excluded 3 large cities	.62	.46 - .83
3 large cities (reference category)	1.00	-
Socio-economic class		
non-manual, high/middle	.83	.70 - .99
non-manual, low/farmers	.93	.78 – 1.10
manual	1.00	-

† relative incidence rate = incidence rate compared to the reference category

General practitioners' management

A wait-and-see policy (no prescription-no referral) was observed more often in 2001 (20% in 1987 and 34% in 2001) (table 2).

Table 2. General practitioners' management of acute tonsillitis in children, 1987-2001

	First national survey (1987)		Second national survey (2001)	
	% (of total number of episodes = 971)	% (of total number of prescriptions = 1014)	% (of total number of episodes = 1561)	% (of total number of prescriptions = 931)
Wait-and-see	20%		34%	
Drug prescribing				
Antibiotics	71%	68%	56%	92%
Analgesics	13%	13%	2%	3%
Symptomatic airway medication	12%	11%	0%	0%
Other and unknown	8%	8%	3%	5%
Total		100%		100%

Furthermore, general practitioners prescribed less broad-spectrum antibiotics in 2001. In 2001, children aged 15-17 years were prescribed narrow-spectrum antibiotics most often (29%). In 1987, these children were prescribed fewer narrow-spectrum antibiotics compared to the other children (19%). In both surveys, the 0-4 year olds had highest prescription rates.

At the time of both surveys, phenethicillin and phenoxymethylpenicillin were the narrow spectrum antibiotics of choice, in 1987 mainly phenethicilin was prescribed, in 2001 mainly phenoxymethylpenicillin was prescribed. The proportion of narrow-spectrum antibiotics (of all prescribed antibiotics) increased from 56% in 1987, to 66% in 2001 ($p<0.01$). Of the broad-spectrum antibiotics, amoxicillin was prescribed most often in both surveys. Macrolides were prescribed significantly more in 2001: 10% of all prescribed antibiotics in 2001 compared to 4% of all prescribed antibiotics in 1987 ($p<0.01$) (table 3)

Table 3. Types of antibiotics prescribed for children with acute tonsillitis (0-17 years), 1987 and 2001

	1987 (n=682)	2001 (n=854)
Narrow-spectrum		
-phenithicillin	35%	29%
-phenoxymethylpenicillin	20%	37%
-other penicillins	1%	0%
Total narrow-spectrum	56%	66%
Broad-spectrum		
-amoxicillin	35%	21%
-other penicillins	1%	2%
-macrolides	4%	10%
-tetracyclins	3%	1%
-cephalosporins	1%	0%
Total broad-spectrum	44%	34%

In 2001, the proportion of prescribed analgesics and symptomatic airway drugs decreased significantly in all age-groups (table 2).

In 1987, general practitioners referred 6.2% (60 referrals/971 episodes) of the children with newly diagnosed acute tonsillitis to secondary care; 95% these referrals were to ENT-specialists. In 2001, 5.3% (83 referrals/1561 episodes) of all children were referred, and again the majority (96%) was referred to ENT specialists.

Discussion

Our results show a significant decrease in incidence rates of acute tonsillitis in children aged 0-17 years in general practice. General practitioners' management has changed as well. In 2001, they decided for a wait-and-see policy more often, and prescribed less broad-spectrum antibiotics.

What are possible explanations for the decreasing incidence rates? Only a small fraction of all childhood complaints are presented to the general practitioner. Especially complaints that do not worry parents are not presented often.[10] In 2001, consultation rates decreased by approximately 25%, and this is one of the explanations for lower

incidence rates of acute tonsillitis (chapter 3). Lower consultations rates for sore throat may also be caused by the fact that symptomatic medications were no longer reimbursed by insurance companies in 2001, as was the case in 1987. Therefore, parents might buy these drugs in a drugstore first, postponing consultation to general practice. However, the decline in consultation rate can only explain about half of the decrease in incidence rate.

There were coding differences between both surveys: in 1987, trained clerks coded the diagnoses; in 2001, general practitioners coded the diagnoses themselves. Could this explain the difference in incidence rates? If so, a difference between symptom diagnoses and disease-specific diagnoses between both surveys would explain the difference in incidence rate of acute tonsillitis. The incidence rate of the symptom diagnosis 'sore throat' was 4.1 per 1000 person years in 1987 and 10.5 per 1000 person years in 2001.

Although an increase of the symptom diagnosis is observed, this increase is relatively small and may only explain little of the observed decrease in incidence rate of acute tonsillitis.

Another possibility is that the incidence of sore throat in the general population may have decreased significantly over time. However, health interviews with children (or their parents) proved that this was not the case. In 1987, 2887 children were interviewed and asked whether they had a sore throat during the past 14 days. 12.1% of the children responded that this was the case. In 2001, 11.4% of all interviewed children (3010) had complained of a sore throat over the past 14 days *(personal communication NIVEL)*. So, this minor decline does not contribute to the decrease in incidence rate in general practice.

In 1993, the Haemophilus Influenzae type B (Hib) vaccine was incorporated in the Dutch child vaccination programme.[16] Hib causes meningitis and upper airway infections. In a period prior to the Hib vaccination researchers demonstrated, by microbiological analyses of patients with chronic tonsillitis, that Hib was found in the throat swabs in 1 out of 14 patients (7%).[17] Therefore, we hypothesize that the Hib vaccination has no -to little- effect in the decrease of acute tonsillitis incidence rates in children that were vaccinated for Hib during the second survey (the 0-8 year olds). The relatively high incidence rate that was found in the 15-17 year old children may be explained by infections with the mononucleosis infectiosa virus.[18]

In 2001, the 15-17 year olds were prescribed narrow-spectrum antibiotics most often, whereas the 0-4 year olds were prescribed broad-spectrum antibiotics most. Prescribing a broad-spectrum antibiotic in patients with a mononucleosis infectiosa virus may cause an allergic reaction and may contribute to the decision to choose for a narrow-spectrum antibiotic in 15-17 year olds.[19] In children aged 0-4 years, upper airway infections may be more generalised and acute tonsillitis may be part of a disease-complex in a child, for example a child may have tonsillitis and acute otitis media.[20] In that case a broad–spectrum antibiotic is more appropriate.

In the analysis of prescriptions, we could not make a distinction in the order in which drugs were prescribed, and therefore we have no insight in the sequence of the general practitioners' management. In 2001, more episodes of acute tonsillitis were without prescriptions; still, in the majority of the episodes general practitioners did prescribe drugs. This finding is in contrast with the guideline for acute tonsillitis, in which a wait-and-see policy is recommended. Unfortunately, we do not have information of general practitioners' advice about over-the-counter drugs.

In conclusion, the incidence rate of acute tonsillitis in children decreased, however, neither the decline in consultation rate, nor the increase in incidence rate of sore throat, or the introduction of the Hib vaccine can explain this decrease. Probably, the Dutch guideline of sore throat and the Dutch studies that support the guideline with evidence, [21,22] have been of importance in changing general practitioners' prescribing pattern (e.g. increasing prescription of narrow-spectrum antibiotics) and may, in part, be a reason why parents (and children) consult the general practitioner less often with a sore throat.

References

1. Bruijnzeels MA, van Suijlekom-Smit LWA, van der Velden J, van der Wouden JC. The child in general practice (Dutch). Rotterdam: Erasmus University, 1993.
2. Van de Lisdonk EH, van den Bosch WJHM, Huygen FJA, Lagro-Jansen ALM. Morbidity in general practice (Dutch). 2nd edition. Utrecht: Bunge, 1994.
3. Jacobs RF. Judicious use of antibiotics for common pediatric respiratory infections. Pediatr Infect Dis J 2000; 19: 938-43.4.
4. Ruwaard D, Kramers PGN. Volksgezondheid Toekomst Verkenning. Health status of Dutch citizens in the period 1950-2010 (Dutch). Rijksinstituut voor Volksgezondheid en Milieuhygiëne. Den Haag: SDU, 1993.
5. Dagnelie CF, Zwart S, Balder FA, Romeijnders ACM, Geijer RMM. NHG-guideline acute sore throat (Dutch). Huisarts Wet 1990; 33: 323-6.
6. Dagnelie CF, Zwart S, Balder FA, Romeijnders ACM, Geijer RMM. NHG-guideline acute sore throat (first revision) (Dutch). Huisarts Wet 1999; 42: 271-8.
7. Thomas M, Del Mar C, Glasziou P. How effective are treatments other than antibiotics for acute sore throat? Br J Gen Pract 2000; 50: 817-20.
8. Van der Ven M, Van der Ven-Daane I, Bruijnzeels MA, van der Wouden JC, van Suijlekom-Smit LWA, van der Does E. The antimicrobial treatment of acute tonsillitis in children in Dutch general practice (Dutch). Huisarts Wet 1993; 36: 134-6.
9. Del Mar CB, Glasziou PP, Spinks AB. Antibiotics for sore throat (Cochrane Review). In: The Cochrane Library, Issue 2, 2003. Oxford: Update Software.
10. Bruijnzeels MA, Foets M, Van der Wouden JC, Van den Heuvel WJA, Prins A. Everyday symptoms in childhood: occurrence and general practitioner consultation rates. Br J Gen Pract 1998; 48: 880-4.
11. Hoogendoorn D. Acute rheumatic disease and acute glomerulonephritis; current clinical incidence and mortality in the Netherlands. Ned Tijdschr Geneeskd 1989; 133: 2334-8.
12. Foets M, van der Velden J, de Bakker D. Dutch national survey of general practice. A summary of the survey design. NIVEL, Utrecht; 1992.
13. Lamberts H, Wood M (eds). International classification of primary care. Oxford: Oxford University Press, 1987.
14. Schellevis FG, Westert GP, de Bakker DH, Groenewegen PP, van der Zee J, Bensing JM. De tweede Nationale Studie naar ziekten en verrichtingen in de huisartsenpraktijk: aanleiding en methoden. Huisarts Wet 2003;46:7-12.
15. Statistics Netherlands. Standaard Beroepenclassificatie 1992, editie 2001. Heerlen: CBS, 2001.

16. Inspectie voor de Gezondheidszorg.Vaccinatietoestand Nederland per 1 januari 2002. Den Haag: IGZ, 2003.
17. Brodsky L, Moore L, Stanievich J. The role of heamophilus influenzae in the pathogenesis of tonsillar hypertrophy in children. Laryngoscope 1988: 98: 1055-60.
18. Macsween KF, Crawford DH. Epstein-Barr virus-recent advances. Lancet Infect Dis 2003; 3: 131-40.
19. Renn CN, Straff W, Dorfmuller A, Al-Masaoudi T, Merk HF, Sachs B. Amoxicillin-induced exanthema in young adults with infectious mononucleosis: demonstration of drug-specific lymphocyte reactivity. Br J Dermatol 2002: 147: 1166-70.
20. Behrman RE, Kliegman RM. Nelson Essentials of Pediatrics. Philadelphia: Saunders, 2002.
21. Dagnelie CF. Sore throat in general practice (thesis). Utrecht: Universiteit Utrecht, 1994.
22. Zwart S. Sore throat, streptococci and penicillin: studies on beta-hemolytic streptococci and penicillin treatment in acute sore throat in general practice (thesis). Utrecht: Universiteit Utrecht, 1999.

5. Epidemiology of unintentional injuries in childhood

Abstract

Objective To assess the incidence of unintentional injuries in general practice, and to identify children at risk for experiencing an unintentional injury.

Methods We used data of all 0-17 year old children of a representative survey in 96 Dutch general practices in 2001. Consultations related to unintentional injuries were selected. We computed incidence rates by age gender and type of injury. Multilevel multivariate regression analysis in different age strata identified patient and maternal characteristics associated with elevated injury risk.

Results 9484 new injury episodes were identified from 105,353 new health problems presented in general practice giving an overall incidence rate of 115 per 1000 person years (95% confidence interval 113 to 118). Of all injuries, 35% (3339/9484) were lesions of the skin; 31% (2894/9484) were complaints/sprains of extremities. Gender and residence in rural areas are strong predictors of injury in all age strata. Also, in children aged 0 to 4 years a higher number of siblings is associated with elevated injury risk ($\geq$3 siblings odds ratio1.57, 95%CI 1.19 to 2.08) and in the 12 to 17 year olds, ethnic background, mothers age and socio-economic class are associated with experiencing an injury (non-western children odds ratio 0.67, 95%CI 0.54-0.81; younger maternal age 1.12, 95%CI 1.01-1.26; low socio-economic class 1.39, 95%CI 1.22-1.58).

Conclusion Unintentional injury is a significant health problem in children in general practice, accounting for 9% of all new health problems in children. In all age groups, boys in rural areas are especially at risk to experience an injury.

Introduction

It is estimated that 1 out of 4 children receives medical attention for an injury each year, in either primary or secondary care.[1-3] Most studies concerning childhood injuries have been performed in a hospital/emergency care setting, providing valuable information on epidemiology and heterogeneity of the nature of accidents presented in a secondary care setting. However, because at least half of all injuries in children that seek medical attention is handled by general practitioners, surprisingly few studies on childhood injuries have been performed in primary care.[3 4] Since the base of the iceberg of injuries is seen in general practice, additional and valuable insight in the epidemiology of childhood injuries and associated characteristics is achieved when studied in a primary care setting.
Research performed in the secondary care setting has provided some insight in the determinants associated with injuries in children presented at the emergency department. Noteworthy are the well-documented gender differences showing that boys are injured more often,[2 5 6] probably related to the more risk-taking nature of the male sex.[7] Less clear is the socio-economic gradient: some researchers report a positive association with low-income families or unemployment of the father,[8] whereas others find no association with socio-economic class at all. [9] Other possible determinants of childhood injuries include ethnicity, residence in rural areas,[10] and younger maternal age.[11]
Recognising and understanding the determinants associated with childhood injuries presenting in general practice may provide healthcare workers with possible tools for prevention.

The objective of this study is to estimate the incidence of childhood injuries presenting in primary care by age and gender in order to quantify the occurrence in children and to establish the determinants of children at risk for injuries.

Methods

Second National Survey of General Practice

Data of children aged 0-17 years were used from the second Dutch national survey of general practice, performed by the Netherlands Institute for Health Services Research (NIVEL) in 2001.[12]In the Netherlands, general practices have a fixed list size, meaning that all non-institutionalised inhabitants are listed in a general practice.

During 12 months 195 general practitioners in 104 practices registered all physician-patient contacts and registered all health problems presented within a consultation. All visits concerning the same health problem were linked into the same episode. A consultation concerning a new health problem marked the beginning of a new episode. The diagnosis made by the general practitioners was coded using the ICPC.[13]

The participating general practitioners were representative for age, gender and location in rural or urban areas. All practices used computerized patient files for the registration of morbidity data. The study population (a 2.5% sample of the Dutch population) is representative of the Dutch population for age, gender, and residence in rural or urban areas, social class and ethnic minority groups.

For the present study, morbidity data from eight of the practices were excluded due to insufficient quality of the data.

Baseline characteristics of the study population such as age, gender and family composition were derived from practice files. Other characteristics were obtained by means of a mailed questionnaire, which was filled out by the parents, or by the children themselves if older than 12 years. The response rate ranged from 70% to 100% for the different variables.

The degree of urbanisation was based on postal density and reclassified into three groups: urban, semi-rural and rural. The child's socio-economic class was based on parents' occupation and level of education and was reclassified into three groups: high, middle and low. The ethnicity of the child was derived from the country of birth of the parents. In this study, if either parent was born in non- western countries (Africa, Asia, Central or South America), their children were defined as non-western children; all other children were defined as western children.

Extraction of diagnoses related to accidents and unintentional injuries

In accordance with the generally used definition (WHO), unintentional injury is defined as all disability which occurs under accidental circumstances.[14]

To retrieve accidental or unintentional injuries, we selected all possible injury-related ICPC codes of all children and divided the diagnoses into those we considered to be probably caused by an accidental injury, and those possibly related to an accidental injury (Appendix A). The probably injury-related diagnoses were: fractures of arm, leg, hand/foot and other fractures, sprains/strains of extremities, burns, cuts and lacerations, concussion and the diagnosis injuries/accidents (ICPC codes A80, A81, A85, A86, B76, L72-80, L96, N79, S14 and S16-18). All episodes of these diagnoses were considered to be accidental, thus unintentional injuries, and were included in the analysis.

The diagnoses of injuries we considered to be possibly related to accidents were: bleeding/swelling, handicap, eye symptoms (red, pain, foreign object), nose and ear symptoms (pain, foreign object, bleeding), symptoms/complaints of the musculoskeletal tract (neck, back, extremities), complaints/foreign objects of the skin. Because these diagnoses could also be caused by an infectious or other non-accidental cause, a random sample of 10% (with a minimum of 10 cases) of the notes in the electronic patient records were examined to judge whether the health problem diagnosis was caused by an accident. If there were no notes concerning that diagnosis (occurring in approximately 20%), the case was excluded from analysis. If only less than 20% of the sample for each diagnosis was considered to be an accidental injury, all these diagnoses were excluded from the analysis (ICPC codes: A08, A28, B77, F1, F2, L1, L2, L3, L4, L5, L6, L13, L28, R06, R08, S01, N81). Similarly, if more than 80% of these diagnoses were considered to be accidental injuries, all diagnoses were included in the analysis (ICPC codes: D79, L9, L16, L81, N80, S13, F75). All other consultations with diagnoses with ICPC codes of possibly accidental diagnoses were classified as not certainly accidental. Notes of these diagnoses were examined per patient in the electronic patient files and included in the analysis only if the diagnoses appeared to be related to an accident (ICPC codes: A10, F76, F79, H05, H76, H78, H79, L08, L10, L11, L12, L7, L14, L15, L17, L18, L19, L20, L29, R87, R88, S15, S19).

Approximately half of the diagnoses were judged by both HO and JD, the remaining half was judged by JD. Only a handful of cases were doubtful and these were excluded from analysis. Episodes of intentional injuries (e.g. suicide attempt) and insect bites were also excluded.

Analysis

All new episodes of injuries were evaluated by descriptive analysis. Incidence rates were calculated by dividing the number of new episodes by the total number of person years, and 95% confidence intervals were computed around incidence rates considering a Poisson distribution. Children with one or more injuries were compared with all children listed in the practices that did not have an injury. We tested differences of age with a t-test, other categorical characteristics with chi-square tests. To assess factors associated with childhood injury we analysed separate age strata, because previous studies have shown a clear dependency between injury and child's age. Per age stratum we measured the unadjusted, univariate association between various child and maternal characteristics and the occurrence of injuries. To test independent associations we used a multilevel multivariate logistic regression model, and for each age stratum we entered those factors that were significantly associated in the univariate model (cut-off point: $p<0.05$). A multilevel model was used to account for the correlation within families. We used SPSS version 11.0 for the univariate analysis and SAS 8.2 for the multilevel multivariate logistic analysis.

Results

Descriptive analysis and incidence rates

The study population consisted of 82,053 children aged 0-17 years, which presented 105,353 new episodes of disease. In total, 9% of all new health problems were accidental injuries (9484/105,353 new episodes), resulting in an overall incidence rate of 115 per 1000 person years. These episodes were presented by 10% of all children (8365/82,053). Table 1 gives gender and age specific incidence rates and shows that boys have higher incidence rates in all age groups. For both boys and girls, highest incidence rates were found in the age group 12-17 years.

Figure 1 shows the types of injuries and differences per age group; 29.5% of all injuries involve injuries of the skin (e.g. lacerations and cuts) and incidence rates are highest in the 0-4 year olds. Sprains and strains, predominant in the age group 12-17 years, account for 15% of all injuries. Incidence rates of concussion, accidental poisoning and injuries due to foreign objects are highest in the young children.

Figure 1. Types of injuries stratified by age category

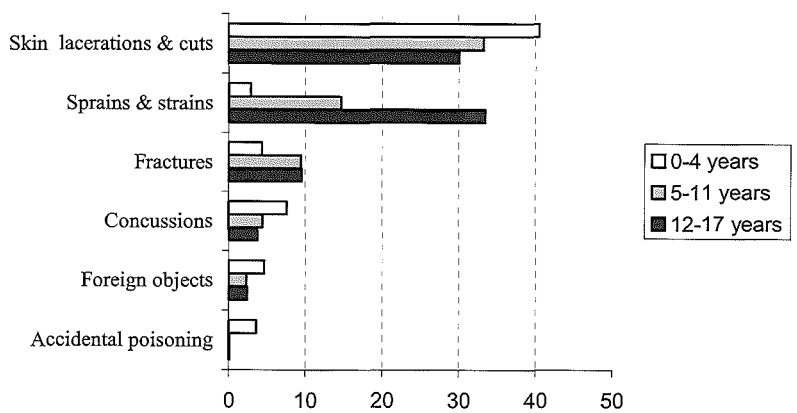


Table 1. Incidence rates of injuries by gender and age category

	0-4 years			5-11 years			12-17 years			Total		
	number	IR	95%CI	number	IR	95%CI	number	IR	95%CI	number	IR	95%CI
male	1315	117	110-123	914	112	107-117	2185	157	151-164	5414	128	124-131
female	842	81	75-86	479	92	87-97	1749	130	124-136	4070	102	99-105
total	2157	100	95-104	1393	102	99-106	3934	144	139-148	9484	115	113-118

IR = incidence rate per 1000 person year

More detailed rates for injury diagnoses are summarized in table 2. Overall, 66% (6233/9484) of all childhood injuries are skin lesions and complaints/sprains of extremities.

Table 2. Diagnoses of injuries

Injury		**Number**	**Incidence Rate per 1000 pys**	**(95% CI)**
Skin	Cuts	1658	20.2	(19.2-21.2)
	Bruise/contusion	707	8.6	(8.0-9.2)
	Laceration	438	5.3	(4.8-5.8)
	Burns	255	3.1	(2.7-3.4)
	Bites (animal)	166	2.0	(1.7-2.3)
	Foreign body	57	0.7	(0.5-0.8)
Strain/sprains	Ankle	1057	12.9	(12.1-13.6)
and other	Knee	462	5.6	(5.1-6.1)
symptoms	Foot/hand	743	9.1	(8.4-9.7)
	Arm	425	5.2	(4.7-5.7)
	Other	1558	18.9	(18.0-19.9)
Fractures	Radius/fibula	229	2.8	(2.4-3.1)
	Tibia	65	0.8	(0.6-0.9)
	Hand/foot	187	2.3	(1.9-2.5)
	Other	183	2.2	(4.6-5.5)
Head	Concussion	414	5.0	(4.6-5.5)
Eye	Contusion	122	1.5	(1.2-1.7)
	Foreign body	74	0.9	(0.7-1.1)
Ear	Laceration	18	0.2	(0.1-0.3)
	Foreign body	24	0.3	(0.2-0.4)
Poisonings		86	1.0	(0.8-1.2)
Other		556	6.8	(6.2-7.3)
Total		9484	115.6	(113.3-117.9)

Characteristics associated with elevated injury risk

The characteristics of the children that experienced injuries were compared with the characteristics of children of the study population without injuries (Table 3).

