

# Influence of Day Care Attendance on the Use of Systemic Antibiotics in 0- to 2-Year-Old Children

Nana Thrane, MD, PhD\*‡; Charlotte Olesen, MD\*; Jens Tølbøll Mortensen MD, PhD§; Charlotte Søndergaard, MD\*; Henrik Carl Schønheyder, MD, Dr Med Sci§||; and Henrik Toft Sørensen, MD, PhD, Dr Med Sci§||

**ABSTRACT.** *Objective.* To examine the association between time spent in different public day care settings and prescription of systemic antibiotics.

*Design.* Population-based cohort study of 5035 Danish children born in 1997 followed from birth to June 30, 1999.

*Methods.* The study was performed by the linkage of records drawn from administrative registries. Exposure was the total time spent in a day care home or day care center. Outcome was the first prescription of a systemic antibiotic. Possible perinatal and sociodemographic confounding factors were considered by statistical analysis.

*Results.* During the first year of life, 39.8% of the girls and 51.1% of the boys received at least 1 antibiotic prescription drug. Enrollment in a day care setting doubled a child's risk of receiving a prescription drug (adjusted relative risk in day care home 1.9, 95% confidence interval: 1.7–2.0; adjusted relative risk in day care center 2.0, 95% confidence interval: 1.7–2.3). Only age confounded the analyses. Age >1 year at the starting time in day care reduced the risk of receiving antibiotic prescriptions during the first 3 months after enrollment.

*Conclusions.* Enrollment in public day care facilities raised the risk of receiving an antibiotic prescription drug to the same extent in day care homes as well as in day care centers, so we cannot recommend one facility over the other based on the present study. Children <1 year old at enrollment were most at risk, suggesting that extension of parental leave may reduce the use of antibiotics. *Pediatrics* 2001;107(5). URL: <http://www.pediatrics.org/cgi/content/full/107/5/e76>; day care settings, antibiotic use, infectious diseases, children, prescription drug.

ABBREVIATIONS. RR, relative risk; DCC, day care center; DCH, day care home; SA, systemic antibiotics; NDC, not enrolled in day care.

From the \*Danish Epidemiology Science Centre at the Department of Epidemiology and Social Medicine, University of Aarhus, ‡Medical Research Unit, Ringkjøbing County, §Department of Clinical Epidemiology at Aalborg Hospital and University of Aarhus, Aarhus; ||Department of Clinical Microbiology, Aalborg Hospital, Aalborg; and the ¶Department of Medicine V, Aarhus University Hospital, Aarhus C, Denmark.

Received for publication Sep 26, 2000; accepted Dec 21, 2000.

Address correspondence to Nana Thrane, MD, PhD, Danish Epidemiology Science Centre, Vennelyst Boulevard 6, DK 8000 Aarhus C. E-mail: [n.thrane@dadlnet.dk](mailto:n.thrane@dadlnet.dk)

PEDIATRICS (ISSN 0031 4005). Copyright © 2001 by the American Academy of Pediatrics.

The increased risk of infectious diseases in day care settings (relative risk [RR] ~2), which has been known about since the postwar period<sup>1–4</sup>, is of particular relevance in Denmark where 64% of children aged 6 months to 2 years attend public day care.<sup>5</sup> As use of antibiotics is a morbidity parameter related to infection, it is important from a public health perspective to identify situations and factors associated with high use of antibiotics. Besides discomfort and parental anxiety, infections may give rise to long-term complications, such as mastoiditis and hearing loss after otitis media.<sup>6</sup> Infectious illness also involves economic consequences because of use of health services and parents' absence from work while taking care of sick children.<sup>7</sup> Increased transmission of infectious agents may also result in excess illness among parents, day care staff members, and other children.<sup>8</sup> Furthermore, use of antibiotics is associated with antimicrobial resistance.<sup>9,10</sup>

Information on the association between child care attendance and the use of antibiotics is limited. Most studies were conducted before 1987, and results on risk according to type of day care (ie, day care centers [DCC] or day care homes [DCH]) are contradictory.<sup>1,3,11–14</sup>

This population-based follow-up study analyzes 1) the risk of receiving at least 1 prescription of systemic antibiotics (SA) according to age and gender; 2) the association between total time spent in a day care setting and use of prescription SA; and 3) the risk of receiving at least 1 prescription of SA during the first 3 months after enrollment in day care.

## METHODS

### Study Population

The study population included all children born during 1997 in the county of Northern Jutland, Denmark, who lived in the county during the entire study period ( $n = 5652$ ). Data were extracted from the North Jutland Birth Registry, which includes information on all pregnancies and births recorded by the midwives. Children who died during the study period were excluded ( $n = 40$ ), of whom 32 died before they reached the age of 4 months. The County of Northern Jutland has 27 municipalities. Because of municipal refusal to participate in the study and lack of usable registrations, we did not have access to information on day care from 5 municipalities, leaving 5035 children for the final analyses.

### Day Care Attendance

In Denmark, public day care is administered by the municipalities and organized as DCH, with a single care provider who takes care of 1 to 4 children in the private home, or DCC where 20 to 80 children are cared for in a facility established for that purpose.