Table 3. Characteristics of children with and without an injury in general practice

	Injury N=8,365	**No injury** N=73,688	**p-value**
Age(years) mean	9.4	7.8	<0.001
Gender male	56.8%	50.8%	<0.001
Female	43.2%	49.2%	
Social class			
I high	38.0%	41.7%	
II middle	39.6%	39.1%	<0.001
III low	22.4%	19.1%	
Residence			
urban	22.3%	32.5%	
semirural	20.9%	21.8%	<0.001
rural	56.8%	45.7%	
Ethnicity			
western	92.3%	90.1%	<0.001
non-western	7.7%	9.9%	
Number of siblings			
0	19.6%	20.8%	
1	47.9%	46.1%	<0.001
2	23.3%	23.6%	
≥3	9.3%	9.4%	
Age difference mother-child			
14-25 years	19.9%	18.0%	<0.001
>25 years	80.1%	82.0%	

The mean age of children with an injury was 9.4 years compared to 7.8 years of children without an injury. The table shows that, unadjusted for possible confounders, western boys belonging to the low socio-economic class, living in a rural area, with a young mother and a sibling were at risk to experience an accidental injury. Further univariate and multivariate analysis was performed in the different age groups to control for various age effects. In all age strata, male gender and living in a rural residence was associated with an elevated risk of injury. In the age group 0-4 years, having three or more siblings was also associated with an elevated injury risk but no association was found with maternal age. In children aged 5-11 years, belonging to the low socio-economic class and having a western background were also independently associated with an elevated risk of childhood injury. In these children, the number of siblings was no longer independently associated with injury risk, but the age difference with the mother was. For those aged 0-17 year, belonging to the low socio-economic class and having a western background were also associated with risk of injury.

Table 4. Characteristics associated with childhood injury, stratified by age category

	0-4 years		5-11 years		12-17 years	
	unadjusted OR (95%CI)	adjusted OR (95%CI)	unadjusted OR (95%CI)	adjusted OR (95%CI)	unadjusted OR (95%CI)	adjusted OR (95%CI)
Gender						
female	referent	referent	referent	referent	referent	referent
male	1.44 (1.31-1.59)	1.35 (1.19-1.53)	1.22 (1.14-1.32)	1.23 (1.12-1.35)	1.23 (1.15-1.34)	1.82 (1.66-2.01)
Residence						
urban	referent	referent	referent	referent	referent	referent
semirural	1.44 (1.25-1.66)	1.33 (1.11-1.59)	1.39 (1.24-1.56)	1.28 (1.10-1.49)	1.35 (1.21-1.52)	1.27 (1.09-1.47)
rural	1.76 (1.57-1.98)	1.48 (1.27-1.74)	1.82 (1.66-2.01)	1.58 (1.39-1.79)	1.79 (1.63-1.96)	1.56 (1.37-1.76)
Social class						
I high	referent		referent	referent	referent	referent
II middle	1.04 (0.92-1.19)		1.08 (0.98-1.19)	1.0 (0.89-1.11)	1.19 (1.08-1.32)	1.13 (1.01-1.26)
III low	1.01 (0.86-1.19)		1.21 (1.08-1.35)	1.15 (1.0-1.3)	1.5 (1.35-1.68)	1.39 (1.22-1.58)
Nr. of siblings						
0	referent	referent	referent	referent	referent	
1	1.32 (1.17-1.48)	1.19 (1.02-1.39)	1.18 (1.04-1.35)	1.06 (0.89-1.25)	1.0 (0.92-1.1)	
2	1.24 (1.07-1.44)	1.25 (1.42-1.53)	1.09 (0.96-1.26)	1.10 (0.91-1.32)	0.97 (0.87-1.08)	
≥3	1.29 (1.05-1.56)	1.57 (1.19-2.08)	1.09 (0.93-1.28)	1.22 (0.98-1.52)	0.94 (0.82-1.08)	
Ethnicity						
western	referent		referent	referent	referent	referent
non-western	0.88 (0.72-1.07)		0.74 (0.63-0.87)	0.72 (0.59-0.88)	0.69 (0.59-0.82)	0.67 (0.54-0.81)
Age difference mother-child						
14-25 years	0.94 (0.80-1.11)		0.98 (0.88-1.10)		1.12 (1.03-1.24)	1.12 (1.01-1.26)
>25 years	referent		referent		referent	referent

Discussion

This is the first episode based representative study to provide reliable incidence rates and detailed information on paediatric unintentional injuries rates in general practice. Since data were collected prospectively and all children and their families are listed in Dutch general practice, incidence rates are accurate and the predictors of child injury are valid estimates. We found that 9% of all new health problems in children are injury related.

The overall incidence rate of 115 per 1000 person years is quite comparable with the results of Hambidge et al., who examined all injury-related visits in primary care in the US.[4] They found an overall rate of 138 per 1000 person years, but because their study was not episode-based, no distinction was made between multiple visits concerning the same injury episode or for incident cases. Other studies examining paediatric injuries were based on emergency department setting or on retrospective questionnaire surveys, the latter susceptible to recall and selection bias.[15]

Most paediatric injuries in general practice are injuries of the skin and sprains/strains of extremities, which was also reported by others.[1 4] Residence in a rural area is the most frequently occurring independent risk factor for experiencing childhood injury in all age groups. Although not completely clarified, this finding is consistent with results of others.[4 16] It is possible that, due to a higher density of emergency departments in urban areas, less severely injured children are treated directly in secondary care compared with rural area. It is more likely, however, that rural areas foster a higher level of accident proneness.

Compared with others, the socio-economic gradient is less clear in our study.[17 18] Explanations for this could be that, in the Netherlands, there are no socio-economic class differences regarding access to primary care and other studies may have suffered from selective response to the health questionnaires on which their estimates were based.

Surprisingly, mothers' age at parity is only weakly associated with injuries, and then only in the age group 12-17 years. If any association, we would have expected a relationship with the youngest ages, when the mother is predominantly responsible for the child's health.[19 20] From school age onwards, western children are more at risk for injuries than non-western children. Previous analysis of overall consultation rates of non-western children showed that rates for non-western children are higher than for western children, thus lower injury rates for non-western children do not reflect lower accessibility to primary care. Another Dutch study has hypothesized that non-western children participate less in sports, thus lowering their injury risk. [21]

Limitations

When interpreting our results, some limitations of this study should be addressed. Inevitably, there will have been some misclassification of injuries. However, we estimate that the effect and magnitude is small, giving an error of approximately 3% in injury diagnoses, because 83% (7880 certain injury episodes/9484 all injury episodes) of the injuries were derived from diagnoses of which an accidental cause was certain. Also, incidence rates are most likely to be underestimates of rates in general practice, because we excluded diagnoses if, besides the diagnosis, no other information was available in the patient record. If all of these had in fact been accidental injuries, incidence rates would have increased by only about 4%. When measuring injuries in a primary care setting, there is always some overlap with injuries encountered in emergency departments. From a subanalysis of referrals of injuries to secondary care we estimate that 4% to 8% of the injuries were referred to secondary care by the general practitioner or, vice versa, were treated immediately in an emergency department and were reported to the general practitioner afterwards. Furthermore, we were not able to gather reliable information on causes, circumstances and severity of injuries, which is an important drawback in our study. Coding differences between general practitioners are also unavoidable, but efforts to reduce such bias included ICPC training programmes prior to the survey.

Although unintentional injuries treated in general practice are generally less severe than those treated in secondary care, it is an important childhood health problem in primary care. Surprisingly, little or no attention is paid to childhood injuries in the general practitioner vocational training programmes, which cannot be justified considering the substantial disease burden. A recent report from the UK stresses the need to prioritise this health problem in general practice.[22] Skin lesions, sprains and concussion are encountered most often and could be addressed in the educational programme. Research has shown that unintentional injuries in children might be preventable, for example by general practitioners' safety advice combined with easy access to safety equipment[23-25]. We identified determinants associated with experiencing an injury such as the male gender, having a western background and living in a rural area. Children and families with these characteristics can be considered as high-risk groups and could be targeted when considering implementing preventive measures.

References

1. Sibert JR, Maddocks GB, Brown BM. Childhood accidents--an endemic of epidemic proportion. Arch Dis Child 1981;56:225-7.
2. Gallagher SS, Finison K, Guyer B, et al. The incidence of injuries among 87,000 Massachusetts children and adolescents: results of the 1980-81 Statewide Childhood Injury Prevention Program Surveillance System. Am J Public Health 1984;74:1340-7.
3. Scheidt PC, Harel Y, Trumble AC, et al. The epidemiology of nonfatal injuries among US children and youth. Am J Public Health 1995;85:932-8.
4. Hambidge SJ, Davidson AJ, Gonzales R, et al. Epidemiology of pediatric injury-related primary care office visits in the United States. Pediatrics 2002;109:559-65.
5. Rivara FP, Bergman AB, LoGerfo JP, et al. Epidemiology of childhood injuries. II. Sex differences in injury rates. Am J Dis Child 1982;136:502-6.
6. Jorgensen IM. The epidemiology of fatal unintentional child injuries in Denmark. Dan Med Bull 1995;42:285-90.
7. Ginsburg HJ, Miller SM. Sex differences in children's risk-taking Behaviour. Child Develop 1982;53:426-8.
8. Horwitz SM, Morgenstern H, DiPietro L, et al. Determinants of pediatric injuries. Am J Dis Child 1988;142:605-11.
9. Pless IB, Taylor HG, Arsenault L. The relationship between vigilance deficits and traffic injuries involving children. Pediatrics 1995;95:219-24.
10. Danseco ER, Miller TR, Spicer RS. Incidence and costs of 1987-1994 childhood injuries: demographic breakdowns. Pediatrics 2000;105:E27.
11. Bourguet CC, McArtor RE. Unintentional injuries. Risk factors in preschool children. Am J Dis Child 1989;143:556-9.
12. Westert GP, Schellevis FG, de Bakker DH, et al. Monitoring health inequalities through general practice: the Second Dutch National Survey of General Practice. Eur J Publ Health, in press.
13. Lamberts H, Wood M, Hofmans-Okkes I. The International Classification of Primary Care in the European Community, with a multilanguage layer. Oxford: Oxford University Press, 1987.
14. WHO. http://www.who.int/violence_injury_prevention/injury/definitions/def29/en, 2003.
15. Harel Y, Overpeck MD, Jones DH, et al. The effects of recall on estimating annual nonfatal injury rates for children and adolescents. Am J Public Health 1994;84:599-605.
16. Probst JC, Moore CG, Baxley EG, et al. Rural-urban differences in visits to primary care physicians. Fam Med 2002;34:609-15.

17. Hippisley-Cox J, Groom L, Kendrick D, et al. Cross- sectional survey of socioeconomic variations in severity and mechanism of childhood injuries in Trent 1992-7. BMJ 2002; 324:1132-4.
18. Roberts I, DiGuiseppi C, Ward H. Childhood injuries: extent of the problem, epidemiological trends, and costs. Inj Prev 1998;4:S10-6.
19. Kendrick D, Marsh P. How useful are sociodemographic characteristics in identifying children at risk of unintentional injury? Public Health 2001;115:103-7.
20. Gulotta CS, Finney JW. Intervention models for mothers and children at risk for injuries. Clin Child Fam Psychol Rev 2000;3:25-36.
21. Brussaard JH, van Erp-Baart MA, Brants HA, et al. Nutrition and health among migrants in The Netherlands. Public Health Nutr 2001;4:659-64.
22. Kendrick D, Groom L, Hippisley-Cox J, Savelyich BS, Webber E, Coupland C. Accidental injury: a neglected area within primary care groups and trusts? Health Educ Res 2003;18:380-388.
23. Towner E, Dowswell T. Community-based childhood injury prevention interventions: what works? Health Promot Internation 2002;17:273-84.
24. Towner E, Dowswell T, Jarvis S. Updating the evidence. A systemic review of what works in preventing childhood unintentional injuries: Part 2. Inj Prev 2001;7:249-53.
25. Clamp M, Kendrick D. A randomised controlled trial of general practitioner safety advice for families with children under 5 years. BMJ 1998;316:1576-9.

Appendix A

ICPC codes defined as certain accidental or unintentional injury > all cases included in analysis

A80 injury/accident
A81 multiple traumata
B76 rupture of the spleen
L72 fracture arm
L73 fracture leg
L74 fracture hand or foot
L75 fracture femur
L76 other fracture
L77 sprain/strain ankle
L78 sprain/strain knee
L79 other sprain/strain
L80 dislocation of joints
L96 acute injury of menisci/
N79 concussion
S14 burns
S16 contusion skin
S17 laceration skin
S18 cuts skin
A84 poisoning† (medicinal)
A86 poisoning† (chemical substance)

† these diagnoses were examined to exclude non-accidental poisoningICPC codes classified not certain accidental

≥ 80% caused by an accident > included in analysis		≤ 20% caused by an accident > excluded from analysis		Caused by an accident in 20-80% of all cases > all cases in or excluded after examination of the reason for encounter note	
D79	foreign object digestive tract	A08	swelling	A10	bleeding
F75	contusion/ bleeding eye	A28	handicap	F76	foreign object eye
L9	symptoms arm	B77	other injury circulation	F79	other injury eye
L16	symptoms ankle	F1	pain eye	H05	blood from ear
L81	other injury musculoskeletal tract	F2	red eye	H76	foreign object ear
N80	other head injury	L1	symptoms neck	H78	superficial injury ear
S13	bite animal/ human	L2	symptoms back	H79	other injury ear
		L3	acute low back pain	L7	symptoms jaw
		L4	symptoms chest	L8	symptoms shoulder
		L5	symptoms side	L10	symptoms elbow
		L6	symptoms axilla	L11	symptoms wrist
		L13	symptoms hip	L12	symptoms hand/ fingers
		L28	handicap musculoskeletal tract	L14	symptoms leg
				L15	symptoms knee
		R06	epistaxis	L17	symptoms toes/ feet
		R08	other symptoms nose	L18	pain muscles
		S01	pain skin	L19	symptoms muscles
		N81	other nerve injury	L20	symptoms joints
		Y80	injury male tract	L29	other symptoms musculoskeletal tract
				R87	foreign object airway
				R88	other injury airway
				S29	other injury skin
				S15	foreign object skin
				U80	injury urinary tract
				X82	injury female tract

6. Injury-proneness in children

Abstract

Objective To examine the clustering of unintentional injuries in children and to describe characteristics of repeatedly injured children compared with singly injured children.

Methods Data of 0-17 year old children (82,053) were used from a Dutch national survey of general practice in 2001. Children that presented one or multiple injuries to their general practitioner during the study period were identified and compared.

Characteristics of children with repeated unintentional injuries (i.e. injury-prone children) are presented as odds ratios (OR) based on multilevel logistic regression analysis.

Results 1% of the total study population experienced 22% of all unintentional injuries, and 2% of all families were involved in 35% of all unintentional injuries. Predictive characteristics independently associated with injury-proneness were: older age (12-17 years, OR: 1.7; 95%CI: 1.3-2.1), previous unintentional injury of a sibling (OR: 2.0; 95%CI: 1.6-2.5), living in a rural environment (OR: 1.5; 95%CI: 1.2-1.9) and mother's aged < 27 years when giving birth (OR: 1.3; 95%CI: 1.1-1.6). Surprisingly, gender was not associated with injury-proneness.

Conclusions In this study we observed a clustering of unintentional injuries in children and in families. Therefore, physicians may play a role in preventing future unintentional injuries in these high-risk children or their families when presenting with an injury.

Introduction

Unintentional injuries are an important cause of childhood morbidity and mortality in developed countries; it is reported that one in every four children gets injured per year.[1 2] Because many unintentional injuries are thought to be preventable, efforts have been made to identify risk factors associated with such injuries.[3-5] Some authors have suggested that prevention strategies are more effective when applied to specific high-risk groups.[6]

It has been reported that children who have had an injury are at increased risk of experiencing a second injury; there are also indications that if a child experiences an unintentional injury, his or her siblings also have a temporary elevated risk for injuries.[7-10] Moreover, a clustering of unintentional injuries in small parts of the population was also observed in a previous morbidity analysis of children consulting their general practitioner.[11]

The concept of injury-proneness (i.e. experiencing multiple unintentional injuries) is discussed in international literature, [12-14] it seems that certain children are not only at higher risk to experience a single injury, but also have a higher risk for repeated injuries.

These findings support the importance of focusing on injury-proneness. Combined with the fact that intervention programmes could be more effective in high-risk groups, it is of interest to examine whether these children can be identified in a primary care setting.

The aims of this study were to assess whether a group of children that experience repeated injuries can be identified in general practice. In addition, we aimed to assess which child and family characteristics are associated with these repeated injuries.

Methods

Design

Morbidity data of children aged 0 to 17 years were used from the second Dutch National Survey of General Practice performed by the Netherlands Institute for Health Services Research (NIVEL) in 2001.[15]

During a one-year study period, 195 general practitioners in 104 practices throughout the Netherlands registered all contacts between patients and the practice. All contacts regarding the same health problem were aggregated into one disease episode. If a child experienced the same health problem more than once during the year, as assessed by the general practitioner, it was recorded as a second disease episode. All diagnoses were coded using the International Classification of Primary Care (ICPC).[16] The participating general practitioners and their

practices are representative for the Dutch general practice population. Morbidity data of eight practices were excluded from the analyses due to insufficient quality of data.

Study population

Data of all children listed in the participating practices were included in the analyses. Child and family characteristics such as age, gender and family structure were extracted from the computerized practice files. Child's age was categorized into three groups approximating school levels in the Netherlands, 0-4, 5-11 and 12-17 years. Age difference between mother and child was classified in two groups; mothers aged under 27 years at birth, and mothers from and above 27 years of age at birth. The cut off point of 27 years was chosen because it was the median age of all mothers in the survey.

Other patient characteristics were collected through mailed questionnaires and filled out by parents or children during the survey. The child's socio-economic class was based on parents' occupation and level of education and was classified into three groups: high, middle and low. The degree of urbanization was defined according to the population density according to Statistics Netherlands and grouped into urban, semi-rural and rural.[17] Child's ethnicity was based on country of birth of either parent, in accordance with the definition of Statistics Netherlands.[18]

Definition of unintentional injuries and injury-proneness

Unintentional injuries were defined as disability that occurs under accidental circumstances, as stated by the WHO.[19]

We defined injury-proneness as experiencing at least two unintentional injuries during the survey period of one year.

Unintentional injuries

To assess whether a diagnosis was related to an injury we listed all ICPC codes of diagnoses that were probably injury related. These injury-related ICPC diagnoses were categorized in two groups. The first group consisted of all diagnoses which could only be the result of an injury (e.g. fractures, burns and abrasions). To evaluate whether all ICPC diagnoses of this first group were injury related, we randomly selected 5% of all episodes and manually judged the notes of the general practitioner in the electronic patient files; all reviewed episodes with these diagnoses proved to be unintentional injuries.

The second group included diagnostic ICPC codes for which we were uncertain as to whether they were the result of an unintentional injury. To assess whether or not they were injury related, we randomly selected 10% of the episodes for each diagnosis (with a minimum of 10 per ICPC diagnosis). If only $\leq$20% of the episodes were the result of an unintentional injury, all episodes with this diagnosis were excluded. If $\geq$80% were related to an unintentional injury, all episodes with this diagnosis were included in our analysis.
Of the remaining ICPC diagnoses (>20% and <80% result of an unintentional injury) we manually judged the notes of all individual episodes in the electronic patient files and these were included in our analysis only when the general practitioner explicitly described an unintentional injury (e.g. trauma, accident or fall).

Analysis

Characteristics of children that experienced a single unintentional injury were compared with those of the injury-prone children because we hypothesized that risk factors associated with experiencing one injury would be different from those for experiencing multiple injuries. The following child characteristics were compared in univariate analysis: age, sex, ethnicity, and the following family characteristics: degree of urbanization, socio-economic status, previous unintentional injury in a sibling, and the age difference between mother and child. The independent sample t-test was used to test differences in age. The Mann-Whitney test was used to compare the total number of children in the family and the χ^2 test to test differences in socio-economic class, age, ethnicity, sex and degree of urbanization.
The age difference between mother and child was dichotomized at the lower quartile of 27 years.
When estimating the role of previous accidents in siblings, only data of families with two or more children were used.
Univariately significant variables were entered into a multilevel logistic regression model to test if they were independently associated with injury-proneness, adjusting for correlation within families and number of children in the family. The statistical packages SPSS 11 and SAS 8.2 were used for the analyses.

Results

During the study period 10% (8365/82,053) of the study population experienced 9484 unintentional injuries. A total of 1014 children experienced multiple injuries and were defined as injury-prone children. These children (1% of the total study population) experienced 22% of all injuries. The frequency of injuries in the injury-prone children ranged from 2 to 7 injuries; 85.5% of the injury-prone children experienced two injuries, 14.5% experienced three or more.

The clustering of unintentional injuries was also seen in families; all injuries were experienced in 22% of all families (1475/7651 total number of families) and 35% of all injuries were experienced in 2% of all families.

Univariate analyses

The distribution of unintentional injuries varied with age, older children (age categories 5-11 and 12-17 years) were more likely to present with repeated unintentional injuries than children aged 0 to 4 years. The mean age of injury-prone children was higher than singly injured children (10.5 years and 9.1 years, respectively; $p<0.001$). Table 1 compares several child and family characteristics of the single injury children and the injury-prone children. The mean age difference between mother and child was 28.6 in the injury-prone children compared to 29.4 years in the singly injured children. The socio-economic status was slightly lower in the injury-prone children and they more often lived in rural areas. A previously injured sibling was found twice as often in the group of injury-prone children than in the group of singly injured children. Child's gender, ethnicity and total number of children in the family were not associated with injury-proneness.

Multilevel analysis

After adjustment for socio-economic class, total number of children in the family and for correlation within families, a previous unintentional injury of a sibling emerged as the strongest predictor of experiencing a second injury if a child had already experienced one injury. Another independent predictive variable was age: children aged 12 to 17 years were at higher risk than younger children. Residence in rural areas and a smaller age difference between mother and child were also significantly associated with the risk of experiencing repeated injuries (Table 2).

Table 1. Characteristics of accident-prone children compared to singly injured children.

	Total number of unintentional injuries		
	1 (N=7351 children)	≥2 (N=1014 children)	p-value
Age (years)			
0-4	1822 (24.8%)	167 (16.5%)	
5-11	2683 (36.5%)	327 (32.2%)	
12-17	2846 (38.7%)	520 (51.3%)	<0.001$^{\nabla}$
Age of children (mean, in years)	9.1	10.5	<0.001^{+}
Gender			
Boys	4147 (54.4%)	603 (59.5%)	
Girls	3204 (43.6%)	411 (40.5%)	ns$^{\nabla}$
Mean number of children in family	2.28	2.30	ns$^{\circ}$
Age difference mother-children (mean, in years)	29.4	28.6	<0.001^{+}
Socio-economic class			
High	2005 (38.5%)	251 (34.4%)	
Middle	2061 (39.6%)	291 (39.9%)	
Low	1140 (21.9%)	188 (25.8%)	<0.03$^{\nabla}$
Degree of urbanisation			
Urban	1718 (23.4%)	177 (17.5%)	
Semi-rural	1551 (21.1%)	195 (19.2%)	
Rural	4082 (55.5%)	642 (63.3%)	<0.001$^{\nabla}$
Previous unintentional injury of sibling			
No	6795 (92.4%)	858 (84.6%)	
Yes	556 (7.6%%	156 (15.4%)	<0.001$^{\nabla}$
Ethnicity			
Western	5067 (92.5%)	706 (91.2%)	
Non-western	412 (7.5%)	68 (8.8%)	ns$^{\nabla}$

$^{+}$Independent samples t-test, $^{\nabla}$ Pearson Chi-Square, $^{\circ}$ Mann-Whitney Test

ns: not statistically significant

Table 2. Multilevel analysis for accident-proneness, OR and 95% confidence intervals.