Information on day care settings for the 5035 children was obtained for January 1, 1997, through June 30, 1999. We recorded the date of enrollment, date of exit, and type of day care setting. Because of the low number of children attending DCC, we did not distinguish between small or large DCCs. For each child, we calculated the exact period of time enrolled or not enrolled in day care (NDC).

### Antibiotic Prescriptions

The outcome measure was defined as the first antibiotic prescription for each child. The National Health Service was used to identify the dates of all SA prescriptions (Anatomic Therapeutic Chemical Code J01) during the period January 1, 1997, to June 30, 1999. In Denmark, antibiotics are purchased by prescription only. All prescription drugs are sold through monopolized pharmacies equipped with computerized accounting systems linked to the Danish National Health Service, which provides tax-supported health care for all citizens and reimburses 50% to 75% of the cost of most prescribed drugs.

We did not have information on drugs not subsidized by the National Health Service, such as cephalosporins and tetracyclines. The relevance of these drugs is negligible; cephalosporins accounted for only 0.2% of the total defined daily doses of antibiotics sold in Denmark during 1996,<sup>15</sup> and tetracyclines are not recommended for children <8 to 12 years old.<sup>16</sup>

### Confounding Factors

Information on potential confounders of the association between day care and SA prescriptions was considered. Data from the North Jutland Birth Registry included gender, birth weight (<2500, 2500–4500, and >4500 g), gestational age (<37, 37–41, and >41 weeks), mothers' smoking habits in early pregnancy (yes/no), and marital status (ie, the mother living alone or cohabiting with the father in early pregnancy [yes/no]). We extracted data from the National Statistical Office of Denmark<sup>17</sup> (registered November 1996) concerning older siblings in the home (0/≥1) and the mother's highest educational level: basic school ≤10 years, high school degree, vocational education and training (1–3 years), short-cycle and medium-cycle higher education (1–4 years), or long-cycle higher education (>4 years).

### Record Linkage

The study database was established by record linkage of information on day care, perinatal and sociodemographic factors, and prescription data. The linkage was accomplished using the unique personal identification number given to each Danish citizen at birth.

### Statistical Methods

To summarize the prescriptions over time, we constructed Kaplan-Meier survival curves, according to age for boys and girls, and compared the curves with the log-rank test.<sup>18</sup>

The follow-up began at the date of birth, and each child contributed to the risk time in the categories DCH, DCC, and NDC with the time they were registered in each category throughout the study period. The censoring date was either date of first SA prescription or June 30, 1999. We calculated the incidence rates, ie, the number of events (children with at least 1 SA prescription) per 100 child-years spent in DCH, DCC, and NDC using Cox regression for the overall population. We estimated the RR (ie, the incidence rate ratio), for the association between day care settings and antibiotic prescriptions. The incidence rate ratio is the incidence rate in DCH or DCC compared with the incidence rate in NDC.<sup>18</sup> The stratification on age was performed by the following age bands: 0 to 5, 6 to 11, 12 to 17, 18 to 23, and 24 to 35 months, based on the Mantel-Haenszel method.

We performed stratified analyses of the potential confounder variables to examine variation across strata (ie, effect modification). The potential confounding of the following variables was examined in Cox regression models: gender, birth weight, gestational age, mother's smoking habits, marital status, siblings, and mother's educational level. In the final models, we included only variables that changed the RR by >10%.<sup>19</sup>

## RESULTS

### Characteristics of Cohort and Day Care Attendance

Table 1 shows the characteristics of the children in the cohort. By the time of their first birthday, 55.3% of the children had attended public day care (Fig 1). During the study period, 20.9% of the children did not attend day care, 72.3% attended DCH, 4.9% attended DCC, and 1.9% attended both DCH and DCC (mixed).

### Use of Antibiotics

Figure 2 shows the cumulative incidence proportions, (ie, the risk of receiving at least 1 SA according to age and gender). The risk was increased for boys ( $P < .001$ ). During the first year of life, 39.8% of the girls and 51.1% of the boys received antibiotics.

### Association of Day Care with Prescription of Antibiotics

Table 2 shows the incidence rates of prescriptions in relation to day care. Ninety-nine children received prescriptions per 100 observed child-years of enrollment in DCH for children in age group 0 to 5 months. Enrollment in a day care setting, DCH as well as DCC, doubled a child's risk of receiving a prescription SA (Table 2). The final model only included age because the other potential confounding factors did not change the risk estimate (DCH vs NDC: adjusted RR 1.9 [95% confidence interval: 1.7–2.0] and crude RR 2.5 [95% confidence interval: 2.3–2.6]). Stratification showed a decreasing RR with increasing age. The association between day care and prescriptions was stronger for children without older siblings. The RR did not differ between children enrolled in 1 or 2 types of (mixed) day care settings (data not shown).

### Analysis Restricted to Children in Day Care

We restricted the analysis to children attending day care ( $n = 3981$ ) for the analyses of the risk of receiving a prescription after enrollment in the first day care. One third of the children received at least 1 SA prescription during the first 3 months after enrollment. Female gender, age >1 year at start in day care, and no prescriptions before enrollment decreased the risk of prescription (Table 3).