	OR	95%CI		
Age (years)				
0-4	Reference			
5-11	1.21	0.95	-	1.53
12-17	1.67°	1.32	-	2.10
Degree of urbanisation				
Urban	Reference			
Semi-rural	1.20	0.92	-	1.58
Rural	1.49°	1.19	-	1.88
Age difference between mother and children (years)				
<27	1.32 ∇	1.10	-	1.59
≥27	Reference			
Socio-economic class				
High	Reference			
Middle	1.16	0.93	-	1.43
Low	1.06	0.88	-	1.28
Previous unintentional injury of sibling				
Yes	2.00 °	1.58	-	2.54
No	Reference			

Adjusted for correlation within families and the number of children in the family

° $p < 0.001$; ∇ $p < 0.01$

Discussion

To our knowledge this is the first study to identify injury-prone children in a primary care setting. The data show that a particular group of children is injured more frequently, and therefore experiences the majority of all unintentional injuries.

Clustering of injuries has been described in other settings, e.g. Schor et al. found that 1% of a school population experienced 17% of all injuries. [10] Others found that 10% of individuals experienced 37 % of total injuries and 5% of all families experience 12% of the injuries.[7] However, the present results indicate that the clustering of unintentional injuries may be even more pronounced than previously reported.

To identify child and family factors related to injury-proneness we used a multilevel model; this technique is not yet commonly applied in this area. However, the multifactorial aetiology of unintentional injuries is best analyzed with multilevel modeling in order to take into account the factors at both the individual and family level.[20]

Surprisingly, boys did not have a higher risk to be injury-prone than girls, although previous studies on unintentional injury, including our own previous analyses,[11] show that the male gender is the main risk factor to distinguish between no injury and one or more injuries. However, the current analyses show that gender is not significantly associated with injury-proneness. Thus, the injury-prone children are not typically boys, although gender remains to be a risk factor for injuries in general. Therefore, we hypothesize that injury-proneness is more strongly related to a non-gender related characteristic (such as clumsiness) than to a more exploring behavior which is thought to be a boy-specific characteristic.[21] Future research is needed to support this theory.

The most predictive characteristic was a sibling who had a previous unintentional injury. Others have also reported that a previous injury in a family increases the risk of unintentional injuries in other family members; e.g. stressful life events, such as parental-child conflicts are related with a higher risk of experiencing unintentional injuries.[22] They found that the increased risk only lasted for 3 or 6 months. Our results support their finding since most (80%) of the 'second' injuries in a child occurred within 6 months after the 'first' injury in the other sibling. The first unintentional injury of a child could be a stressful life event that triggers future injuries. Or, both this first and the subsequent injury could be the result of another stress raising event.[8 9]

Another important predictor for repeated injuries is age: children older than 4 years and especially older than 11 years are more likely to be injury-prone than the youngest age group. This could be explained by the fact that younger children are more likely to be supervised by their parents, which is an important protective factor.[23]

Injury-prone children and their families more often live in a rural environment, a finding also reported by others.[24 25]

Limitations

The most important limitation of our study is the possible misclassification of injuries. We cannot be certain that all diagnoses classified as injuries were indeed unintentional injuries. In an attempt to minimize misclassification, we manually judged the majority of the diagnoses. Another limitation is the lack of data about the circumstances preceding the injury. Furthermore, we cannot rule out child abuse, which may account for some of the repeated injuries.

Regarding the association between injury-proneness and rural environment we have to take into account that, in a rural environment, the average distance to a general practitioner is generally shorter than to an emergency department. Therefore, children living in a rural environment may more frequently be treated by their general practitioner for unintentional injuries, compared with children living in urban areas. Another factor of special importance to the younger children is the help-seeking behavior of the parents. One can imagine that injured children with insecure parents more frequently visit a general practitioner and are therefore more frequently classified injury-prone. Unfortunately, we cannot correct for these factors because we have no data on severity of injury nor of parental behavior.

Conclusion

We identified a small group of children that we could define as injury-prone. These children consult their general practitioner repeatedly as the result of multiple unintentional injuries. Others have shown that prevention actually decreases unintentional injury rates. It is a point of debate whether prevention should focus on children at risk as individuals, or on their families. Most characteristics that we found to be associated with injury-proneness are family characteristics. Furthermore, the strong relation between a previously injured sibling and injury-proneness of a child calls for an approach at family level. Therefore, this study identifies opportunities for injury prevention at family level. For example, prevention could focus on families living in a rural environment with mothers under 27 at time of birth, which present with a child with a first unintentional injury, in addition to preventive measures provided to the general population.

References

1. Danseco ER, Miller TR, Spicer RS. Incidence and costs of 1987-1994 childhood injuries: demographic breakdowns. Pediatrics 2000;105:E27.
2. Guyer B, Freedman MA, Strobino DM, Sondik EJ. Annual summary of vital statistics: trends in the health of Americans during the 20th century. Pediatrics 2000;106:1307-17.
3. Clamp M, Kendrick D. A randomised controlled trial of general practitioner safety advice for families with children under 5 years. BMJ 1998;316:1576-9.
4. Hussey JM. The effects of race, socioeconomic status, and household structure on injury mortality in children and young adults. Matern Child Health J 1997;1:217-27.
5. Mott JA. Personal and family predictors of children's medically attended injuries that occurred in the home. Inj Prev 1999;5:189-93.
6. Towner E, Dowswell T, Jarvis S. Updating the evidence. A systemic review of what works in preventing childhood unintentional injuries: Part 2. Inj Prev 2001;7:249-53.
7. Boyce WT, Sobolewski S. Recurrent injuries in schoolchildren. Am J Dis Child 1989;143:338-42.
8. Johnston BD, Grossman DC, Connell FA, Koepsell TD. High-risk periods for childhood injury among siblings. Pediatrics 2000;105:562-8.
9. Johnston BD, Grossman DC, Thompson RS. Transient elevation in risk of injury in siblings following injury encounters. J Pediatr 2003;142:79-83.
10. Schor EL. Unintentional injuries. Patterns within families. Am J Dis Child 1987;141:1280-4.
11. Otters H, Schellevis FG, Damen J, van der Wouden JC, van Suijlekom-Smit LWA, Koes BW. Epidemiology of unintentional injuries in children: a population-based survey in general practice. *submitted*
12. Langley J. The "accident prone" child -- the perpetration of a myth. Aust Paediatr J 1982;18:243-6.
13. Langley JD. 'Accident proneness': statistical and practical significance. Inj Prev 1997;3:80-1.
14. Wright P. Is saying NO to 'accident proneness' throwing the baby out with the bathwater? Inj Prev 1997;3:79-80.
15. Westert GP, Schellevis FG, de Bakker DH, Groenewegen PP, Bensing JM, van der Zee J. Monitoring health inequalities through General Practice: the Second Dutch National Survey of General Practice. Eur J Public Health, in press.
16. Lamberts H, Wood M, Hofmans-Okkes IM. The International Classification of Primary Care in the European Community, with a multilanguage layer. Oxford: Oxford University Press, 1987.
17. Statistics Netherlands. http://www.cbs.nl, 2003.

18. Statistics Netherlands. Statistisch Jaarboek. Voorburg: Centraal Bureau voor de Statistiek, 2002:21-23.
19. WHO.http://www.who.int/violence_injury_prevention/injury/definitions/def29/en 2003.
20. Haynes R, Reading R, Gale S. Household and neighbourhood risks for injury to 5-14 year old children. Soc Sci Med 2003;57:625-36.
21. Ginsburg HJ, Miller SM. Sex differences in children's risk-taking behaviour. Child Development 1982;53:426-428.
22. Bijur PE, Kurzon M, Hamelsky V, Power C. Parent-adolescent conflict and adolescent injuries. J Dev Behav Pediatr 1991;12:92-7.
23. Soori H, Bhopal RS. Parental permission for children's independent outdoor activities. Implications for injury prevention. Eur J Public Health 2002;12:104-9.
24. Hambidge SJ, Davidson AJ, Gonzales R, Steiner JF. Epidemiology of pediatric injury-related primary care office visits in the United States. Pediatrics 2002;109:559-65.
25. Probst JC, Moore CG, Baxley EG, Lammie JJ. Rural-urban differences in visits to primary care physicians. Fam Med 2002;34:609-15.

7. Self-reported perceived health and morbidity in overweight and obese children

Abstract

Objective To examine differences in self-reported health and morbidity presented in general practice between children with and without overweight, and to identify children at risk for overweight.

Methods We used data from a representative survey of morbidity in 104 Dutch general practices in 2001. During the survey, a random sample of 2719 children aged 2-17 years responded to a health interview. Body mass index was calculated using self reported weight and height and interview data were linked to morbidity presented in general practice.

Results Of all children, 12% were overweight or obese (319/2719). Overweight children aged 12-17 years reported poorer perceived health and presented more disease episodes in general practice than non-overweight children. Parents of overweight children aged 2-11 years (proxy interview) did not report a poorer health for their children but the children did consult the general practitioner more often. Morbidity patterns of overweight children differed from children without overweight; they reported more ear and respiratory complaints and had higher incidence rates of ear diseases (178/1000 person years vs. 105/1000 person years, $p=0.02$) and respiratory diseases (311/1000 person years vs. 217/1000 person years, $p<0.01$) in general practice. Children in low-income families (OR 1.5, 95% CI 1.2-2.0), living in urban areas (OR 1.6, 95%CI 1.3-2.1), are at higher risk for overweight.

Conclusion Overweight and obesity is a health burden for children on a daily basis, resulting in short-term health consequences. This finding reinforces the need for preventive strategies in childhood.

Introduction

An increasing prevalence of overweight and obesity in children has been reported throughout the developed world,[1-3]and this trend has also been observed in the Netherlands.[4 5] From 1980 to 1997, the prevalence of overweight and obesity has more than doubled; in the ages 5-7 years the prevalence of overweight and obesity has even tripled. This trend raises concern, and as in other countries, the national Health Council has recently stressed the importance of obesity in relation to health risks and urges further research in this field to assess trends and examine prevention strategies for obesity.[6]

A considerable amount of research has been performed investigating the long and short-term health risks in order to determine the clinical and public health consequences of the obese youth.[7-10] Nevertheless, the current perception is that obesity in children is a threat for future health, but does not yield immediate negative health effects. Moreover, most research on short-term health consequences examined differences in occurrences of specific health problems such as asthma, or rare diseases in childhood such as diabetes mellitus,[11 12] rather than investigating differences in general morbidity and perceived general health status in its entirety. And exactly the latter is of interest: what is the perceived health in general of overweight and obese children? Do overweight and obese children indeed perceive a poorer health or have more or different health problems than other children in daily life? If so, this knowledge could be useful for the development and implementation of preventive strategies, for example by addressing parents to increase their insight in their child's current (perceived) health. If they are aware of day-to-day health differences in their overweight children, it is imaginable that they may be more motivated to achieve weight loss in their child, for example by adjusting to more healthy eating patterns and/or by encouraging physical activities.
A recently performed national survey in general practice in the Netherlands,[13] allows linkage of subjective interview data with general practitioners' medical records. This opens the opportunity to address questions such as: What is the overall perceived health of overweight and obese children? Do overweight and obese children have more complaints or symptoms on a day-to-day basis? Is medical help sought more frequently and do they present other morbidity patterns in general practice? This study aims to clarify these issues. In addition, we aim to identify socio-demographic characteristics of obese and overweight children in order to describe the children most at risk in the Netherlands.

Methods

Design

Data were used from the second Dutch national survey of general practice, performed by the Netherlands Institute for Health Services Research (NIVEL) in 2001.[13] This national survey consisted of morbidity registration by general practitioners and face-to-face health interviews with a randomly selected sample of the patient population. Interview and morbidity data were linked and used for the present study. In the Netherlands, general practices have a fixed list size, which means that all non-institutionalised inhabitants are listed in a general practice, and secondary care is limited to patients that are referred by their general practitioner.
A total of 195 general practitioners in 104 practices participated in the survey (164.75 full-time equivalent). The participating general practitioners were representative for age, gender and settlement in rural or urban areas.

Interview

A random sample of approximately 150 registered patients per full-time equivalent general practitioner was selected and approached to participate in an elaborate health interview, in order to achieve the targeted response rate of 80 patients per full-time equivalent general practitioner. The overall response rate of approached patients was 65%. The interviews were performed by trained interviewers and the interviews were evenly distributed among four consecutive 3-month periods to correct for seasonal fluctuations. Items used for this study included family structure and socio-economic status, self-reported height and weight, self-reported perceived health and the number and nature of symptoms or complaints during the previous two weeks. If the children were younger than 12 years, a proxy interview was carried out with a parent. In children aged 12-17 years, the interviews were conducted with the children themselves, usually with a parent present elsewhere in the house.

Morbidity registration

During 12 months the general practitioners registered all physician-patient contacts and registered all health problems presented within a consultation. This survey was episode-orientated, meaning that different consultations concerning the same health problem were clustered into one disease episode. A consultation concerning a new health problem, according to the general practitioner, marks the beginning of a new episode. The diagnosis made by the general practitioners was coded using the ICPC.[14] For the present study, morbidity data of eight practices were excluded due to insufficient quality of the morbidity registration.

Overweight and obesity

The internationally recommended body mass index (BMI) was used as a measure of overweight and obesity in the children,[15]which was based on self-reported weight and height. A recently developed standard for overweight and obesity BMI cut-off points in Dutch children was used to determine the prevalence of overweight and obesity in the study population.[5] These cut-off points are almost identical to the recommended worldwide standard definition of overweight and obesity.[16]

Measurement of self-reported perceived health

Self-reported health was assessed by a single-item health status question (adapted from the SF36). Children (or parents) were asked "How is your (child's) health in general? Excellent, very good, good, poor or very poor?" Furthermore, children (or parents) were asked whether they (their child) experienced one or more of 41 acute symptoms during the past fourteen days (e.g. cough, sore throat, fever, tiredness, listlessness, etc.).

Study population

For the present study, interview data and corresponding general practitioners' morbidity registration data were used of the 2-17 year old children. Children under the age of 2 years were excluded because overweight and obesity is not defined in these ages. Further, we excluded children that did not have Dutch nationality for two reasons: first, only Dutch-speaking persons were included in the interview survey. Therefore, only the children of Dutch-speaking ethnic minority groups were included which caused a bias in the response of this group. Second, the BMI cut-off values were developed based on Dutch children only. A total of 2719 children were included in the analysis.

Analysis

Prevalence of overweight and obesity was calculated for three age categories: preschool age (2-4 years), pre-pubertal age (5-9 years) and from early pubertal age onwards (10-17 years). In the assessment of the prevalence of overweight and obesity, overweight children and obese children are assessed separately. In all subsequent analyses, overweight and obese children are clustered into one group: 'overweight & obese children'.

Children with overweight or obesity were compared with children without overweight. Differences in the categorical characteristics were tested with chi-square tests. A multivariate logistic regression model was used to identify independent associations of family characteristics and the presence of overweight and obesity in children. Self-reported health was analysed separately for children younger and older than 12 years because of the proxy interview with children younger than 12 years. Differences in categories of self-reported health, health problems, GP consultations and number of episodes were tested with chi-square tests. Differences in the number of health problems or consultations were tested with the Mann-Whitney test. Incidence rates were calculated by dividing the number of new episodes by the total number of person years, and were compared considering a Poisson distribution. We used SPSS version 11.0 for the analysis.

Results

Prevalence

Of the 2719 children included in the analysis, 319 children were overweight or obese (219 and 100 children, respectively). The overall prevalence of overweight and obesity is 11.7% (95%CI 10.5-13.0). The distribution by age group is shown in figure 1. In the 2-4 year olds the prevalence of overweight is 8%; the prevalence of obesity is 8%. In children aged 5-9 years, the prevalence of overweight is 10%; the prevalence of obesity is 5%. Of the 10-17 year olds, 8% are overweight, but obesity is much less prevalent in this age group (2%).

Self-reported health

Table 1 shows that parents report no significant difference in experienced health between the 2-11 year old overweight and obese children and non-overweight children. The overweight and obese children older than 12 years reported a significantly lower perceived health. The number of self-reported health problems during the previous 14 days does not differ significantly between children with or without overweight, in either of the two age groups.

Figure 1. Prevalence of overweight and obesity in the sample

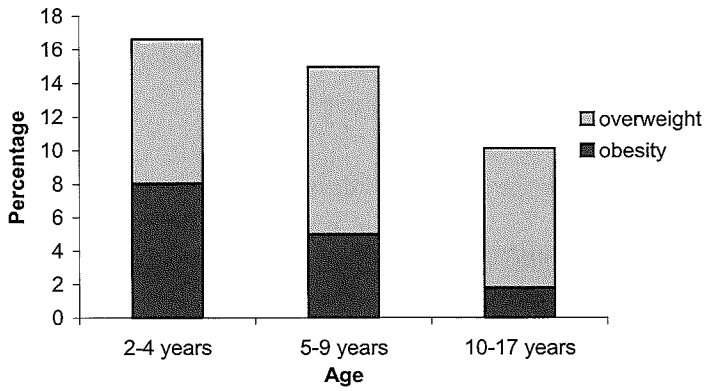


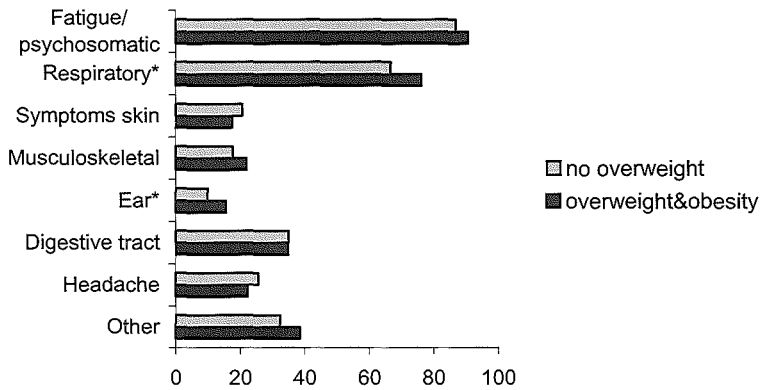
Table 1. Self-reported health and health problems.

	Children without overweight (n = 2140)		**Overweight & obese children** (n = 319)		
Self-reported health					
2-11 years					
very good	684	(63.6%)	109	(61.6%)	
good	344	(32.0%)	58	(32.8%)	p = 0.7
poor	48	(4.5%)	10	(5.6%)	
12-17 years					
very good	434	(56.7%)	37	(43.5%)	
good	295	(38.5%)	39	(45.9%)	p = 0.02
poor	37	(4.8%)	9	(10.6%)	
Number of self-reported health problems ≤ 14 days	2.9	(3605/2140)	3.2	(1013/319)	p = 0.7
2-11 years					
none	264	(19.2%)	49	(20.9%)	
1-2	544	(39.6%)	91	(38.9%)	p = 0.8
3 or more	566	(41.2%)	94	(40.2%)	
12-17 years					
none	73	(9.5%)	13	(15.3%)	
1-2	266	(34.7%)	23	(27.1%)	p = 0.1
3 or more	427	(55.7%)	49	(57.9%)	

Not all cells add up to the total of children in each group, because of missing values in the questionnaire or morbidity registration data.

Figure 2 presents the self-reported complaints per specific symptom group over the previous 14 days. Overall, 81% (257/319, 95%CI: 76-85) of the children with overweight reported complaints; 84% (1803/2140, 95%CI: 83- 86) of the children without overweight reported complaints. Fatigue and psychosomatic complaints such as insomnia and listlessness were often reported by all children or their parents. Ear complaints and respiratory problems were reported significantly more often by overweight and obese children.

Figure 2. Reported complaints during the previous 14 days.



*statistically significant difference ($p<0.01$) between children who are not overweight and those with overweight or obesity

Consultations and episodes in general practice

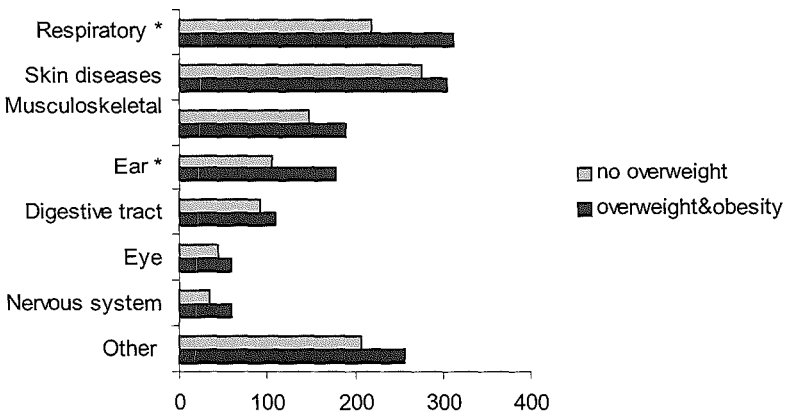
The number of general practitioner consultations differs significantly among the 2-11 year olds, and the number of presented episodes differs significantly between children with and without overweight in the older children (Table 2). On average, children without overweight consult the general practitioner less than two times per year, whereas overweight and obese children consult their general practitioner more than twice. The number of presented episodes in general practice ranges from 1.6 per year in 2-11 year olds without overweight, to 2.5 per year in 12-17 year olds with overweight. Exclusion of consultations for overweight or obesity did not change these results. Health problems that were reported more often by overweight and obese children were also presented in general practice more often.

Table 2. Consultations and number of presented episodes in general practice.

	Children without overweight (n = 2140)		Overweight & obese children (n = 319)		
No. of GP consultations (1 year)					
2-11 years					
none	431	(33.3%)	66	(30.0%)	
1 consultations	309	(23.9%)	41	(18.6%)	p= 0.046
2 consultations	189	(14.6%)	46	(20.9%)	
≥3 consultations	366	(28.3%)	67	(30.5%)	
mean	1.93	(2495/1295)	2.42	(532/220)	p = 0.07
12-17 years					
none	254	(34.4%)	25	(30.1%)	
1 consultations	182	(24.6%)	15	(18.1%)	p = 0.3
2 consultations	108	(14.6%)	15	(18.1%)	
≥3 consultations	195	(26.4%)	28	(33.7%)	
mean	1.80	(1329/739)	2.58	(241/83)	p = 0.07
No. of health problems presented in general practice					
2-11 years					
none	425	(32.8%)	63	(28.6%)	
1-2 episodes	571	(44.1%)	95	(43.2%)	p = 0.2
≥3 episodes	299	(23.1%)	62	(28.2%)	
mean	1.59	(2062 /1295)	1.97	(434/220)	p = 0.06
12-17 years					
none	234	(31.7%)	22	(26.5%)	
1-2 episodes	340	(46.0%)	35	(42.2%)	p = 0.2
≥3 episodes	165	(22.3%)	26	(31.3%)	
mean	1.62	(1197 /739)	2.45	(214 /83)	p = 0.02

In the overweight and obese children, incidence rates for ear and respiratory problems were 179 per 1000 person years and 311 per 1000 person years, respectively, whereas in children without overweight these incidence rates were 105 per 1000 person years for ear problems and 217 per 1000 person years for respiratory problems (difference in incidence rate ear problems: $p = 0.003$; difference in incidence rate respiratory problems; $p = 0.005$). Overweight and obese children also presented slightly more musculoskeletal problems, predominantly the older children, but this difference was not significant ($p = 0.12$).

Figure 3. Incidence rates of health problems presented in general practice.



* statistically significant difference ($p<0.05$) between the children without overweight and the children with overweight or obesity.

Children at risk for overweight or obesity

Socio-demographic characteristics of the overweight and obese children are tabulated and compared with children without overweight (Table 3). There is no gender difference in the occurrence of overweight or obesity. Multivariate analysis, adjusting for correlations between the socio-demographic characteristics, shows that family income and residence in urban areas is independently associated with a higher risk of overweight and obesity in children.

Table 3. Characteristics of overweight & obese children compared with children without overweight (unadjusted and adjusted OR; 95% confidence intervals).

	Children without overweight (N=2140) Number	Overweight & obese children (N=319) Number	Unadjusted OR	(95%CI)	Adjusted OR†	(95%CI)
Gender						
male	1077	150	ref		ref	
female	1063	169	1.1	(0.9-1.4)	1.1	(0.9-1.4)
No. of persons in household						
≤3 persons	321	69	1.4	(1.1-1.9)	1.3	(0.9-1.9)
4 persons	1033	156	ref		ref	
≥5 persons	784	93	0.8	(0.6-1.0)	0.9	(0.6-1.1)
Family structure						
2 parent household	1955	282	ref		ref	
1 parent household	167	34	1.4	(0.9-2.1)	1.2	(0.8-2.0)
Education level						
high	1337	213	ref		ref	
low	793	104	1.2	(0.9-1.6)	1.1	(1.2-2.0)
Family income						
low	787	157	1.6	(1.2-2.0)‡	1.5	(1.2-2.0)‡
high	1194	151	ref		ref	
Residence						
urban	1065	197	1.6	(1.3-2.1)‡	1.6	(1.3-2.1)‡
rural	1075	122	ref		ref	

Not all cells add up to the total number of children in each group, because of missing values in the questionnaire.

†adjusted for age and for the other variables, ‡ $p < 0.01$

Discussion

To our knowledge, this is the first population-based study indicating that overweight is a health burden for children on a day-to-day basis. Not only do overweight and obese children experience more and different health problems than their peers, overweight teenagers also report a poorer perceived health.

The prevalence of overweight and obesity seems to have increased significantly since 1997 and especially in young children, the 2-4 year olds. In 1997, the prevalence of obesity in these children ranged from 1-2%.[5] In our study we found a prevalence of approximately 8% (Figure 1). Accordingly, in this age group the prevalence of non-obese overweight has decreased. This finding is very worrisome, suggesting that there is a transition into obesity within the overweight children and that the severity of overweight in these children has increased. In a recent study in the UK, a similar increase of obesity in 3-4 year olds was observed and if this trend persists public health consequences could be unexpectedly high.[17] The population of the present study and the population studied in 1997 are comparable and BMI definitions are similar, thus rates prevalence rates of both studies are comparable However, because our study population is relatively small, generalizability is limited and larger studies are needed to confirm this trend.

Our results show that overweight and obese children older than 12 years report a poorer perceived health than their peers and also present more health problems to their general practitioner. Recently, Friedlander et al. also reported an association between overweight and decreased scores for several quality of life domains, but only in 8-11 year olds.[18] In the current study, parents do not report differences in perceived health in the younger overweight children; however, they do consult the general practitioner more often with their children. This difference in self-reported health in the younger overweight children may be due to the proxy design and it is possible that the younger children do perceive a poorer health, but that this is unnoticed by their parents. Another explanation could be that, from a parent's point of view, it is less desirable to report that your child has poorer health. That overweight children consult primary care more often was also reported in a Canadian study, which found a higher prevalence of obesity in children aged 4 to17 years that consulted primary care compared with the prevalence of obesity in children in the general population.[19]

We also found that children with overweight and obesity have a different morbidity pattern, both self-reported and presented in primary care. Strikingly, overweight children not only

have more respiratory problems, but also have more ear problems compared to non-overweight children. Previous studies also found an association between obesity and respiratory problems (whether or not related with asthma),[20] and it is believed that obesity and asthma are causally related.[21] However, in our study, subanalysis did not reveal any differences in the occurrence of asthma, so other explanations as to why overweight children have more respiratory and ear problems may be more appropriate. For example, researchers who found no proof for an increase of allergic inflammation in overweight children, provide evidence that obese children could have an upregulation of systemic inflammatory mechanisms.[22-24] Our study supports this theory because, besides an increase in respiratory problems, we also observe higher rates of ear infections in overweight children. The latter has not been reported before and suggests that the impact of overweight or obesity is not limited to an inflammation of the airway epithelium.

Which children are more at risk? We found that children in families with a lower income are at higher risk to become overweight or obese and this socio-economic gradient has also been reported by others.[3 25-27] Conversely, other researchers did not find this inverse association in children and suggest that the social class differences are negligible.[2] These inconsistencies could be due to the varying definitions of socio-economic status. Our finding that residence in an urban area is associated with the risk of overweight in childhood confirms a nation-wide study on childhood obesity.[4] Moreover, another Dutch study showed that children living in urban areas had less healthy eating patterns.[28]

Limitations

We used self-reported height and length to determine the BMI, which may have introduced misclassification in this survey. However, in this study, we think that this is limited because face-to-face interviews promote validity of answers[29] and, probably, especially that of self-reported weight. Moreover, this would probably have led to an underestimation of overweight and obese children in our study because we think that most people would be inclined to report a lower weight. If there is misclassification in self-reported height, this will probably be overestimated. Therefore, any misclassification of the BMI will most likely not affect the direction of the relations found in this study. This is supported by a recent study comparing self-reported height and weight with actual height and weight which showed small differences in weight, but this had no impact on the assessment of obesity related morbidity.[30] A consequence of such misclassification would also be an underestimation of the actual health

differences in children. Although there was a 35% non-response in the survey, we argue that selection bias was limited. Firstly, because the participants were sampled independent of general practice consultation. Secondly, compared with data from Statistics Netherlands, the children in our sample are representative for the Dutch childhood population and report similar experienced health as other Dutch children. This study shows that socio-demographic characteristics are associated with the risk of being overweight; however, we realize that a cross-sectional design has limitations in the assessment of causal relationships.

Conclusion and implications

This study indicates that overweight and obese children present more health problems to primary care than their peers. Moreover, overweight teenagers report that they feel less healthy. The bulk of research on health consequences of childhood obesity to date is focussed on long-term risks such as atherosclerotic diseases and the persistence of obesity into adulthood.[27 31-33] This study shows that overweight and obese children also experience health consequences in daily life. This is very disturbing and has not been reported earlier. Childhood obesity should be considered as a chronic health problem and strategies should be undertaken to tackle this increasing problem.[34] General practitioners see overweight and obese children in their surgery more often than children without overweight and therefore they could play an important role in the treatment and prevention of obesity. Therefore, we agree with others who propose a more active role of the general practitioner in preventing childhood obesity and its consequences, for which several strategies have been recommended.[34 35] For example, it can be assumed that the general practitioners' advice is more effective if linked to health problems. Other recommended strategies include long-term health interventions such as family fitness programmes. Simultaneously, other prevention strategies should be considered, for example excluding unhealthy foods from school cafeterias. Moreover, the finding that overweight children consult the general practitioner more often opens opportunities to consider closer collaboration with Youth Health Care Services. But, most important, parents of overweight children should be aware of the daily (and long-term) consequences of overweight and should be encouraged (for example by general practitioners) to achieve weight loss in their overweight children. Overall, it is clear that childhood overweight and obesity is an increasing health threat, causing not only an impaired health in the future, but at present. Future intervention studies are needed, which could be focussed on low-income families in urban areas and could be performed in a primary care setting.

References

1. Ogden CL, Flegal KM, Carroll MD, Johnson CL. Prevalence and trends in overweight among US children and adolescents, 1999-2000. JAMA 2002;288:1728-32.
2. Livingstone B. Epidemiology of childhood obesity in Europe. Eur J Pediatr 2000;159 Suppl 1:S14-34.
3. Armstrong J, Dorosty AR, Reilly JJ, Emmett PM. Coexistence of social inequalities in undernutrition and obesity in preschool children: population-based cross sectional study. Arch Dis Child 2003;88:671-5.
4. Fredriks AM, van Buuren S, Wit JM, Verloove-Vanhorick SP. Body index measurements in 1996-7 compared with 1980. Arch Dis Child 2000;82:107-12.
5. Hirasing RA, Fredriks AM, van Buuren S, Verloove-Vanhorick SP, Wit JM. Increased prevalence of overweight and obesity in Dutch children, and the detection of overweight and obesity using international criteria and new reference diagrams (Dutch). Ned Tijdschr Geneeskd 2001;145:1303-8.
6. Health Council of the Netherlands. Overweight and obesity. The Hague: Health Council of the Netherlands, 2003; publication no. 2003/ 07.
7. Morrison JA, Barton BA, Biro FM, Daniels SR, Sprecher DL. Overweight, fat patterning, and cardiovascular disease risk factors in black and white boys. J Pediatr 1999;135:451-7.
8. Morrison JA, Sprecher DL, Barton BA, Waclawiw MA, Daniels SR. Overweight, fat patterning, and cardiovascular disease risk factors in black and white girls: The National Heart, Lung, and Blood Institute Growth and Health Study. J Pediatr 1999;135:458-64.
9. Must A, Strauss RS. Risks and consequences of childhood and adolescent obesity. Int J Obes Relat Metab Disord 1999;23 Suppl 2:S2-11.
10. Reilly JJ, Methven E, McDowell ZC, Hacking B, Alexander D, Stewart L, et al. Health consequences of obesity. Arch Dis Child 2003;88:748-52.
11. Fagot-Campagna A, Saaddine JB, Flegal KM, Beckles GL. Diabetes, impaired fasting glucose, and elevated HbA1c in U.S. adolescents: the Third National Health and Nutrition Examination Survey. Diabetes Care 2001;24:834-7.
12. Eriksson JG, Forsen T, Tuomilehto J, Osmond C, Barker DJ. Early adiposity rebound in childhood and risk of Type 2 diabetes in adult life. Diabetologia 2003;46:190-4.
13. Westert GP, Schellevis FG, de Bakker DH, Groenewegen PP, Bensing JM, van der Zee J. Monitoring health inequalities through General Practice: the Second Dutch National Survey of General Practice. Eur J Public Health; in press.
14. Lamberts H, Wood M, Hofmans-Okkes I. The International Classification of Primary Care in the European Community, with a multilanguage layer. 1st ed. Oxford: Oxford University Press, 1987.

15. Pietrobelli A, Faith MS, Allison DB, Gallagher D, Chiumello G, Heymsfield SB. Body mass index as a measure of adiposity among children and adolescents: a validation study. J Pediatr 1998;132:204-10.
16. Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. BMJ 2000;320:1240-3.
17. Bundred P, Kitchiner D, Buchan I. Prevalence of overweight and obese children between 1989 and 1998: population-based series of cross sectional studies. BMJ 2001;322:326-8.
18. Friedlander SL, Larkin EK, Rosen CL, Palermo TM, Redline S. Decreased quality of life associated with obesity in school-aged children. Arch Pediatr Adolesc Med 2003;157:1206-11.
19. Gauthier BM, Hickner JM, Noel MM. High prevalence of overweight children in Michigan primary care practices. An UPRNet study. Upper Peninsula Research Network. J Fam Pract 2000;49:73-6.
20. Somerville SM, Rona RJ, Chinn S. Obesity and respiratory symptoms in primary school. Arch Dis Child 1984;59:940-4.
21. Gilliland FD, Berhane K, Islam T, McConnell R, Gauderman WJ, Gilliland SS, et al. Obesity and the risk of newly diagnosed asthma in school-age children. Am J Epidemiol 2003;158:406-15.
22. Von Mutius E, Schwartz J, Neas LM, Dockery D, Weiss ST. Relation of body mass index to asthma and atopy in children: the National Health and Nutrition Examination Study III. Thorax 2001;56:835-8.
23. Visser M, Bouter LM, McQuillan GM, Wener MH, Harris TB. Elevated C-reactive protein levels in overweight and obese adults. JAMA 1999;282:2131-5.
24. Visser M. Higher levels of inflammation in obese children. Nutrition 2001;17:480-1.
25. Goodman E. Letting the "Gini" out of the bottle: social causation and the obesity epidemic [editorial]. J Pediatr 2003;142:228-30.
26. Kinra S, Nelder RP, Lewendon GJ. Deprivation and childhood obesity: a cross sectional study of 20,973 children in Plymouth, United Kingdom. J Epidemiol Community Health 2000;54:456-60.
27. Eriksson J, Forsen T, Osmond C, Barker D. Obesity from cradle to grave. Int J Obes Relat Metab Disord 2003;27:722-7.
28. Brugman E, Meulmeester, J, Spee-van der Wekke, J et al. Breakfast-skipping in children and young adolescents in The Netherlands. Eur J Pub Health 1998;8:325-8.
29. Leeuw ED, van der Zouwen J. Data quality in telephone and face-to-face surveys: a comparative meta-analysis. Telephone Survey Methodology. New York: Wiley; 1988. p. 283-300.

30. Strauss RS. Comparison of measured and self-reported weight and height in a cross-sectional sample of young adolescents. Int J Obes Relat Metab Disord 1999;23:904-8.
31. Kotani K, Nishida M, Yamashita S, Funahashi T, Fujioka S, Tokunaga K, et al. Two decades of annual medical examinations in Japanese obese children: do obese children grow into obese adults? Int J Obes Relat Metab Disord 1997;21:912-21.
32. Fuentes RM, Notkola IL, Shemeikka S, Tuomilehto J, Nissinen A. Tracking of body mass index during childhood: a 15-year prospective population-based family study in eastern Finland. Int J Obes Relat Metab Disord 2003;27:716-21.
33. Berenson GS, Srinivasan SR, Bao W, Newman WP, 3rd, Tracy RE, Wattigney WA. Association between multiple cardiovascular risk factors and atherosclerosis in children and young adults. The Bogalusa Heart Study. N Engl J Med 1998;338:1650-6.
34. Dietz WH, Nelson A. Barriers to the treatment of childhood obesity: a call to action [editorial]. J Pediatr 1999;134:535-6.
35. Charney E. Childhood obesity: the measurable and the meaningful [editorial]. J Pediatr 1998;132:193-5.

Part II

General practitioners' management

8.

Dutch general practitioners' referral of children to specialists

Abstract

Objective To examine current referral patterns for children aged 0-17 years and compare these with referral patterns reported for 1987.

Methods Data were analysed from two national cross-sectional surveys in Dutch general practice which were performed in 2001 (91 general practices) and in 1987 (103 general practices). All new referrals to specialties were assessed by age, gender, ICPC category, specialty referred to and specific episodes of disease. Referral measures were quantified as new referrals per 1000 person years and per 100 new episodes, a measure of likelihood of a child with a specific diagnosis to be referred. Rates in 2001 were compared with 1987.

Results Referral rates decreased from 138 per 1000 person years in 1987, to 84 per 1000 person years in 2001. Age differences in referral rates were similar. Compared to 1987, more boys than girls were referred to specialists. The overall likelihood of a condition being referred decreased from 8.0 per 100 episodes in 1987 to 6.5 per 100 episodes in 2001. Reasons for referral also changed in 2001, particularly for the ENT specialist and ophthalmologist. Moreover, referral rates for acute otitis media, refractive disorders and vision problems decreased two- to four-fold in 2001.

Conclusion

Nowadays, Dutch general practitioners tend to manage more health problems themselves and refer less children to specialists.

Introduction

Although the vast majority of health problems in children presented in general practice are managed by the general practitioners themselves, a part of general practitioners' referrals concern children. In the Netherlands, as in the UK, the general practitioner acts as a gatekeeper for specialist care, so that access to specialist care is limited to those patients who are referred by their general practitioner. Moreover, because every Dutch inhabitant is listed in a general practice, referrals by general practitioners provide valid insight into the use of specialist care.

Only few studies have examined referrals in children to specialists by general practitioners in more detail. Studies have either small numbers,[1] or are restricted to referrals to a single outpatient clinic.[2] Even less information is available on how referral patterns evolve over time within a particular country. In the first Dutch National Survey, performed in 1987, referral rates for children in general practice showed varying referral rates by age, sex and specialty referred to.[3] Since this first national survey, several changes have been made in health care for children in the Netherlands. For example, several evidence-based guidelines for childhood diseases have been implemented to help decision-making for referral to specialist care. These guidelines are generally accepted and widely used by Dutch GPs.[4]

It is of interest, not only for general practitioners but also for specialists, to have insight in up-to-date and nation-wide representative information on general practitioners' referral rates. It is of interest to know which conditions are frequently referred and which childhood problems are managed predominantly by general practitioners and are seldomly referred. Moreover, valuable insight may be gained in the demand for outpatient specialty care.

The objective of our study was to examine current referral patterns of general practitioners to specialists for health problems in children aged 0-17 years, and to compare these data with the first Dutch national survey of 1987.

Methods

Data were analysed from the second Dutch national survey of general practice, which was performed by the Netherlands Institute for Health Services Research (NIVEL) in 2001. In addition, secondary analyses on data from the first Dutch national survey (1987) were performed. Details on the design of both national surveys have been described elsewhere.[5 6] For the current study data on children aged 0-17 years were analysed from both surveys.

Second National Survey

The second national survey was performed in 2001, 195 general practitioners in 104 practices participated in the study. The participating general practitioners and practices were representative for Dutch general practitioners and practices. The total study population consisted of 394,192 patients, a 2.5% representative sample of the Dutch population.
During a one-year period all patient contacts and all new referrals were registered. All health problems presented within one consultation were recorded separately using the International classification of Primary Care (ICPC-1)[7] and the diagnosis was coded immediately by the general practitioner using ICPC. This survey was episode-orientated, meaning that different consultations concerning the same health problem were clustered into one disease episode. The last diagnosis made by the general practitioner was considered the diagnosis of the episode. If a referral was made during a consultation, the specialty referred to was registered and the referral was linked to the diagnosis made by the general practitioner and to the relevant episode. Patient characteristics such as age and gender were derived from the general practitioners computerised patient records.
For this analysis data from 13 practices were excluded for the following reasons: In 8 practices the quality of registered data was poor and 5 other practices failed to register referrals.

First Dutch National Survey

The first national survey was performed in 1987. A non-proportionally stratified sample of 161 general practitioners (103 practices) was randomly selected to participate in the study. The general practitioners were divided into 4 groups and each group registered all contacts between patient and doctor on registration forms during one of four consecutive 3-month periods during 1987. Data recorded of each consultation included patient characteristics (age, gender), reason for encounter, diagnosis and new referrals to specialists. Diagnoses made by the general practitioner were coded afterwards by specially trained clerks using the ICPC. The first national

survey was also episode-orientated. Because of an underrepresentation of the population in deprived areas, the population was weighed to the Dutch population of 1987 to correct for morbidity presented in these areas.

Measures of referral and analysis

For the current study all new referrals to secondary care were evaluated with referring diagnosis and specialty referred to. Referring diagnosis was considered the diagnosis at the time the referral was made. A referral was considered new when a child was referred to a specialist for the first time for a certain health problem. If, later on in the study period, the child was referred to the same specialist but for a new and different health problem, this was considered as a new referral. The referral rate was calculated as the number of referrals per 1000 person years. The referral rate by episode of illness, a measure of likelihood of a certain health problem being referred, was calculated as the number of referrals for a certain condition per 100 new episodes presented to general practice.[3] For analysis SPSS version 11.0 was used.

Results

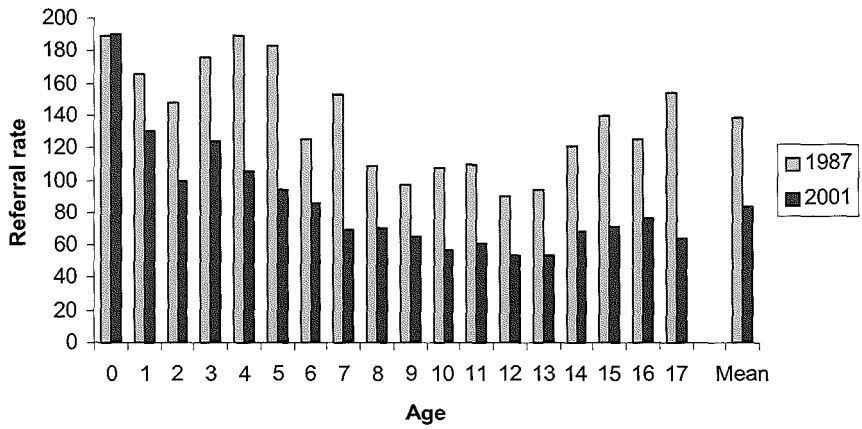
Overall referral rates

The study population of the 2001 survey consisted of 78,648 children aged 0-17 years. A total of 101,398 new episodes were presented in general practice and 6608 new referrals were made to specialists. A total of 6130 children were referred, 7.8% of all children [95%CI: 7.6-8.0]. The overall referral rate to specialists was 84 per 1000 person years [95%CI: 82-86]. The study population of 1987 consisted of 86,577 children, who presented 37,715 new episodes, and 2997 new referrals were made during the 3-month study period. This resulted in an overall referral rate of 138 per 1000 person years [95%CI: 134-143].

Referral by age and gender

Figure 1 shows the distribution of the referrals by age for 1987 and 2001. Both surveys show similar referral patterns for age: most referrals in the first years of life (mainly to pediatricians and ENT specialists), fewest referrals at ages 10 -14, and an increasing number of referral at ages 15-17 years. In 2001, boys were referred more often to specialists than girls (boys: 89/1000 person years; girls 79/1000 person years, p<0,001). In 1987, girls were referred to specialists as often as boys (girls: 138/1000 person years; boys 140/1000 person-year, p=0.69).

Figure 1. Referral rates for the population by age in 1987 and 2001



Referral rates by diagnosis

Table 1 gives an overview of the referral rates for the population and referral rates per episode of illness for both surveys by ICPC category. The likelihood of being referred, quantified in the referral rate per 100 episodes of illness, decreased from an overall rate of 8.0 in 1987 to 6.5 in 2001. Referral rates for musculoskeletal problems decreased by 65% and 55% respectively, indicating that considerably more musculoskeletal problems were managed by general practitioners themselves in 2001, and were less frequently referred to secondary care. It is also shown that population-based referral rates for respiratory and skin problems are high, but the likelihood for these conditions to be referred is relatively low. In 2001, general practitioners referred more children with psychological or psychiatric problems. This increase is mainly accounted for by a substantial increase of referrals for learning problems.

Table 1. Referral rates for the population and referral rates per episode of illness referability rates by ICPC category in 1987 and 2001

	Number		Population-based referral rate		Episode-based referral rate	
	1987 (3 months)	2001 (12 months)	1987	2001	1987	2001
A General	175	531	8	7	4	4
B Blood	21	38	1	0.5	7	4
D Digestive	196	563	9	7	6	6.5
F Eye	379	771	17.5	10	28	18
H Ear	388	839	18	10.5	11	8
K Circulatory	38	130	2	1.5	31	32
L Musculoskeletal	524	698	24	9	13	6
N Neurological	90	206	4	2.5	18	8.5
P Psychological	42	291	2	3.5	8	14
R Respiratory	443	1008	20.5	13	4	4.5
S Skin	464	871	21.5	11	7	4
T Endocrine	70	160	3	2	22	20
U Urology	28	125	1.5	1.5	5	6.5
W Pregnancy	22	14	1	0.2	10	1
X Female genital	22	54	1	0.5	5	3.5
Y Male genital system	85	294	4	3.5	29	28
Z Social problems	9	15	0.5	0.2	4	4.5
Total	2997	6608	138	84	8.0	6.5

Population-based referral rate: new referrals per 1000 person years.

Episode-based referral rate: new referrals per 100 new episodes.

Table 2 gives the top-5 diagnoses leading to referral within each of the specialties most frequently referred to in 2001 (covering 41% of all referrals).Referral rates for the population and referral rates per episode of illness from both surveys are shown. This table illustrates that the reasons for referral have changed considerably, especially for referrals to the ENT-specialist: in 2001, the referral rate for acute otitis media was 72% lower than in 1987 and is no longer the main reason for referral to the ENT specialist, as it was in 1987. In 2001, the dermatological diseases warts and eczema were treated more often by general practitioners themselves than in 1987.

Table 2. Diagnoses (top-5) of the specialties most frequently referred to.

Referrals	Population-based referral rate		Episode-based referral rate	
	1987	2001	1987	2001
ENT	**32.5**	**20.9**		
R90 Hypertr./chron. infection T and A	4.2	3.9	54.8	46.0
H72 Serous otitis media/ glue ear	4.8	3.2	33.1	22.4
H02 Hearing complaints	0.9	2.4	100	41.9
H71 Acute otitis media	6.9	1.9	7.5	3.1
R76 Acute tonsillitis/ abscess	2.4	1.0	5.6	5.3
Pediatrics	**22.4**	**19.5**		
R96 Asthma	0.8	1.2	4.7	9.0
K81 Heart murmur	0.4	0.9	55.6	54.5
D01 Abdominal complaints	0.1	0.6	1.0	5.9
U71 Cystitis/ UTI	0.3	0.8	2.0	5.4
T10 Failure to thrive	0.8	0.7	45.0	29.4
Ophthalmology	**18.3**	**10.5**		
F05 Other vision problems	4.4	2.9	147.7	59.0
F91 Refractive disorders	6.6	2.6	140.2	73.6
F95 Strabismus	2.4	1.3	115.2	82.0
F99 Other diseases eyes/adnex	0.4	0.3	40.9	50
N01 Headache	0.1	0.3	4.4	3.4
Surgery	**24.2**	**9.3**		
D89 Hernia inguinalis	2.0	1.1	69.2	77.1
L72 Fracture: radius/ ulna	1.5	0.6	44.2	21.1
D88 Appendicitis	1.9	0.5	74.1	42.0
S94 Ingrown toenail	1.4	0.6	29.2	10.4
Y81 Phimosis	0.8	0.6	38.3	23.9
Dermatology	**13.9**	**8.1**		
S87 Atopic eczema	0.9	1.4	8.2	8.6
S82 Naevus	0.4	0.9	18.7	15.4
S88 Eczema NEC	1.7	0.9	5.2	3.7
S03 Warts	3	0.8	7.6	2.2
S96 Acne	0.9	0.5	9.4	7.6
Orthopaedics	**11.6**	**5.1**		
L98 Acquired deformities of limbs	2.7	0.5	31.7	15.4
L82 Congenital deformities	1.2	0.6	50	45.5
L15 Symptoms knee	0.1	0.6	5.1	6.1
L17 Symptoms feet/toes	0.3	0.4	9.9	3.3
L85 Scoliosis	1.0	0.3	29.9	21.6

Discussion

Referral patterns of children have changed considerably during the past 15 years in the Netherlands. Our results show that Dutch general practitioners nowadays refer fewer children and are less likely to refer children to specialist care.

Not only has the overall number of referrals decreased, reflected in an almost 50% lower population-based referral rate, but also the overall likelihood of a certain condition being referred, reflected in the referral rate per 100 episodes of illness, has decreased by almost 20%. In part, the decrease in population-based referral rate can be explained by an approximate 25% decrease in childhood consultation rate from 1987 to 2001 (chapter 3). However, the episode-based referral rate reflects general practitioners' referral decision and is independent of differences in consultation rates (assuming that severity of childhood morbidity presented in general practice has not changed). That these episode-based referral rates have declined as well, demonstrates clearly that general practitioners tend to manage more health problems themselves in 2001 than they did before.

In 2001, 7.8% of the children in the Netherlands were referred to specialists, slightly less than the 8.7% reported recently in the UK.[8]

To our knowledge no studies have examined general practitioners referrals of children over time. Moreover, only a few studies have explored referral patterns for patients of all ages over time. A Dutch study examining new referrals from 1971 to 1994 in four general practices showed a decrease of new referrals after 1971, but from 1981 onwards the referral rates remained more or less stable.[9] Statistics Netherlands collects secondary care-based data on referrals to specialists, and they also found a decreasing number of childhood referrals between 1991 and 2000.[10] A study of referral patterns in the UK showed a steady increase of referrals from 1990 through 1994, not only to all specialties but also to pediatrics.[11]

Referral rates for children vary greatly by age at referral, which is illustrated for both surveys in figure 1. Both surveys show highest referral rates in the first years of life, lowest rates at ages 10-14, and a gradual increase in the teen and adolescent age groups. This is consistent with results of other studies.[12] Although not fully understood, boys are referred to specialists more often nowadays, a finding also reported by others. [13 14]

Parallel to the overall decreased referral rate, the likelihood for a condition being referred, quantified in the referral rate per 100 episodes of illness, also decreased, although to a lesser extent. One explanation is that, during the past 15 years, a considerable amount of research

has been performed in primary care rationalising a watchful-waiting policy or non-invasive treatment for several childhood conditions, showing that referral to secondary care is often not necessary. Furthermore, based on this research, several new guidelines for childhood diseases were developed including criteria for referral, which may have attributed to the decrease in episode-based referral rates. In particular, this may be the case for referrals to the ENT specialist and ophthalmologist. For example, the otitis media guideline (the first Dutch guideline concerning children) appeared in 1990 and gives clear advice as to when referral is appropriate.[15] Although our study design does not allow statements about causal associations between lower referral rates and guideline adherence, our results do suggest that these guidelines are helpful in deciding when to refer and thus leading to fewer referrals to secondary care. This may also be the case for referrals to the ophthalmologist; a guideline on refractive disorders and vision problems was implemented in 1990, with well-defined recommendations as to when a child should be referred.[16] In 2001, the likelihood of referral for respiratory problems had not decreased, but referral rates for these conditions decreased from 20.5 in 1987 to 13 in 2001. This implies that fewer children consult their general practitioner for respiratory tract problems, as was also found in a previous analysis of the present survey. In contrast to the trend of overall declining referral rates for children, we found that children were referred more often for learning problems. We hypothesize that these are ADHD-related, for example that parents or teachers question whether learning problems of a child are caused by ADHD and request referral for further testing.

In 2001, referral and referability rates of conditions such as fracture of the arm and appendicitis (diagnoses that generally need treatment in secondary care) decreased two to three-fold compared with 1987. An explanation for this unexpected finding could be that patients went directly to the emergency department, but registration of the referral was not made in the general practitioners' records.[17]

Limitations

Although both surveys were similar in design and were performed by the same research group, comparing referral rates of both surveys has limitations. For example, nowadays general practitioners may refer health problems to the physiotherapist that previously may have been referred to the orthopaedic surgeon; however, a subanalysis did not reveal any significant changes in referrals to physiotherapists. Furthermore, in 1987 the diagnosis was coded by trained NIVEL clerks, whereas in 2001 the general practitioners coded the diagnosis themselves; which could have led to coding differences in diagnoses between the two surveys.

Implications for future research

This study gives a broad, up-to-date and representative picture of referral patterns in Dutch children. The results show that referral patterns have changed considerably over time, with an overall decreasing referral rate and an overall decreasing likelihood of diseases being referred. Changes in referral patterns may be due to an improved primary care, but this study has not addressed the question whether the decrease in referrals implies a decrease in inappropriate referrals; this needs further research.

References

1. Van den Bosch WJHM, Bor H, van Weel C. Verwijzen van kinderen in vier huisartspraktijken. Huisarts Wet 1992;45:267-271.
2. MacFaul R, Long R. Paediatric outpatient utilisation in a district general hospital. Arch Dis Child 1992;67:1068-72.

3. van Suijlekom-Smit LWA, Bruijnzeels MA, van der Wouden JC, van der Velden J, Visser HK, Dokter HJ. Children referred for specialist care: a nationwide study in Dutch general practice. Br J Gen Pract 1997;47:19-23.
4. Grol R. Successes and failures in the implementation of evidence-based guidelines for clinical practice. Med Care 2001;39(8 Suppl 2):46-54.
5. Foets M, van der Velden J, de Bakker D. Dutch national survey of general practice. A summary of the survey design. NIVEL: Utrecht,1992.
6. Westert GP, Schellevis FG, de Bakker DH, Groenewegen PP, Bensing JM, van der Zee J. Monitoring health inequalities through General Practice: the Second Dutch National Survey of General Practice. Eur J Pub Health; in press.
7. Lamberts H, Wood M, Hofmans-Okkes I. The International Classification of Primary Care in the European Community, with a multilanguage layer. First edition. Oxford: Oxford University Press, 1987.
8. Forrest CB, Majeed A, Weiner JP, Carroll K, Bindman AB. Referral of children to specialists in the United States and the United kingdom. Arch Pediatr Adolesc Med 2003;157:279-285.
9. Van de Lisdonk EH, van Weel C. New referrals, a decreasing phenomenon in 1971-94: analysis of registry data in the Netherlands BMJ1996;313:602.
10. Statistics Netherlands. Statistisch Jaarboek 2002. Voorburg/ Heerlen, 2003.
11. Surender R, Bradlow J, Coulter A, Doll H, Brown SS. Prospective study of trends in referral patterns in fundholding and non-fundholding practices in the Oxford region, 1990-4. BMJ 1995;311:1205-1208.
12. Roland MO, Bartholomew J, Morrell DC, McDermott A, Paul E. Understanding hospital referral rates: a user's guide. BMJ 1990;301:98-102.
13. Forrest CB, Reid RJ. Prevalence of health problems and primary care physicians' specialty referral decisions. J Fam Pract 2001;50:427-432.
14. Vehvilainen AT, Kumpusalo EA, Takala JK. Reasons for referral from general practice in Finland. Scand J Prim Health Care 1997;15:43-47.
15. Appelman CLM BP, Dunk JHM, van de Lisdonk EH, de Melker RA, van Weert HCPM. NHG standard Otitis Media Acuta. (Guideline on acute otitis media of the Dutch College of General Practitioners.). Huisarts Wet 1990;33:242-245.
16. Van de Beek G, de Bruin WH, Gooskens PAJ, de Jong A, Schiffelers HRM, Wouts WJM. Oogheelkundige diagnostiek. NHG standaard.(Guideline on ophthalmic diagnostics of the Dutch College of General Practitioners). Huisarts Wet 1990;33:394-402.
17. Kulu-Glasgow I, Delnoij D, de Bakker D. Self-referral in a gatekeeping system: patients' reasons for skipping the general practitioner. Health Policy 1998;45:221-238.

9. Trends in prescribing antibiotics for children in Dutch general practice

Abstract

Objective To assess changes in antibiotic prescribing patterns for children between1987 and 2001, and to identify general practice characteristics associated with higher antibiotic prescribing rates.

Methods Cross-sectional national survey of Dutch general practice in 1987 and 2001. Data were used of all children aged 0-17 years; 86,577 children in 103 participating practices in 1987, and 76,010 children in 90 participating practices in 2001. Population-based, contact-based and disease-based antibiotic prescription rates were evaluated by age, gender and diagnosis. Practice characteristics associated with inappropriate broad-spectrum antibiotic prescription were identified.

Results Population-based prescription rates decreased from 300/ 1000 children (95% CI, 292-307) in 1987 to 232/ 1000 children in 2001(95% CI, 228-235). In 1987, the contact-based prescription rate was 108/ 1000 contacts (95% CI, 106-111) and this was somewhat similar in 2001: 103/ 1000 contacts (95% CI, 101-105). In 2001, increased disease-based prescription rates were observed for acute otitis media, acute bronchitis, acute upper airway infections, acute tonsillitis and cough. Overall, non-recommended broad-spectrum antibiotics were prescribed more often in 2001 than in 1987 (87% in 1987 vs. 90% in 2001, $p<0.001$). Adjusted for other practice characteristics, general practitioners in single-handed practices prescribed 58% more broad-spectrum antibiotics inappropriately for upper airway infections than general practitioners in group practices.

Conclusion Antibiotic prescribing in children is still relatively low in the Netherlands. However, the prescription of broad-spectrum antibiotics for inappropriate diagnoses has increased, an unfavourable trend given the emerging bacterial resistance. Single-handed practices should especially be targeted to improve antibiotic prescribing in children.

Introduction

In general practice antibiotic drug use is highest among children and approximately 70% of all antibiotics in children are prescribed for upper respiratory tract infections.[1, 2] As in other developed countries, the most frequent type of misuse is prescribing antimicrobial agents for infections which are commonly caused by a virus.[3-5] Although non-hospital antimicrobial drug use in the Netherlands is the lowest in the European Union,[6, 7] several nation-wide studies have reported inappropriate high antibiotic prescribing.[8-10] Moreover, there seems to be a large variation between physicians in antibiotic prescribing.[1, 11, 12] In view of the emerging worldwide threat of bacterial and antibiotic resistance, there is an increasing urge to identify determinants and patterns of antibiotic prescribing to identify where clinical practice can be improved .[2, 13-15]

Detailed information on antibiotic drug prescribing in general practice is scarce. Results from the first Dutch national survey in general practice in 1987, showed that 20% of all antibiotics for children was prescribed by 5% of the general practitioners.[10] Since the first national survey was performed, evidence-based guidelines rationalizing antibiotic prescription have been developed by the Dutch College of General Practitioners. These guidelines in general recommend restrictive antibiotic prescription and favour small-spectrum antibiotics; for example, antibiotics are recommended only for patients with severe tonsillitis, phenethicillin being the antibiotic of first choice. A new guideline is always published in the Dutch journal for general practitioners (Huisarts en Wetenschap) and a summary is also issued on so-called practice cards. These cards, in handy format, ease the implementation and use of guidelines in daily practice.

Although the guidelines are generally accepted and widely used by Dutch general practitioners,[16, 17] recent evidence shows that the relative share of broad-spectrum antibiotics is high in the Netherlands.[18] This trend is worrisome and has not been observed in other countries; on the contrary, many report declining antibiotic prescription rates.[19, 20]

We performed this study to obtain insight in the antibiotic prescribing patterns of 2001 and to compare these with 1987.

The objectives of this study are to examine antibiotic drug prescribing for children in primary care, by diagnosis, age and gender, to evaluate changes in antibiotic prescribing since 1987, and to assess whether practice characteristics are associated with higher prescription rate.

Methods

Data were analysed from the first and second Dutch national surveys of general practice, which were performed by the Netherlands Institute for Health Services Research (NIVEL) in 1987 and 2001, respectively. For the present study, data from both surveys for children aged 0-17 years were analysed. In the Netherlands, general practices have a fixed list size, meaning that all non-institutionalised inhabitants are listed in a general practice.

First Dutch National Survey 1987

A non-proportionally stratified sample of 161 general practitioners was selected randomly to participate in the survey. The general practitioners were divided into four groups and each group registered all contacts between patient and practice on registration forms during one of the four consecutive 3-month periods during 1987. The registration periods were distributed evenly among the four seasons to correct for seasonal variability of morbidity. Data recorded of each consultation included patient characteristics (age, gender), reason for encounter, diagnosis and prescription of drugs. Diagnoses made by the general practitioner were coded afterwards by specially trained workers using the International Classification of Primary Care (ICPC)[21]. Other demographic patient characteristics were obtained by questionnaire. Because of an underrepresentation of deprived areas, the population was weighed to the Dutch population of 1987.

Second National Survey 2001

The second national survey was performed in 2001 and has been described in detail elsewhere [22]. In short, 195 general practitioners in 104 practices registered all physician-patient contacts during 12 months. General practitioners registered all health problems presented within a consultation and diagnoses were coded using the ICPC. Also, all prescriptions made by the general practitioner were registered. Characteristics of participating practices such as pharmacy holding, the type of practice (single-handed/ group practice), settlement in rural or urban area and list size was obtained by mailed questionnaire. Patient characteristics such as age and gender were derived from the general practitioners' computerized patient files.

For this analysis data from 14 of the 104 practices were excluded for various reasons: ten practices with inadequate registration of patient contacts or drug prescription were excluded after quality control. Four other practices were excluded because they appeared not to have registered morbidity or prescription data due to software problems.

Episodes of disease

Both surveys are episode orientated, meaning that different consultations concerning the same health problem are linked to one episode. The last diagnosis made by the general practitioner is considered the diagnosis of the episode of care.

Prescription measures

Prescriptions are coded according to the ATC classification.[23] All prescriptions of antibiotics for systemic use (Anatomic Therapeutical Chemical group J01) are analyzed from both surveys. In addition, from the survey of 1987, antibiotics of ATC groups J03A, J03B and G04A are analyzed as well, because in 2001 these ATC groups no longer exist and the antibiotics with these codes are incorporated in the J01 category (e.g.1987: ATC code J03A: sulphonamides, ATC code J03B: trimethoprim in combination with sulphonamides, G04A: antibiotics for urinary tract). Antibiotics are analyzed by age group, gender and diagnosis for which the prescription was made. Narrow-spectrum antibiotics are defined as antibiotics with ATC codes J01CE and J01CF (phenoxymethylpenicillin, phenethicillin, flucloxacillin and benzylpenicillin). Prescriptions are evaluated and compared by 1000 person years. To take into account differences in consultation rates and the number of health problems encountered in general practice, prescription rates are also examined per 1000 patient contacts (a contact-based prescription rate) and by disease-specific episodes (a disease-based prescription rate). The latter is a measure of likelihood of antibiotic prescription for a certain health problem. For example, if a certain health problem has 20 prescriptions per 100 episodes, it can be interpreted that 20% of episodes of that disease is treated with antibiotics.

To assess whether certain practices in the survey of 2001 were associated with antibiotic prescribing, a measure of inappropriate antibiotic prescription was computed in order to identify general practices in which improvement of judicious antibiotic prescription is most needed. The measure calculated for each participating practice is the number of broad-spectrum antibiotic prescriptions for the diagnoses with ICPC code R05 (cough), R74 (acute upper airway infection) and R78 (acute bronchitis) per fulltime-equivalent general practitioner. For these diagnoses antibiotics are generally considered inappropriate and this is

supported by overwhelming evidence.[24] Prescription of broad-spectrum antibiotics for these diagnoses is considered even more inappropriate.

Analysis

The 95% confidence intervals were calculated around prescription rates, and differences in proportions of types of prescribed antibiotics in both surveys were tested with chi-square tests. To identify characteristics of general practices associated with inappropriate antibiotic prescribing, a Poisson regression model was used. As dependent variable the number of broad-spectrum antibiotic prescriptions for diagnoses R05 (cough), R74 (acute upper airway infection) and R78 (acute bronchitis) per fulltime-equivalent general practitioner was used. Independent practice characteristics entered in the model were: the type of practice organisation (single-handled vs. group practice); the number of children listed in the practice; the proportion of children in the practice as a proxy of experience with childhood conditions, pharmacy holding and degree of urbanisation

Extra Poisson dispersion was taken into account. For analysis SPSS version 11.0 and SAS version 8.2 was used.

Results

Antibiotic prescription rates, by age and gender.

During the survey of 1987, 86,577 children had 59,855 encounters in general practice resulting in 50,829 episodes of disease. A total of 5,648 patients received 6,487 antibiotic prescriptions resulting in an overall antibiotic prescription rate of 300 per 1000 person years (95% CI, 292-307) and 108 per 1000 GP contacts. In the survey of 2001, a total of 76,010 children aged 0-17 years presented 152,282 episodes of disease during 171,272 contacts with general practice. A total of 17,636 antibiotic prescriptions were issued to 12,231 patients, which gives a significantly lower overall prescription rate of 232 per 1000 person years (95% CI, 228-235) (Table 1.). Taking into account the differences in consultation rates in both surveys, the contact-based prescription rate of 1987 is 108 per 1000 encounters in 1987 (95% CI, 106-111), compared to 103 per 1000 encounters in 2001 (95% CI, 101-105); this difference between surveys is just significant. Overall, girls received somewhat more antibiotics than boys, but the 0-4 year old boys received most antibiotic prescriptions: 500 per 1000 person years in 1987 and 444 per 1000 person years in 2001.

Table 1. Antibiotic prescriptions by age category and gender: comparison of national surveys 1987 and 2001†

		National Survey 1987			National Survey 2001		
		No. of prescriptions	per 1000 pys	per 1000 contacts	No. of prescriptions	per 1000 pys	per 1000 contacts
Total		6,487	300	108	17,636	232	103
Boys	0-4	1,485	500	123	4,644	444	127
	5-9	902	302	121	1,958	173	94
	10-14	401	137	79	1,004	92	61
	15-17	441	191	93	915	144	91
	total	3,229	289	109	8,521	218	102
Girls	0-4	1,283	460	116	3,933	407	128
	5-9	907	324	128	2,313	219	119
	10-14	465	163	79	1,330	125	70
	15-17	603	292	92	1,539	248	84
	total	3,258	311	106	9,115	246	104

†Total number of antibiotic prescriptions, per 1000 person years (pys) and per 1000 GP contacts in each age category (including all patient contacts).

Antibiotic prescriptions per ICPC category

The health problems, for which antibiotics were prescribed, are distributed among the ICPC chapters in table 2. Antibiotic prescriptions are not only presented per 1000 person years, but also per 100 ICPC chapter-specific episodes. The overall antibiotic prescription rate per 100 episodes in the second survey was 11.6 (95% CI, 11.4-11.8); this can be interpreted as, 11.6% of all episodes of disease were treated with antibiotics. In 1987 this episode based prescription rate was 12.7 per 100 episodes (95%CI, 12.4-13.0). In 2001, 45% of the antibiotics were prescribed for respiratory problems, compared with 66% in 1987. In 2001, 25% of these respiratory episodes were treated with antibiotics compared with 33% in 1987 (difference: 8% $p<0.001$). In 2001, 29% of the ear problems were treated with antibiotics; in 1987 this proportion was 23% ($p<0.001$).

Table 2. Distribution of prescriptions by the ICPC chapters‡

	National Survey 1987				National Survey 2001			
	Number	(%)	per 1000 pys	per 100 episodes	Number	(%)	per 1000 pys	per 100 episodes
A General	185	(2.9%)	8.5	2.3	296	(1.7%)	3.9	2.1
H Ear	890	(13.7%)	41.1	23.1	3,556	(20.1%)	46.8	29.3
R Respiratory tract	4,303	(66.3%)	198.8	33.2	7,908	(44.8%)	104.0	24.8
U Urinary Tract	433	(6.7%)	20.0	65.4	1,682	(9.5%)	22.1	66.7
Other ICPC chapters	673	(10.4%)	30.9	2.7	1,966	(11.1%)	25.9	2.5
Unknown	3	(0.06%)	0.1	1.5	2,228	(12.6%)	29.3	16.6
Total	6,487	(100%)	299.7	12.7	17,636	(100%)	232.0	11.6

‡ Total number, prescription per 1000 person years (pys) and per 100 chapter specific episodes of disease.

Diagnoses most frequently prescribed antibiotics

Table 3 shows the top 15 diagnoses for which antibiotics were given. In 1987 and 2001 these health problems accounted for 82% and 75% of all antibiotic prescriptions, respectively. In 2001, acute otitis media was the most important diagnosis for which antibiotics were prescribed, followed by acute bronchitis, (the number one reason in 1987) and urinary tract infection. The likelihood of receiving an antibiotic prescription for these diagnoses in 2001 increased significantly. On average, all episodes of urinary tract infection were prescribed at least one antibiotic prescription in 2001; during a few episodes more than one antibiotic prescription was made. Antibiotic prescription for episodes of asthma decreased from 27.9% in 1987 to 7.3% in 2001.

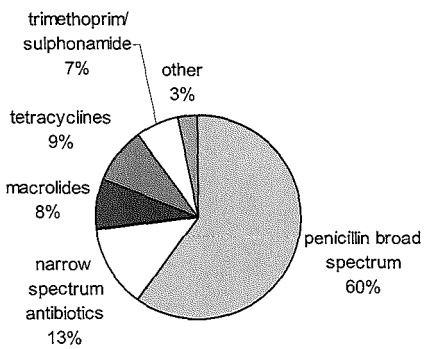
Table 3. Diagnoses for which antibiotics were most frequently prescribed, in 1987 and 2001. Total number, per 1000 person years and per 100 disease episodes.

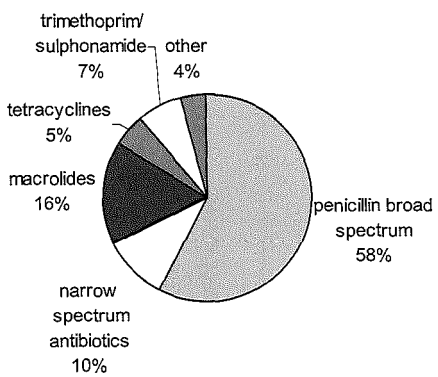
Survey 1987 Diagnosis	No. of prescrip.	no/1000 person years	no/100 disease episodes	**Survey 2001** Diagnosis	No. of prescrip.	no/1000 person years	no/100 disease episodes
1. R78 acute bronchitis	1,236	57.1	75.2	1. H71 acute otitis media	3,101	40.8	55.8
2. R74 acute upper airway inf.	754	34.8	16.4	2. R78 acute bronchitis	2,204	29.0	83.5
3. R76 acute tonsillitis	692	31.9	70.9	3. U71 urinary tract infection	1,595	20.9	104.5
4. H71 acute otitis media	682	31.5	33.5	4. R74 acute upper airway inf.	1,473	19.4	17.0
5. R75 sinusitis	449	20.7	73.3	5. R76 acute tonsillitis	1,285	16.9	73.4
6. U71 urinary tract infection	408	18.9	94.6	6. R81 pneumonia	606	8.0	85.0
7. R81 pneumonia	258	11.9	103.2	7. S84 impetigo	596	7.8	30.4
8. R96 asthma	216	9.9	27.9	8. R75 sinusitis	543	7.2	68.9
9. S84 impetigo	127	5.9	35.6	9. R05 coughing	462	6.1	8.8
10. S96 acne	109	5.0	17.4	10. S96 acne	321	4.2	29.0
11. R77 laryngitis	111	5.1	27.5	11. R90 chronic tonsillitis	285	3.7	32.2
12. R71 whooping cough	66	3.1	55.8	12. R96 asthma	244	3.2	7.3
13. R83 other respiratory inf.	65	3.0	47.0	13. R72 streptococcal angina	218	2.9	78.5
14. R72 streptococcal angina	65	3.0	60.4	14. H72 serous otitis media	141	1.9	9.9
15. R05 coughing	64	2.9	7.0	15. R71 whooping cough	139	1.8	44.1

Types of antibiotics prescribed

The distribution of the different kind of antibiotics is illustrated in Figure 1. The proportion of narrow-spectrum antibiotics decreased from 13% in 1987 to 10% in 2001($p<0.001$). In 2001, the proportion of macrolides has increased from 8% to 16% ($p<0.001$), 60% were prescribed for respiratory tract infections. Tetracylines were prescribed less frequent in 2001.

Figure 1. Types of antibiotics prescribed for children by general practitioners





Survey 1987 **Survey 2001**

Practice characteristics associated with inappropriate prescription

Table 4 shows the relationship between of practice characteristics and prescription rates of broad-spectrum antibiotics for diagnoses R05 (cough), R74 (acute upper airway infection) and R78 (acute bronchitis) in 2001. After adjustment for the number of children listed in the practice and other practice characteristics, the type of practice is significantly associated with an inappropriate prescription rate: single-handed practices prescribe 58% (RR 1.58; 95% CI, 1.07–2.35) more broad-spectrum antibiotics for inappropriate diagnoses compared with group

practices. Having a high proportion of children listed in the practice is associated with a 55% higher inappropriate antibiotic prescribing than practices with normal or low proportion of children (RR 1.55; 95% CI, 1.08-2.23). The location of the practice (rural/urban) and whether or not the general practice is pharmacy holding are not associated with these prescriptions.

Table 4. Characteristics of general practices associated with the number of prescriptions of broad-spectrum antibiotics for diagnoses R05 (cough), R74 (acute upper airway infection) and R78 (acute bronchitis)†, survey 2001.

	rate ratio	95% CI	p-value
Single handed #	1.58	1.07-2.35	0.02
High proportion of children in practice ‡	1.55	1.08-2.23	0.02
Pharmacy holding	1.26	0.78-2.03	0.35
Urban §	0.72	0.49-1.06	0.10
Semirural §	0.73	0.46-1.17	0.19

†adjusted for the number of children listed in the practice and the other practice characteristics

reference: group practice

‡ reference: low/normal proportion of children in practice (≤20%)

§ reference: practices in rural area

Discussion

The overall antibiotic prescription rate per 1000 children in general practice has decreased from 300 in the survey of 1987 to 232 in the survey of 2001 (Table 1). This implies a declining prescription rate of antibiotics in children. However, if differences in consultation rate are accounted for, reflected in the contact-based prescription rate, it becomes clear that prescription rates by general practitioners have remained almost similar since 1987 (Table 2). Possibly, this difference in population-based and contact-based prescription rate reflects a higher threshold of contacting the general practitioner in 2001. For example, nowadays parents may have become increasingly aware of the viral origin of infectious respiratory diseases and the (non-)usefulness of antibiotics in these infections. Therefore they may visit their general practitioner less often, or only when disease is more severe. Indeed, the finding that fewer antibiotics were prescribed for respiratory tract infections in 2001 is consistent with

this hypothesis. Moreover, the results of a recent study by McCaig et al. support our findings.[19] They also found a greater decrease in population-based antibiotic prescription rates than in visit-based prescription rates. They found a decrease of visit-based prescription rates over time; however, they did not account for telephone consultations. In our study all contacts with general practice were included in both the nominator and denominator.

In 2001, the 0-4 year old boys received most antibiotics and this was also found in the UK.[1]

Antibiotics were prescribed more often for diseases of the ear in 2001. In fact, the likelihood of antibiotic prescription for acute otitis media has increased by about 65% (Table 3). The likelihood of antibiotic prescription has also increased, to a lesser extent, for acute tonsillitis (R76). This increase in antibiotic prescriptions for these infections is surprisingly high and unexpected, because published guidelines for acute otitis media and acute tonsillitis rationalized judicious use of antibiotics. Particularly for these health problems we expected a decrease of antibiotic prescriptions. It is possible that parents contact general practice with more severely ill children. In that case, general practitioners are not more inclined to prescribe antibiotics for these infections but are contacted by a patient population with more severe disease. Unfortunately we have no information on the severity of disease.

Non-recommended, broad-spectrum antibiotics have gained field during the past decade, and the recommended small-spectrum antibiotics are prescribed less often (figure 1). Particularly the newer broad-spectrum macrolides are prescribed more often. This has also been found by others, for example a recent study by Resi et al. showed that macrolides were prescribed most often in children over 6 years of age.[25] This trend is disturbing because especially the use of these antibiotics gives rise to the increasing problem of bacterial resistance.[26-29] We identified general practices in 2001 that were associated with inappropriate antibiotic prescribing. It appeared that, adjusted for other practice characteristics, single-handed general practices prescribe 58% more inappropriate antibiotics for inappropriate diagnoses than their colleagues in group practices. Single-handed practices should be targeted in order to prevent inappropriate prescribing in order to enhance judicious antibiotic prescription. To our knowledge, this predictor of inappropriate antibiotic prescribing has not been found by others and opens opportunities to improve antibiotic prescription. For example, intervention studies to prevent inappropriate antibiotic prescription for these diagnoses could be performed by targeting these practices. Unexpectedly, in this survey, practices with a large proportion of children more often prescribe antibiotics inappropriately. Apparently, experience with children and childhood diseases does not necessarily improve antibiotic prescribing patterns.

These data provide good insight in non-hospital antibiotic drug use in children, because antibiotics are not available over-the-counter in the Netherlands. However, this study does have some limitations. In the survey of 1987, diagnosis coding with the ICPC was performed afterwards by specially trained clerks, whereas during the second survey, general practitioners coded the diagnosis themselves. This could explain the difference in the proportion of prescriptions not accounted for in the survey of 2001 (0.06% in 1987 and 12.6% in 2001). This could affect the comparability of the disease-specific and episode-based prescription rates, in particular if the missing diagnoses are not randomly distributed among the ICPC chapters and diagnoses. However, this does not influence the population-based, contact-based and total episode-based prescription rates.

Although antimicrobial drug use is low in the Netherlands compared with other countries, clearly inappropriate indications such as upper respiratory tract infections and acute otitis media still account for a large fraction of antibiotic use, and inappropriate prescribing of broad-spectrum antibiotics has increased. Antibiotic resistance caused by improper antibiotic use is a threatening problem and in the past decades much effort has been made to rationalize and change antibiotic prescribing. The results of this study show that challenges remain to improve clinical practice in primary care. In particular, single-handed practices could be targeted to reduce broad-spectrum prescriptions for inappropriate diagnoses.

References

1. Majeed A, Moser K. gender and sex-specific antibiotic prescribing patterns in general practice in England and Wales in 1996. Brit J Gen Pract 1999:49,735-6.
2. Finkelstein JA, Metlay J P, Davis RL, et al. Antimicrobial use in defined populations of infants and young children. Arch Pediatr Adolesc Med 2000:154,395-400.
3. Mainous AG, Hueston WJ, Love MM al. An evaluation of statewide strategies to reduce antibiotic overuse. Fam Med 2000:32,22-9.
4. Vaccheri A, Castelvetri C, Esaka E, et al. Pattern of antibiotic use in primary health care in Italy. Eur J Clin Pharmacol 2000:56,417-25.
5. Nyquist AC, Gonzales R, Steiner JF, et al. Antibiotic prescribing for children with colds, upper respiratory tract infections, and bronchitis. JAMA 1998:279,875-7.
6. Cars O, Molstad S, Melander A. Variation in antibiotic use in the European Union. Lancet 2001:357,1851-3.
7. Molstad S, Lundborg CS, Karlsson AK, et al. Antibiotic prescription rates vary markedly between 13 European countries. Scand J Infect Dis 2002:34,366-71.
8. Kuyvenhoven M, de Melker R, van der Velden K. Prescription of antibiotics and prescribers' characteristics. A study into prescription of antibiotics in upper respiratory tract infections in general practice. Fam Pract 1993:10,366-70.
9. De Melker RA, Kuyvenhoven MM. Management of upper respiratory tract infections in Dutch family practice. J Fam Pract 1994:38,353-7.
10. Van der Ven-Daane I, van der Ven M, Bruijnzeels MA et al. Het voorschrijven van antibiotica aan kinderen in de huisartspraktijk. Huisarts Wet 1992:35,272-4.
11. Cars H, Hakansson A. To prescribe--or not to prescribe--antibiotics. District physicians' habits vary greatly, and are difficult to change. Scand J Prim Health Care 1995:13,3-7.
12. Van der Ven M, van der Ven-Daane I, Bruijnzeels MA et al. De antimicrobiele behandeling van tonsillitis acuta bij kinderen in de huisartspraktijk. Huisarts Wet. 1993:36,134-6.
13. Trepka, MJ, Belongia EA, Chyou PH, et al. The effect of a community intervention trial on parental knowledge and awareness of antibiotic resistance and appropriate antibiotic use in children. Pediatrics 2001:107,E6.
14. Finkelstein JA, Davis RL, Dowell SF, et al. Reducing antibiotic use in children: a randomized trial in 12 practices. Pediatrics 2001:108:1-7.
15. O'Connor S, Rifkin D, Yang YH, et al. Physician control of pediatric antimicrobial use in Beijing, China, and its rural environs. Pediatr Infect Dis 2001:20,679-84.
16. Grol R. Successes and failures in the implementation of evidence-based guidelines for clinical practice. Med Care 2001:39,Suppl.2,46-54.

17. Grol R. National standard setting for quality of care in general practice: attitudes of general practitioners and response to a set of standards. Brit J Gen Pract 1990:40,361-4.
18. Schirm E, van den Berg P, Gebben, H, et al. Drug use of children in the community assessed through pharmacy dispensing data. Brit J Clin Pharmacol 2000:50,473-8.
19. McCaig LF, Besser, RE, Hughes JM. Trends in antimicrobial prescribing rates for children and adolescents. JAMA 2002:287,3096-102.
20. Nash DR, Harman, J, Wald ER, et al. Antibiotic prescribing by primary care physicians for children with upper respiratory tract infections. Arch Pediatr and Adolesc Med 2002:156,1114-9.
21. Lamberts H, Wood M, Hofmans-Okkes I. The International Classification of Primary Care in the European Community, with a multilanguage layer, 1st edn. Oxford University Press 1987: Oxford, UK.
22. Schellevis FG, Westert WG, de Bakker DH, et al. De tweede Nationale Studie naar ziekten en verrichtingen in de huisartspraktijk: aanleiding en methoden. Huisarts Wet 2003:46,7-12.
23. www.whocc.no/atcddd/, 2004
24. Arroll B, Kenealy T. Antibiotics for the common cold (Cochrane Review). The Cochrane Library 2003:Issue 2.
25. Resi, D, Milandri M, Moro ML. Antibiotic prescriptions in children. J Antimicr Chemoth 2003:52,282-6.
26. Steinman MA, Landefeld CS, Gonzales R. Predictors of broad-spectrum antibiotic prescribing for acute respiratory tract infections in adult primary care. JAMA 2003:289,719-25.
27. McCaig LF, Hughes JM. Trends in antimicrobial drug prescribing among office-based physicians in the United States. JAMA 1995:273,214-9.
28. Van Houten MA, Laseur M, Kimpen JL. Shift in antibiotic prescribing patterns in relation to antibiotic expenditure in paediatrics. Eur J Pediatr 1998:157,479-81.
29. Steinman MA, Gonzales R, Linder JA, et al. Changing use of antibiotics in community-based outpatient practice, 1991-1999. Ann Intern Med 2003:138,525-33.

10. General Discussion

Introduction

Child health care in general practice has changed considerably during the past decades. Not only do children present a different spectrum of health problems in primary care, general practitioners' management has changed as well. Furthermore, this thesis shows that health topics such as obesity and injuries in children cause a significant health burden in children and, therefore, should be prioritised in primary health care.

This chapter highlights the most important findings and implications of this thesis. First, changes in consultation rates and childhood morbidity and specific health issues of childhood injury and obesity are discussed. Also, the most important changes in general practitioners' referral and drug prescribing are discussed. Second, general implications of the findings presented in this thesis are given. Third, limitations of the surveys are discussed and finally, recommendations for future research are given.

Consultation rates

An important finding, with considerable consequences for primary health care in children, is the declining consultation rate in children. In 2001, the overall consultation rate decreased by 25% compared with 1987. Other national data sources of consultation rates show a similar trend. For example Statistics Netherlands reports a decrease of about 15% in consultation rates in 0-19 year olds from 1991 to 2001. The measures of consultation rate used are not similar and therefore the magnitude of decrease in consultation rate may be different. Overall, general practitioner consultation rates of the entire population (all ages) have increased somewhat over the past decade but this increase in demand of care in general practice is mainly attributable to the elderly population.[1-3] We assume that, in 2001, there is a higher threshold for contacting general practice by children for which there are several possible explanations:

Parents postpone consulting the general practitioner in 2001?

- It is possible that parents nowadays are better informed and more confident on how to handle self-limiting conditions themselves, and therefore will wait longer before contacting general practice. Particularly, this could be the case for respiratory tract infections. This is supported by a recent analysis of both surveys, which showed that expectations of general practice care are lower for common and often self limiting health problems.[4]

- Since several years, the costs of frequently used drugs (e.g. acetominophen, cough medication) are no longer reimbursed by health insurance, which could have been a reason for consulting the general practitioner in 1987.
- Possibly, a social phenomenon of the past years could also explain the decrease in consultation rates. Nowadays it is much more common for both parents to have daytime jobs, either full- or part-time. Consequently, they may consult general practice less frequent and only if considered necessary by parents. In addition, subanalyses showed that children present somewhat more health problems per consultation in 2001 than in 1987, which supports this theory of increased efficiency. However, this remains speculative and additional studies are necessary to confirm this hypothesis or to prove otherwise.

General practitioners keep off consultation in 2001?

- Possibly, due to the higher workload, general practitioners keep off consultation for childhood conditions longer in 2001 than in 1987. In general, childhood conditions have a benign course, and a 'wait and see' advice is often justified. Therefore it is possible that general practitioners instruct their assistants to triage more strictly when parents call to make an appointment. As a possible consequence, these parents may wait longer to contact general practice in a future episode of illness in their child. However, additional studies, also with qualitative design, are necessary to assess whether this occurs and whether this occurs more than incidentally.

Children's morbidity pattern in 2001 and changes with 1987

Children present with a different morbidity pattern in 2001 than in 1987. Children presented fewer respiratory problems in general practice in 2001, and, for children of western origin, skin conditions were the main reason to consult the general practitioner. Moreover, childhood injury and overweight constitute a considerable health burden in 2001.

Respiratory tract disease

Incidence rates did not decrease equally over disease categories, illustrated by the much larger (50%) decrease in incidence rates of certain respiratory tract infections. For example the incidence rate of acute tonsillitis decreased from 44.9 per 1000 personyears in 1987 to 19.1 per 1000 personyears in 2001.

The decrease in respiratory tract problems, presented by children in general practice, has recently also been reported by others,[5] and there are several possible explanations:

- There could be a decrease of respiratory tract infections in the general population. Others have proposed that this is a possible and reasonable explanation.[5] However, the interview data of children, mirroring true morbidity trends in the population, do not support this theory. Therefore we think that this explanation may not be very likely, although it should be explored further.

- Particularly in the case of respiratory tract infections, parents nowadays are better informed how to handle these infections and when to consult general practice. Moreover, parents may have become increasingly aware of the viral origin of respiratory infections and the limited usefulness of antibiotics in these infections. As a consequence, parents may contact general practice only with more severe ill children. Unfortunately, we had no information on severity of disease, but this would be of interest to investigate further in future surveys.

Skin disease

Incidence rates of skin problems have increased over time. Considering the overall decline in consultation rate, this increase in skin disease is substantial, and is most pronounced in children of western origin.

The occurrence of constitutional eczema increased during the past decade, which can be explained by the now well-accepted hygiene theory. This theory states that the decrease in exposure to infectious pathogens (smaller families, increase of hygienic customs) gives rise to an increase of allergies and allergy related diseases. [6] However, parallel with the increasing incidence rates of constitutional eczema, increasing rates of impetigo and dermatomycosis are also observed. This is an unexpected finding and it is hypothesised that the use of day care facilities and after school activities may be associated with the occurrence of these skin infections. However, further studies are necessary to confirm and explain this phenomenon.

Unintentional injuries

Our study is the first episode-based study to quantify and describe the occurrence of unintentional injuries in children in a primary care setting. Most previous studies were performed in an emergency department setting,[7 8] or were based on retrospective data,[9] the latter susceptible to recall bias.[10]

Nine percent of all new episodes in children presented in general practice are injury related, and although these injuries are in general less severe than injuries encountered in secondary care (most injuries in our study were lesions of the skin or complaints/sprains of extremities), it represents a substantial health burden.

Another consequence, for example, could be that a child cannot participate in sports activities for several weeks. However, little or no attention is paid to this topic in vocational or other educational general practice programmes.[11] The most important risk factor in children to experience an unintentional injury is the male gender and this is also found in all previous studies of injury epidemiology. Boys are at risk for experiencing an injury and this is probably related to the more risk-taking nature of boys.[12]

Injury prone children

This study also identified children at risk for experiencing multiple injuries: the 'injury prone' children. Injury prone children were a small group of children (1% of the study population) that were injured repeatedly (22% of all injuries). Although injury proneness, as a concept, is discussed in international literature,[13-17] our findings support the concept of injury proneness. Injury prone children are older children, who have young mothers, live in rural areas and also have a sibling that experienced an injury. Injury proneness is not gender related and it is hypothesized that injury proneness is more strongly related to a non-gender related characteristic such as clumsiness rather than the gender related exploring behaviour. The fact

that a previously injured sibling appeared to be the strongest predictor for injury proneness (which has also been reported by others[18]), may imply that family factors are also important in the association with injury proneness.

There is evidence that strategies preventing unintentional injuries by general practitioners may be effective.[19] If implementation of such strategies would be considered in the Netherlands, children higher at risk could be focussed on or the injury prone children could be targeted. Which children to focus on, depends on the goals and financial resources. For example, a pilot study to test the efficacy of indoor safety measures could be focussed to injury prone children, prior to implementation in larger risk groups.

Prevalence and health of overweight and obesity

The prevalence of overweight and obesity in the 2-4 year olds has increased substantially compared with 1997. This is concerning. Several studies have shown that obesity in childhood leads to increased risk of chronic diseases in the future, such as cardiovascular disease and diabetes mellitus.[20-23] Therefore, if this trend persists and if obesity in these children persists into adulthood, (public) health consequences in the Netherlands may be unexpectedly important.

Overweight and obese teens report a poorer quality of perceived health than their peers. Although this relation is based on a one-item health status question and differences are small, we do believe that this is a valid finding, moreover because a very recent study reported a similar trend [24]

Our study shows that overweight and obese children not only report more health problems, they also consult general practice more often with these problems, for example they present more respiratory problems than children without overweight. The relation between overweight in children and respiratory infections has been documented before, however it remains unclear if these respiratory symptoms are asthma related.[25] In recent studies, several researchers have investigated the underlying mechanisms of respiratory symptoms in overweight and obese children and found no evidence of an allergic inflammation of the pulmonary airways. However, they did find evidence for an upregulation of systemic inflammation for example they found higher levels of pro-inflammatory cytokines.[26-28] Our study supports this theory because in the overweight and obese children higher incidence rates of ear infections were found as well. Although the exact underlying mechanism remains unclear, it does seem apparent that overweight is a health burden in these children. General practitioners could play an important role in preventing obesity persisting into adulthood,

because overweight children seem to have more complaints for which they consult the general practitioner more often,[29] thus case-finding is facilitated by this situation.
If considering an intervention to reduce or prevent obesity in children, this should be performed in deprived urban area, because these children are at higher risk for overweight.

So, nowadays, general practitioners see a different pattern of childhood morbidity than in 1987. It is of interest whether or how this shift in morbidity pattern is reflected in general practitioners' management. Referral to medical specialists and antibiotic prescription are focussed on and these issues are discussed in the next part of this chapter. Moreover, the guidelines developed by the Dutch College of General Practitioners could have affected general practitioners' management.[30]

Referral to medical specialists

General practitioners increasingly handle more health problems themselves and refer fewer children to specialists since 1987. This finding is consistent with other nation-wide reports.[31] [32] The decrease in referral rates is larger than the decrease in consultation rates, which is also reflected in the 20% decrease in episode-based referral rate, which means that general practitioners are less likely to refer a child with a certain disease to a medical specialist. Specialists, to whom children are frequently referred to, should also be aware of this trend in order to make a better judgement of morbidity that is presented to them.

Respiratory disease

The decline in incidence rates of respiratory problems is also reflected in the lower referral rate and stable episode-based referral rates for these problems. We hypothesized earlier in this chapter that general practitioners see children with more severe respiratory tract problems in their surgery. In that case we infer that the decline of consultations for respiratory problems is mainly due to the fact that parents wait longer before contacting the general practitioner, thus presenting children with more severe symptoms. And if this is the case, the stable episode-based referral rate implies that also for referral for respiratory problems the threshold has raised as well; general practitioners refer children with probably more severe respiratory problems.

Skin disease

Incidence rates for skin problems have increased markedly, but this is not reflected in higher referral rates for skin diseases. On the contrary, general practitioners manage skin problems more themselves in 2001, than in 1987. Population-based and episode-based referral rates almost halved. In part, this is due to the relative high incidence and decreased referral rates for warts.

Musculoskeletal and psychological problems

The decrease of referrals for musculoskeletal problems is remarkable and not substituted by a higher referral to other primary care workers such as physiotherapists.

Furthermore, an increase of referrals for psychological or psychiatric problems is observed, and there are three possible explanations. First, this may be explained by an increase in the occurrence of psychological problems in children. Similar trends, however small, have been reported previously in a study of Dutch children.[33]
Second, higher referrals for these problems could reflect a higher workload of the general practitioner. Perhaps general practitioners tend to refer these conditions to secondary care more often because these problems are in general more 'time-consuming' than other, somatic, conditions. This could explain the increased episode-based referral rate. Moreover and additionally, the attitude of general practitioners with respect to psychological problems has changed. In 2001, compared with 1987, fewer general practitioners believed that they should manage psychological problems themselves. More general practitioners reported that they believed that psychological problems should be referred and managed by psychologists or psychiatrists.[34]

Acute otitis media

The referral rates for acute otitis media have decreased significantly in 2001. A guideline for acute otitis media was published in 1990, which gives clear advice when to refer to an ENT specialist. For example, referral is restricted to children that have a complicated course of disease or experience more than three ear infections in one year. A previous study suggests that the recommendations of the guidelines are followed by the majority of Dutch general practitioners.[35] Therefore, the decreased referral rates for acute otitis media could indicate an improved clinical practice. However, disease-specific prescription rates must be evaluated alongside disease specific referral rates as well: do decreased referral rates imply increased prescription rates?

Antibiotic prescriptions

The decrease in antibiotic prescription rate is similar to the decrease in consultation rate, which is reflected in stable contact-based and episode-based prescription rates. Thus, general practitioners prescribe antibiotics as often in 2001, as they did in 1987. In diagnoses for which antibiotic use is clearly inappropriate,[36] antibiotic prescriptions did not decrease (e.g. cough, acute upper airway infection). A similar finding was also reported in the UK.[37] Two other striking results will be discussed below.

Antibiotics for acute otitis media

Parallel to the decrease in referral rates for acute otitis media, antibiotics are prescribed more often; the prescription rate increased by 65%, from 33.5 per 100 episodes to 55.8 per 100 episodes. This finding was rather unexpected and surprising because the acute otitis media guideline, rationalising judicious antibiotic prescription, was one of the first guidelines to be introduced. Moreover, Damoiseaux et al. reported in 2000 that antibiotics have just a modest effect in acute otitis media in young children and, concluded that watchful waiting seems to be justified.[38]

One could assume that the children with acute otitis media that were not referred to an ENT-specialist received antibiotics in stead. However, the decrease in referral rate is not fully substituted by an increase in the antibiotic prescription rate for this diagnosis. It is possible that particularly in children with earache, parents are nowadays better informed when to consult general practice. In that case, general practitioners are not more inclined to prescribe antibiotics but are contacted by children with more severe disease. Yet, on the other hand, it is a conflicting finding that in a disease for which a guideline has been implemented, recommending judicious prescribing, antibiotics prescription rates increase. This finding should be investigated further in other studies, to determine whether this increase in prescription rate could fully be explained by a difference in severity of the disease or whether possible other mechanisms are of importance. For example if specific antibiotics are recommended in a guideline, does that lead to an increased prescription of antibiotics?

Increasing use of macrolides

Especially the use of macrolides gives rise to the increasing problem of bacterial resistance, and therefore the increasing prescription of these antibiotics is worrying.[39] This trend is also found in many other countries.[40 41] It was found that single-handed general practitioners more often prescribe antibiotics inappropriately. Possibly, the aggressive marketing strategies of pharmaceutical industries has influenced prescribing patterns but further research is necessary to learn what motivates general practitioners to choose for an antibiotic from the macrolides group.

Summary of the main findings

The children of 2001 consult the general practitioner less often and present a different morbidity pattern in general practice. They present with fewer respiratory problems and present more skin problems. Possibly, respiratory problems are handled increasingly by parents themselves, especially in families of western origin. Unintentional injury in children causes considerable health burden, 9% of all new disease-episodes were injury related and a specific subgroup of injury-prone children is characterized.

In 2001, there is an alarming rise of increasing overweight in children. These children report a poorer perceived health and have more and different health problems. In particular, they suffer from more upper respiratory tract and ear infections than children without overweight.

General practitioners' management has changed as well in 2001. General practitioners manage childhood problems increasingly themselves and refer less children to specialists.

Antibiotic prescriptions remained stable, but more antibiotics were prescribed for diseases in which antibiotics are not justified, such as cough and upper respiratory tract infection. Especially for these diagnoses, macrolides were prescribed more often.

General implications

This thesis provides an overview of current childhood morbidity as presented in general practice and changes over the past decades. Dutch general practitioners are provided with a frame of reference for their own daily practice.

This thesis shows that primary health care for children is organised more efficiently in 2001. It seems that children consult primary medical care more efficiently and this influences the morbidity pattern encountered in general practice. Moreover, deduced from the decreased incidence rates and higher prescription rates for respiratory problems, it seems that children present with more severe health problems in general practice. In addition, general practitioners seem to manage childhood conditions increasingly themselves, implying that referrals to secondary care are made more appropriately. Specialists in secondary care, to whom children are frequently referred to, should also be aware of this trend in order to make a better judgement of morbidity that is presented to them.

The childhood population of this study and their use of primary and secondary care is representative for the population and demand of care of the near future. The Dutch Health Council and public health workers should be aware of trends therein in order to optimise the assessment of the need of future's health services. Moreover, the children studied in this survey are representative for futures' adolescents and adults. Emerging health problems, such as skin diseases and obesity related morbidity, should be monitored in order to assess futures' health burden and should be intervened if and where necessary.

The increase in childhood obesity is very worrying and efforts should be made to reduce this emerging public health problem. Childhood obesity should be a priority in child public health and health care and health care professionals should be aware of the long and short-term health consequences of overweight. If this trend persists, health care planners should anticipate on the possible increasing demand for care in the future, for example a higher demand of diabetes care and increasing expenditure for expensive cardiovascular drugs. Parents should be informed that there is evidence that their overweight children perceive their quality of health as poorer and that these children seem to be more vulnerable for infections.

This can be used as an extra argument for parents to prevent obesity and overweight in their children.
Although unintentional injuries treated in general practice are generally of less severity than those treated in secondary care, it is an important childhood health problem in primary care. Surprisingly, little or no attention is paid to childhood injuries in the general practitioner vocational training programmes. Skin lesions, sprains and concussions are encountered most often and could be addressed in the educational programme in order to improve medical management of these health problems.

Moreover, the considerable health burden caused by childhood obesity and childhood injury calls for preventive measures. This thesis provides several tools that may be useful for further development of strategies to prevent overweight and injury in children.

Limitations

It is inevitable that comparison of nation-wide surveys of such magnitude has limitations and these should be considered when interpreting the results of this thesis.

Firstly, the differences between both surveys are important. Three-month incidence rates of 1987 were weighted to one-year incidence rates and this can lead to skewed incidence rates (for 1987), especially if disease-specific episodes consist of more than one contact. Also, ICPC diagnostic coding was not performed similarly in both surveys and this could explain the difference in proportions of symptom diagnoses. We assume that coding by clerks in the first survey more often led to a specific diagnostic ICPC code, than in the second survey, where general practitioners coded themselves leading to more symptom codes. These differences should be considered when comparing incidence rates of both surveys. In this thesis, only incidence rates of frequent diseases are compared and therefore the findings are considered to be valid.

Secondly, concerning the research performed on injuries, there is an inevitable amount of misclassification of unintentional injuries. However, in an attempt to minimise this bias, a large amount of diagnoses were judged manually and it is estimated that this error is not

higher than approximately 3%. Moreover, there is no information about circumstances of injuries. This is especially of interest when studying injury-prone children.

Thirdly, this study provides associations and predictors of prescription, obesity and injury. However, the cross-sectional design of a survey has limitations in the interpretation of causal relationships, and the established relationships should therefore also be investigated in studies with a longitudinal design.

Finally, but not unimportant, we have no information of disease severity. This is an important drawback of both surveys. If there had been information of severity of disease, it would provide much more insight in the differences of presented morbidity and general practitioners' management. The lack of information on severity of disease episodes limited, for example, the description of unintentional injuries and injury prone children.

Recommendations for future studies

In primary health care

The emerging health problems such as skin diseases and obesity should be monitored in order to assess future's health burden and should be intervened if and where necessary.

Considering the trends of referral and drug prescribing, more in depth studies of implementation and effects of the published guidelines are of interest and necessary to determine to what extent guidelines have affected general practitioners management.

From this study, inference of causal relations of appropriateness of referrals can't be made and is of interest for future studies.[42-44]

Future studies are also necessary to assess why general practitioners tend to describe antibiotics more inappropriately for certain diagnoses than in 1987.

In health care research

Future studies are also necessary in order to assess how unintentional injuries can be prevented. Previous research has shown that general practitioners' safety advice combined with easy access to safety equipment may be effective in the prevention of injuries.[19 45 46] Boys, of western origin, with residence in a rural area, are at highest risk for the experience of an injury and could be targeted when considering implementing preventive measures.

Action must be undertaken to prevent childhood obesity. Therefore, intervention or prevention studies should be developed and evaluated. These could be performed in a primary care setting since general practitioners see these children more often in their practice which may facilitate identifying these children.

References

1. Harmsen JA, Bernsen RM, Bruijnzeels MA, Bohnen AM. General practitioner's workload: objective increase in 9 practices in Rotterdam and surroundings, 1992-1997 and an extrapolation to 2005 (Dutch) Ned Tijdschr Geneeskd 2001;145:1114-8.
2. Helliwell CD, Carney TA. General practitioners' workload in primary care led NHS. Workload for chronic disease management has increased substantially. BMJ 1997;315:546.
3. Van den Berg M, de Bakker D, Kolthof ED, Cardol M, van den Brink-Muinen A. De werkdruk van de huisarts: Zorgvraag en arbeidsduur in 1987 en in 2001. Med Contact 2003;58:1054-6.
4. Cardol M. Verwachtingen van het nut van huisartsenzorg bij alledaagse klachten afgenomen. Huisarts Wet 2004;47:5.
5. Fleming DM, Ross AM, Cross KW, Kendall H. The reducing incidence of respiratory tract infection and its relation to antibiotic prescribing. Br J Gen Pract 2003;53:778-83.
6. Martinez FD. The coming-of-age of the hygiene hypothesis. Respir Res 2001;2:129-32.
7. Powell EC, Tanz RR. Adjusting our view of injury risk: the burden of nonfatal injuries in infancy. Pediatrics 2002;110:792-6.
8. Carter YH, Jones PW. Accidents among children under five years old: a general practice based study in north Staffordshire. Br J Gen Pract 1993;43:159-63.
9. Scheidt PC, Harel Y, Trumble AC, Jones DH, Overpeck MD, Bijur PE. The epidemiology of nonfatal injuries among US children and youth. Am J Public Health 1995;85:932-8.
10. Harel Y, Overpeck MD, Jones DH, Scheidt PC, Bijur PE, Trumble AC, et al. The effects of recall on estimating annual nonfatal injury rates for children and adolescents. Am J Public Health 1994;84:599-605.
11. Kendrick D, Groom L, Hippisley-Cox J, Savelyich BS, Webber E, Coupland C. Accidental injury: a neglected area within primary care groups and trusts? Health Educ Res 2003;18:380-8.
12. Ginsburg HJ, Miller SM. Sex Differences in Children's Risk-taking Behaviour. Child Development 1982;53:426-428.
13. Boyce WT, Sobolewski S. Recurrent injuries in schoolchildren. Am J Dis Child 1989;143:338-42.
14. Langley J. The "accident prone" child -- the perpetration of a myth. Aust Paediatr J 1982;18:243-6.
15. Langley JD. 'Accident proneness': statistical and practical significance. Inj Prev 1997;3:80-1.
16. Wazana A. Are there injury-prone children? A critical review of the literature. Can J Psychiatry 1997;42:602-10.

17. Wright P. Is saying NO to 'accident proneness' throwing the baby out with the bathwater? Inj Prev 1997;3:79-80.
18. Johnston BD, Grossman DC, Thompson RS. Transient elevation in risk of injury in siblings following injury encounters. J Pediatr 2003;142:79-83.
19. Clamp M, Kendrick D. A randomised controlled trial of general practitioner safety advice for families with children under 5 years. BMJ 1998;316(7144):1576-9.
20. Hypponen E, Virtanen SM, Kenward MG, Knip M, Akerblom HK. Obesity, increased linear growth, and risk of type 1 diabetes in children. Diabetes Care 2000;23:1755-60.
21. Berenson GS, Srinivasan SR, Bao W, Newman WP, 3rd, Tracy RE, Wattigney WA. Association between multiple cardiovascular risk factors and atherosclerosis in children and young adults. The Bogalusa Heart Study. N Engl J Med 1998;338:1650-6.
22. Morrison JA, Barton BA, Biro FM, Daniels SR, Sprecher DL. Overweight, fat patterning, and cardiovascular disease risk factors in black and white boys. J Pediatr 1999;135:451-7.
23. Morrison JA, Sprecher DL, Barton BA, Waclawiw MA, Daniels SR. Overweight, fat patterning, and cardiovascular disease risk factors in black and white girls: The National Heart, Lung, and Blood Institute Growth and Health Study. J Pediatr 1999;135:458-64.
24. Maher E. Health related quality of life of severely obese children and adoloscents. Child Care Health Dev 2004;30:94-5.
25. Somerville SM, Rona RJ, Chinn S. Obesity and respiratory symptoms in primary school. Arch Dis Child 1984;59:940-4.
26. Von Mutius E, Schwartz J, Neas LM, Dockery D, Weiss ST. Relation of body mass index to asthma and atopy in children: the National Health and Nutrition Examination Study III. Thorax 2001;56:835-8.
27. Visser M, Bouter LM, McQuillan GM, Wener MH, Harris TB. Elevated C-reactive protein levels in overweight and obese adults. JAMA 1999;282:2131-5.
28. Visser M. Higher levels of inflammation in obese children. Nutrition 2001;17:480-1.
29. Gauthier BM, Hickner JM, Noel MM. High prevalence of overweight children in Michigan primary care practices. An UPRNet study. Upper Peninsula Research Network. J Fam Pract 2000;49:73-6.
30. NHG Standaarden http://nhg.artsennet.nl/index, 2004
31. Van de Lisdonk EH, van Weel C. New referrals, a decreasing phenomenon in 1971-94: analysis of registry data in the Netherlands. BMJ 1996;313:602.
32. Statistics Netherlands. Voorburg/ Heerlen, 2003.
33. Verhulst FC, van der Ende J, Rietbergen A. Ten-year time trends of psychopathology in Dutch children and adolescents: no evidence for strong trends. Acta Psychiatr Scand 1997;96:7-13.

34. Van den Berg MJ, Kolthof ED, de Bakker DH, van der Zee J. Tweede nationale studie naar ziekten en verrichtingen in de huisartspraktijk. Rapport: De werkbelasting van huisartsen. Utrecht: NIVEL, 2004.
35. Grol R. Successes and failures in the implementation of evidence-based guidelines for clinical practice. Med Care 2001;39(Suppl 2):II46-54.
36. Arroll B, Kenealy T. Antibiotics for the common cold (Cochrane Review). The Cochrane Library 2003(Issue 2).
37. Davy T, Dick PT, Munk P. Self-reported prescribing of antibiotics for children with undifferentiated acute respiratory tract infections with cough. Pediatr Infect Dis J 1998;17:457-62.
38. Damoiseaux RA, van Balen FA, Hoes AW, Verheij TJ, de Melker RA. Primary care based randomised, double blind trial of amoxicillin versus placebo for acute otitis media in children aged under 2 years. BMJ 2000;320:350-4.
39. Fischer JE, Steiner F, Zucol F, Berger C, Martignon L, Bossart W, et al. Use of simple heuristics to target macrolide prescription in children with community-acquired pneumonia. Arch Pediatr Adolesc Med 2002;156:1005-8.
40. Steinman MA, Gonzales R, Linder JA, Landefeld CS. Changing use of antibiotics in community-based outpatient practice, 1991-1999. Ann Intern Med 2003;138:525-33.
41. Vaccheri A, Castelvetri C, Esaka E, Del Favero A, Montanaro N. Pattern of antibiotic use in primary health care in Italy. Eur J Clin Pharmacol 2000;56:417-25.
42. Knottnerus JA, Joosten J, Daams J. Comparing the quality of referrals of general practitioners with high and average referral rates: an independent panel review. Br J Gen Pract 1990;40:178-81.
43. Fertig A, Roland M, King H, Moore T. Understanding variation in rates of referral among general practitioners: are inappropriate referrals important and would guidelines help to reduce rates? BMJ 1993;307:1467-70.
44. Reynolds GA, Chitnis JG, Roland MO. General practitioner outpatient referrals: do good doctors refer more patients to hospital? BMJ 1991;302:1250-2.
45. Towner E, Dowswell T, Jarvis S. Updating the evidence. A systemic review of what works in preventing childhood unintentional injuries: Part 2. Inj Prev 2001;7:249-53.
46. Towner E, Dowswell T. Community-based childhood injury prevention interventions: what works? Health Promot Internation 2002;17:273-84.

11. Summary & Samenvatting

Summary

With the ageing of the population, children's health tends to become a neglected area in health research and health care research. And this is unjustified, considering that the children of today are tomorrow's adults and that their health is originated in childhood. Measurement of child's health over time will identify the emergence of new childhood health problems and morbidity trends. The recognition of such trends may lead to a shift in priorities in child health care.
The aims of this thesis are to present an overview of children's morbidity in Dutch general practice and general practitioners' management, and to evaluate changes therein over the past decades. Moreover, determinants of morbidity or changes in general practitioners' management are assessed in order to provide tools for prevention of morbidity or for the improvement of clinical practice.

To investigate these issues, data of 0-17 year old children of two successive national surveys in Dutch general practice were used (1987-2001). Both surveys were designed and performed by the Netherlands Institute for Health Service Research (NIVEL). In both surveys, general practitioners registered all contacts with patients during the study period. Among others, they recorded the diagnosis and if a referral or prescription was made, this was linked to the corresponding diagnosis. Characteristics of the practices and study population were obtained by mailed questionnaire, and the response rate was 70-90% dependant on different variables.

In 1987, 161 general practitioners in 103 practices participated. They were divided into four groups and registered the contacts during one of the four consecutive three-month periods. The study population consisted of 86,577 children. In 2001, 195 general practitioners in 104 practices registered all contacts during the one-year study period. The study population consisted of 82,053 children. The comparison of morbidity between both surveys is reliable, provided that common and frequent diseases are compared, or, if comparison is made on ICPC chapter level.

In **chapter 3**, the morbidity patterns presented by children in 1987 and in 2001 are compared and changes are evaluated against the background of the increased ethnic heterogeneity of the childhood population. Consultation rates decreased from 2.7 visits per year per child to 2.1

visits a year in 2001. Children of non-western origin consulted the general practitioner somewhat more often than children of western origin (which includes the native population). The distribution of episodes among the ICPC chapters has changed by ethnic background. In 1987, respiratory problems were the main reason to contact general practice for all children, but in 2001, skin problems were presented more often than respiratory problems by western children. Incidence rates of skin diseases, such as dermatomycosis, impetigo and eczema increased over time, whereas incidence rates of respiratory disease decreased.

In **chapter 4**, changes in the occurrence of acute tonsillitis are examined more in depth. Incidence rates have more than halved but they are distributed similarly among age, degree of urbanisation and social class, in 2001 as in 1987. A wait and see policy was found more often and fewer broad-spectrum antibiotics were prescribed in 2001.

In **chapter 5,** the incidence of unintentional injuries is quantified and described. Detailed rates are provided by age and type of injury. The overall incidence rate was 115 per 1000 person years, which equals nine percent of all new episodes encountered in general practice. 35% of the injuries were skin lesions; 31% were complaints and or sprains of extremities. Multilevel analyses showed that the male gender and rural residence is associated with the experience of unintentional injuries in all ages. Other child and family characteristics were associated with injury risk dependent on age. A clustering of injuries in certain children was found and this is examined further in **chapter 6**. These children can be considered injury prone and multilevel analyses identified characteristics of these children. They are older and more often live in rural areas. Moreover, they have younger mothers (< 27 years age difference) and more often had a sibling that was injured in the preceding months. Gender was not associated with injury proneness which suggests that a non-gender related characteristic such as clumsiness is more strongly related to injury-proneness rather than the gender related exploring behaviour.

Chapter 7 describes the day-to-day health of overweight and obese children. The prevalence and self reported health of overweight and obesity in children is assessed and compared with health problems presented in general practice. 12% of all children were overweight or obese, the prevalence of obesity in the 2-4 year olds has more than tripled compared with the prevalence of 4 years earlier. Overweight children aged 12-17 years reported a poorer perceived health and presented more disease episodes than in general practice than non-overweight children. Parents of overweight children aged 2-11 years did not report a poorer health for their children but did consult the general practitioner more often with their children. Morbidity patterns of overweight children differed from children without overweight; they

reported more ear and respiratory complaints and had higher incidence rates of ear and respiratory diseases in general practice. Children in low-income families, living in urban areas, are at higher risk for overweight. Overweight and obesity in children has short term health consequences on a day-to-day basis, and this reinforces the need for preventive strategies in childhood.

In **chapter 8**, (changes in) general practitioners' referral patterns to secondary care are examined and referral rates are presented by age, gender, specialty referred to and by disease-specific referral rates. Referral rates to secondary care decreased from 138 per 1000 person years to 84 per 1000 person years. The overall likelihood of a disease being referred decreased from 8 per 100 episodes in 1987 to 6.5 per 100 episodes in 2001.

Two diseases, for which guidelines were developed, acute otitis media and vision problems, showed two to four fold decreased referral rates. General practitioners tend to manage more health problems themselves, suggesting that clinical practice has improved.

In **chapter 9** prescribing patterns of antibiotics are presented by age, gender and diagnosis. Population-based prescription rated decreased from 300 per 1000 children in 1987 to 232 per 1000 children in 2001. However, episode based prescription rates (the number of antibiotic prescriptions per specific diagnosis) of 2001 are almost similar compared with 1987. This means that general practitioners prescribe antibiotics as often in 2001 as in 1987.

However, there are some exceptions: in 2001, increased disease-based prescription rates were observed for acute otitis media, acute bronchitis, upper airway infections and cough. Overall, the non-recommended broad-spectrum antibiotics were prescribed more often in 2001 than in 1987. The use of macrolides has doubled (16% of all prescribed antibiotics in 2001, 8% of all antibiotics in 1987), which is an unfavourable trend, because especially the use of these antibiotics gives rise to the emerging problem of bacterial resistance. Adjusted for other practice characteristics, general practitioners in single-handed practices prescribed more broad-spectrum antibiotics inappropriately. So, although antimicrobial drug prescribing is low in the Netherlands, challenges remain to improve clinical practice in primary care.

General implications and future studies

The children studied in this survey are representative for future's adolescents and adults. Emerging health problems, such as skin diseases and obesity related morbidity, should be monitored in order to assess future's health burden and should be intervened if and where necessary.

Moreover, the considerable health burden caused by childhood obesity and childhood injury calls for preventive measures. This thesis provides several tools that may be useful for strategies to prevent overweight and injury in children.

This study provides Dutch general practitioners a frame of reference of their own daily practice. Moreover, this thesis shows that primary health care for children is organised more efficiently in 2001. It seems that children consult primary care more efficiently and this influences the morbidity pattern encountered in general practice. In addition, general practitioners seem to manage childhood conditions increasingly themselves, implying that referrals to secondary care are made appropriately or only when necessary. However, inference of appropriateness of referral cannot be made and should be investigated further. With respect to these trends of referral and drug prescribing, further studies of implementation and effects of the published guidelines are of interest and necessary to determine to what extent guidelines have affected general practitioners' management.

Future studies are also necessary to assess whether or why general practitioners tend to prescribe antibiotics more inappropriately for certain diagnoses than in 1987.

Samenvatting

Onderzoek naar jeugdgezondheid en jeugdgezondheidszorg dreigt uit de aandacht te verdwijnen met de vergrijzing van de bevolking. Onterecht, omdat de kinderen van vandaag de volwassenen van de toekomst zijn en hun gezondheid zijn oorsprong vindt in hun kinder- en jeugd jaren.
Het in de tijd meten van de gezondheid van kinderen zal leiden tot het herkennen van nieuwe gezondheidsproblemen en van veranderingen in morbiditeitpatronen. Het herkennen van dergelijke trends kan leiden tot een verschuiving van prioriteiten in de kinder- en jeugdgezondheidszorg.
Het doel van deze dissertatie is om een overzicht te geven van de morbiditeit bij kinderen in de Nederlandse huisartspraktijk en van het beleid van huisartsen. Tevens worden de veranderingen hierin in de afgelopen decennia beschreven. Bovendien worden determinanten van morbiditeit en van veranderd huisartsenbeleid onderzocht opdat instrumenten geleverd kunnen worden voor de preventie van morbiditeit of voor verbetering van de klinische praktijk.

Om dit te onderzoeken zijn gegevens van 0-17 jarigen van twee opeenvolgende nationale studies in de Nederlandse huisartspraktijk gebruikt (1987-2001). Beide nationale studies zijn opgezet en uitgevoerd door het Nederlands instituut voor onderzoek in de gezondheidszorg (NIVEL). Tijdens de onderzoeksperiode hebben de betrokken huisartsen in beide studies alle contacten met patiënten geregistreerd. Zij registreerden onder andere de diagnose die zij stelden tijdens het consult. In geval van verwijzing en/of prescriptie vond koppeling plaats met de diagnose. Kenmerken van de deelnemende praktijken en de studiepopulatie werden verzameld met behulp van vragenlijsten. Afhankelijk van de variabele was de respons 70-90%.
In 1987 participeerden 161 huisartsen in 103 praktijken. Zij werden verdeeld in vier groepen en registreerden ieder gedurende één van de vier opeenvolgende perioden van 3 maanden. De studie populatie bestond uit 86.577 kinderen. In 2001 registreerden 195 huisartsen in 104 praktijken alle contacten gedurende één jaar. De studiepopulatie bestond uit 82.053 kinderen. Het vergelijken van morbiditeit tussen beide studies is betrouwbaar mits veel voorkomende aandoeningen worden vergeleken of als een vergelijking wordt gemaakt op ICPC hoofdstuk niveau.

In **hoofdstuk 3** worden de morbiditeitpatronen van 1987 en 2001 vergeleken en de veranderingen daarin geëvalueerd tegen de achtergrond van de toegenomen etnische heterogeniteit van de kinderpopulatie. Consultfrequenties daalden van 2.7 consulten per kind per jaar naar 2.1 consulten per jaar in 2001. Niet westerse kinderen bezochten de huisarts wat vaker dan westerse kinderen (de 'van oorsprong' Nederlandse kinderen behoren ook tot deze groep). De verdeling van de ziekte episoden over de ICPC hoofdstukken is veranderd naar gelang de etnische diversiteit. In 1987 was een luchtweginfectie voor alle kinderen de belangrijkste reden om de huisarts te bezoeken. Echter, in 2001 kwamen westerse kinderen vaker met een huidprobleem dan met een luchtweginfectie.
Incidenties van huidproblemen, zoals dermatomycose, impetigo en eczeem namen toe in de tijd. Daarentegen daalden de incidenties van luchtweginfecties in 2001.
In **hoofdstuk 4** worden de veranderingen in het voorkomen van tonsillitis acuta in meer detail onderzocht. Incidenties zijn in 2001 gehalveerd. Het voorkomen naar leeftijd, urbanisatiegraad en sociale klasse is in beide studies vergelijkbaar. In 2001 werd vaker een afwachtend beleid gevoerd en huisartsen schreven minder vaak antibiotica voor.
In **hoofdstuk 5** is het voorkomen van ongelukken bij kinderen gekwantificeerd en wordt een gedetailleerd overzicht gegeven van diverse typen ongelukken met leeftijdsverdeling (per leeftijdsklasse). De totale incidentie was 115 per 1000 persoonsjaren, wat overeenkomt met negen procent van alle nieuwe ziekte-episoden bij kinderen. 35% van de ongelukken betrof huidletsels, 31% betrof klachten of distorsies van extremiteiten. Multilevel analyse liet zien dat het mannelijke geslacht en het wonen op het platteland geassocieerd zijn met het krijgen van een ongeluk in alle leeftijdscategorieën. Naar gelang de leeftijd waren ook andere kind- en gezinskenmerken geassocieerd met het krijgen van een ongeluk.
Het is ook gebleken dat een kleine groep kinderen relatief vaak een ongeluk had, wat verder is onderzocht in **hoofdstuk 6**. Deze kinderen kunnen worden beschouwd als 'ongeluk-vatbaar' (injury prone). Met behulp van mulitilevel analyse zijn de kenmerken van deze kinderen geïdentificeerd: zij zijn ouder en wonen vaker op het platteland. Daarnaast hebben zij jongere moeders (<27 jaar leeftijdverschil) en vaker een broer of zus die ook een ongeluk had doorgemaakt in de voorafgaande maanden. Geslacht bleek niet geassocieerd met 'ongeluk-vatbaarheid'. Dit suggereert dat een niet-geslachtsgebonden kenmerk, zoals onhandigheid, sterker is geassocieerd met ongeluk-vatbaarheid dan met het geslachtsgebonden verkennend gedrag van kinderen.

Hoofdstuk 7 beschrijft de dagelijkse gezondheid van kinderen met overgewicht en vetzucht. De prevalentie van overgewicht en vetzucht is onderzocht. 12% van alle kinderen had overgewicht of vetzucht. De prevalentie van vetzucht in de 2-4 jarigen is meer dan verdrievoudigd in vergelijking met de prevalentie van 4 jaar eerder. De zelf gerapporteerde gezondheid van deze kinderen werd vergeleken met de gezondheidsproblemen die zij meldden bij de huisarts. Kinderen van 12 tot 17 jaar met overgewicht voelden zich ongezonder en kwamen met meer gezondheidsproblemen bij de huisarts dan kinderen zonder overgewicht. Ouders van 2-11 jarigen met overgewicht rapporteerden geen verschil in gezondheidsbeleving maar consulteerden wel vaker de huisarts met hun kinderen. Het morbiditeitpatroon van kinderen met overgewicht verschilde met die van de kinderen zonder overgewicht; zij hadden vaker oor en luchtweg klachten en hadden ook hogere incidenties van oor en luchtweg aandoeningen in de huisartspraktijk. Kinderen met het hoogste risico op overgewicht waren de kinderen uit gezinnen met de laagste inkomens woonachtig in stedelijke gebieden.
Overgewicht en vetzucht bij kinderen heeft consequenties voor dagelijkse gezondheid op de korte termijn. Dit benadrukt het belang van preventieve maatregelen bij kinderen.
In **hoofdstuk 8** zijn (veranderingen in) verwijzingen naar de tweede lijn onderzocht. Verwijzingen zijn geanalyseerd naar leeftijd, geslacht, reden voor verwijzing en het soort specialisme waarnaar werd verwezen. Verwijzingen naar de tweede lijn daalden van 138 per 1000 persoonsjaren naar 84 per 1000 persoonsjaren. Het op ziekte-episoden gebaseerde verwijscijfer (een soort maat voor kans op verwijzing) daalde van 8 per 100 ziekte-episoden in 1987 naar 6.5 per 100 ziekte-episoden in 2001. Otitis media en refractieafwijkingen, aandoeningen waarvoor standaarden ontwikkeld zijn, hadden twee tot viervoudig gedaalde (op ziekte-episoden gebaseerde) verwijscijfers.
Huisartsen blijken steeds meer gezondheidsproblemen zelf te behandelen. Deze trend suggereert een verbetering van het klinisch handelen.
In **hoofdstuk 9** is het antibiotica voorschrijfgedrag per leeftijdscategorie, geslacht en diagnose beschreven. Het op de populatie gebaseerde antibiotica prescriptiecijfer daalde van 300 prescripties per 1000 kinderen naar 232 per 1000 kinderen. Echter, het op ziekte-episoden gebaseerde prescriptiecijfer (het aantal antibiotica prescripties per specifieke diagnose) is in 2001 gelijk aan 1987. Dat betekent dat huisartsen in 2001 even vaak antibiotica voorschrijven als in 1987.Er zijn echter een aantal uitzonderingen: In 2001 werden hogere ziekte specifieke prescriptie gevonden voor otitis media acuta, acute bronchitis, bovenste luchtweginfecties en hoesten. Over het algemeen werden de niet-aanbevolen breed spectrum antibiotica in 2001

vaker voorgeschreven en het gebruik van de macroliden was verdubbeld (16% van alle voorgeschreven antibiotica in 2001 vs. 8% van alle antibiotica in 1987). Dit is een ongunstige ontwikkeling omdat vooral deze antibiotica bijdragen aan de toenemende bacteriële resistentie. Solisten schreven vaker onterecht breed spectrum antibiotica voor (gecorrigeerd voor andere praktijk variabelen).
Hoewel antibiotica prescriptie laag is in Nederland, blijft het een uitdaging om de klinische praktijk te verbeteren.

Algemene implicaties en toekomstig onderzoek
De kinderen die onderzocht zijn in de Tweede Nationale Studie zijn representatief voor de adolescenten en volwassenen van de toekomst. Opkomende gezondheidsproblemen, zoals huidproblemen en de aan overgewicht gerelateerde morbiditeit, moeten verder worden gevolgd om een inschatting te kunnen maken van toekomstige gezondheidsproblemen. Zo kan er worden ingegrepen waar het nodig is.
Bovendien vraagt het aanzienlijke gezondheidsprobleem van ongelukken en overgewicht bij kinderen om preventieve maatregelen.
Dit onderzoek voorziet Nederlandse huisartsen van een kader voor het eigen dagelijks handelen. Tevens blijkt uit dit onderzoek dat de eerstelijns gezondheidszorg voor kinderen efficiënter is geregeld in 2001. Huisartsen handelen problemen bij kinderen vaker zelf af. Ook verwijzen zij vermoedelijk beter en gerichter naar de tweede lijn en alleen indien noodzakelijk. Echter, een dergelijke conclusie kan niet uit dit onderzoek worden getrokken en verder onderzoek hiernaar wordt aanbevolen.
Ten aanzien van de trends in het verwijs en prescriptie gedrag moet verder onderzoek worden verricht naar het effect van de gepubliceerde standaarden en hun invloed op het beleid van huisartsen. Verder onderzoek is ook nodig om na te gaan waarom, in vergelijking met 1987, huisartsen vaker de niet-aanbevolen antibiotica voorschrijven voor ziektebeelden die over het algemeen geen antibiotica rechtvaardigen

Publications and manuscripts related to this thesis

Otters HBM, van der Wouden JC, Schellevis FG, van Suijlekom-Smit LWA, Koes BW. Trends in prescribing antibiotics for children in Dutch general practice. J Antimicrob Chemother. 2004; 53: 361-6.

Otters H, van der Wouden JC, Schellevis FG. Respiratory infection and antibiotic prescription rates. Br J Gen Pract. 2004; 54:132-8.

Otters H, Jabaaij L. Antibiotica voor kinderen: verschillen tussen 1987 en 2001. Huisarts Wet. 2004; 47:73.

Otters HBM, van der Wouden JC, Schellevis FG, van Suijlekom-Smit LWA, Koes BW. Dutch general practitioners' referral of children to specialists: a comparison between 1987 and 2001. Br J Gen Pract, *in press.*

Diepenhorst HIJ, Otters HBM, van Suijlekom-Smit LWA, Schellevis FG, van der Wouden JC. Tonsillitis acuta bij kinderen in de huisartspraktijk: verandering van incidentie en beleid? (Dutch) Huisarts Wet. 2004; 47:399-404.

Otters HBM, Schellevis FG , Damen J, van der Wouden JC, van Suijlekom-Smit LWA, Koes BW. Epidemiology of unintentional injuries in children, a population-based survey in general practice. Br J Gen Pract, *in press.*

Otters H, van Dijk L, van derWouden JC, Schellevis FG, van Suijlekom-Smit LWA, Koes BW. Self-reported perceived health and morbidity in overweight and obese children. *Submitted*

Otters HBM, van der Wouden JC, Schellevis FG, van Suijlekom-Smit LWA, Koes BW. Changing morbidity patterns in childhood in Dutch general practice: 1987-2001. *Submitted*

Damen J, Otters HBM, Schellevis FG, van der Wouden JC, van Suijlekom-Smit LWA, Koes BW. Injury proneness in children, a population-based survey in general practice. *Submitted*

Dankwoord

Blij ben ik dat ik eindelijk ben toegekomen aan de laatste schrijfoefening waarbij ik ieder die heeft bijgedragen aan dit proefschrift persoonlijk mag bedanken.

Als eerste dank ik mijn promotor Prof B.W Koes. Beste Bart, jij bent vanaf het begin betrokken geweest bij de voortgang van het onderzoek en het tot stand komen van de artikelen. Ik dank jou voor je relativerende opmerkingen en voor je inhoudelijke bijdragen aan dit proefschrift.
Dan mijn beide co-promotoren dr J.C van der Wouden en dr F.G Schellevis.
Beste Hans, jij was vanaf het begin enthousiast en jouw deur stond altijd open. Ik dank jou ook voor je hulp tijdens de laatste fase van het onderzoek waarbij jij mij tijdrovende klussen uit handen hebt genomen terwijl ik weer met de huisartsopleiding was begonnen.
Beste Francois, als projectleider van de Tweede Nationale Studie heb jij niet alleen een belangrijke inhoudelijke bijdrage geleverd aan dit proefschrift maar ook inspireerde jij me tijdens dit onderzoek. Ook dank ik jou voor de talloze reisjes die jij naar Rotterdam maakte om de voortgang van artikelen te bespreken.

Verder dank ik alle huisartsen en patiënten die hebben deelgenomen aan de Tweede Nationale Studie, want zonder hun was dit proefschrift er niet geweest.

Nauw betrokken bij dit onderzoek was ook kinderarts dr. L.W.A van Suijlekom-Smit. Beste Lisette, mijn dank voor de inhoudelijke en nuttige commentaren op de artikelen waardoor vaak een andere invalshoek werd belicht.
Samen met Liset van Dijk (NIVEL) is het artikel over overgewicht tot stand gekomen. Beste Liset, ik dank jou voor je kritische commentaren waardoor het stuk er iedere keer beter van werd. Ik vond het plezierig om met je samen te werken en zie uit naar het vervolg.
Jurgen Damen, destijds medisch student, dank ik voor zijn inzet en voor zijn niet onaanzienlijke bijdrage aan het extraheren van de ongelukken uit de dataset.
Henk Diepenhorst, destijds ook medisch student, dank ik voor zijn werk waar ik gebruik van heb gemaakt in dit proefschrift.
Roos Bernsen, de statistica. Jou dank ik voor je humor, je statistische bijdragen en dat je altijd de tijd had om geduldig al mijn vragen over de statistische analyses te beantwoorden.

Michiel van der Linden, destijds projectleider van de module morbiditeit en nu collega op de afdeling Huisartsgeneeskunde, dank ik voor zijn hulp bij mijn vragen over het tot stand komen van de dataset.
Han van Snellenberg van het NIVEL dank ik voor zijn geduld tijdens al mijn verzoeken voor nog meer data. Lea Jabaaij, ook van het NIVEL, dank ik voor de samenwerking bij het schrijven van een Nederlandstalige column.
Mw. L. Isles-Visser zette de puntjes op de i wat betreft het geschreven engels, waarvoor mijn dank.
Rene en Menno dank ik voor hun assistentie bij mijn computermoeilijkheden.

Het succesvol voltooien van een gecombineerd onderzoek en opleiding traject kan niet zonder de steun van de Huisartsopleiding Rotterdam. Frits Bareman (plaatsvervangend hoofd van de Huisartsopleiding) en later Herman Bueving (hoofd Huisartsopleiding) dank ik voor hun flexibiliteit waardoor er last-minute veranderingen in mijn traject konden worden gemaakt. Siep Thomas (hoogleraar Huisartsgeneeskunde) dank ik voor de filosofisch getinte gesprekken over wetenschap.

Collega's van de afdeling hebben voor afleiding en gezelligheid gezorgd. Kamergenoten van Ff331: Jacques van Splunder en Rebekka Veugelers: jullie dank ik voor alle lol, muzikale afleidingen, gezelligheid en haring uitstapjes. Rebekka, nu jij nog.
Jennie Prins, Esther Kok (vriendin, oud-huisgenoot en collega) en mijn mede AIOTO's Marco Blanker, Boris Schouten en Annet Lievense dank ik, naast gezelligheid, ook voor het aanhoren van mijn klaagzangen. Kamergenoten van WK131, Hans, Corinne, Sander, Herman, Arianne, Sita en Annet, dank ik voor kletspraat over van alles en nog wat en kopjes espresso. Verder dank ik Frieke, Pim, Marlies, Arthur, Max, Pepijn, Leonie, Ton, Hans H, Marjolein, Umit, Janneke, Anita, Celinde, Lieke, Petra, Marie-Louise, Edith, Bionca, Esther en Rianne voor gezelligheid op de afdeling.

En toen was er Roparun 2003. Ik dank Marco Blanker, Jennie Prins, Boris Schouten en Max Reijman, medeorganisatoren, dat wij heelhuids zijn gefinished in Parijs.
Verder dank ik ook alle andere Roparunners voor een fantastische prestatie en onvergetelijke tijd (Gerrit-Jan, Frits, Ber, Chris, Astrid, Dominique, Caroline, Erik, Anne, Marjolein, Toke, Ineke, Sita, Menno, Jurgen, Rianne, Frieke, Jaap, Arianne, Bionca, Pepijn, Frederika, Rebekka en Renee)

Opleiding en onderzoek viel goed te combineren, ook dankzij de steun en flexibiliteit van mijn derde jaars opleider(s). Hans Harmsen en Sylvie Lo Fo Wong. Hans, jouw relativeringsvermogen en je bekwaamheid en deskundigheid op het gebied van communicatie heeft mij als toekomstig huisarts bijgeschaafd. Sylvie, jouw daadkracht en inhoudelijke kennis heeft mij gemotiveerd.Verder was het gewoon heel gezellig om met jullie en Lize, Marielle en Anneloes in de praktijk te werken.

Mijn familie en vrienden dank ik dat zij altijd begrip toonden als ik het druk had.
Mijn ouders dank ik voor alle onvoorwaardelijke steun die zij hebben gegeven in alles wat ik heb gedaan en doe.
Saskia, Andre (en kleine Britt), zus en zwager: jullie dank ik voor jullie interesse in mijn artikelen en de opbeurende mailtjes. Ook voor jaarlijkse zussendag.
Mijn (toekomstige) schoonouders dank ik voor hun betrokkenheid in mijn welzijn. Ook voor hun interesse voor mijn onderzoek en mijn opleiding tot (huis)arts.
Jaap en Leonie dank ik voor het zwager en schoonzusterschap.
Michèle, Lucien, Esther en Ytzen, jullie dank ik voor vriendschap sinds huisje één.
Marielle, Mirjam, Sandra, Anja en Marguerite, meiden van de leukste HAIO groep, jullie dank ik voor gekke uitspattingen en toekomstige weekendjes.
Alice dank ik ook, zij weet waarvoor.
Katinka van de summerschool voor gezellige etentjes in en rondom Leiden.
Marieke K voor vriendschap vanaf de middelbare school en culinaire hoogstandjes.

Tot slot Renger Rijkels, jouw onvoorwaardelijke liefde, steun en betrokkenheid hebben mij steeds gestimuleerd. Ik dank jou dat jij altijd achter mij staat.

Curriculum Vitae

Hanneke Otters werd geboren op 19 september 1973 te Culemborg. Na het behalen van haar gymnasium diploma aan het Nieuwe Lyceum in Bilthoven (1991), begon zij in 1992 aan de studie Geneeskunde aan de Erasmus Universiteit in Rotterdam. In 1997 haalde zij haar doctoraal examen en in 1999 werd het artsexamen cum laude afgesloten. Aansluitend werkte zij een jaar in het Vlietland ziekenhuis te Schiedam; een half als arts-assistent cardiologie en een half jaar als arts-assistent op de spoedeisende hulp. In september 2000 begon zij aan het AIOTO traject waarbij huisartsopleiding en onderzoek ineen zijn geïntegreerd. In juli 2003 behaalde zij de Master of Science Epidemiologie aan het Netherlands Institute for Health Sciences (NIHES). Sinds medio 2004 is zij lid van de Verenigingsraad van het Nederlands Huisartsen Genootschap (NHG). De huisartsopleiding zal in november 2004 afgerond zijn.