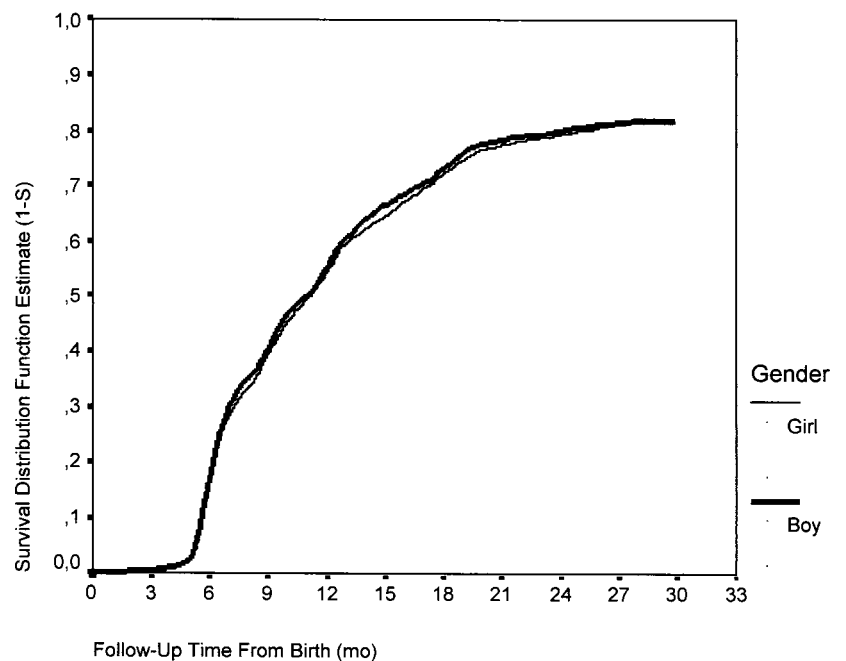
## DISCUSSION

Enrollment in a day care setting doubled a 0- to 2-year-old child's risk of receiving a prescription SA, and there was no difference in this respect between DCH and DCC. Children who were enrolled in day care after their first birthday had a lower risk of receiving antibiotics.

The major strengths of our study are its large size, the population-based design, and the prospective data collection on an administrative basis. Hence, we obtained very precise risk estimates. The exclusion of 5 of 27 municipalities was independent of the outcome measure (prescriptions), and this nondifferential selection has presumably not affected the results. All children in the study were followed from birth, and selection bias because of loss to follow-up did not occur. Furthermore, our information on prescrip-

**TABLE 1.** Characteristics of Children in the Cohort ( $N = 5035$ ) and Percentages Within Type of Day Care Setting

	Overall %	DCH <i>n</i> = 3639	DCC <i>n</i> = 248	Mixed <i>n</i> = 94	NDC <i>n</i> = 1054
Gender					
Girl	49	48.9	49.2	40.4	49.9
Boy	51	51.1	50.8	59.6	50.1
Birth weight (g)					
<2500	4.7	4.4	5.2	5.3	5.8
2500–4500	91.3	91.5	91.2	90.4	90.5
>4500	4.0	4.0	3.6	4.3	3.7
Gestational age (wk)					
<36	6.0	5.2	7.7	8.5	8.0
37–41	85.2	85.5	82.4	88.3	83.7
>41	8.8	9.2	8.5	3.2	8.3
Mother smoking during pregnancy					
No	72.2	71.5	75.4	69.1	74.3
Yes	27.8	28.5	24.6	30.9	25.7
Marital status					
Single	4.6	4.4	12.1	14.9	2.7
Cohabiting	95.4	95.6	87.9	85.1	97.3
Siblings					
0	40.7	43.4	39.1	46.8	31.0
≥1	59.3	56.6	60.9	53.2	69.0
Mother's education					
Basic school only	28.8	26.6	33.1	34.0	34.9
High school only	3.2	3.4	0.4	2.1	3.5
Vocational education	42.9	45.0	25.4	28.7	41.0
Higher education 1–4 y	20.3	20.7	30.7	10.6	12.0
Higher education >4 y	4.1	3.8	9.7	13.8	2.8
Unknown	0.7	0.5	0.8	–	1.4
Age at enrollment in first day care (mo)					
0–4	3.4	2.6	10.9	12.8	–
5–7	40.1	40.2	37.1	46.8	–
8–12	32.5	32.7	32.3	23.4	–
13–17	16.0	16.2	14.5	14.9	–
18–23	7.1	7.4	3.6	2.1	–
24–35	0.9	0.9	1.6	–	–



**Fig 1.** Kaplan-Meier survival curve (1-S). Cumulative incidence proportion of children attending day care setting according to age.

tions could not be biased by knowledge about type of day care, and we were able to control for some confounding factors. Among the weaknesses are the following: 1) Children not enrolled in public day care may have attended private day care arrangements.

However, during the study period, all municipalities in the County of Northern Jutland offered a guarantee for a place in public day care after the end of the maternal leave period; 2) Exposure to day care was analyzed by the time notified and not the time the

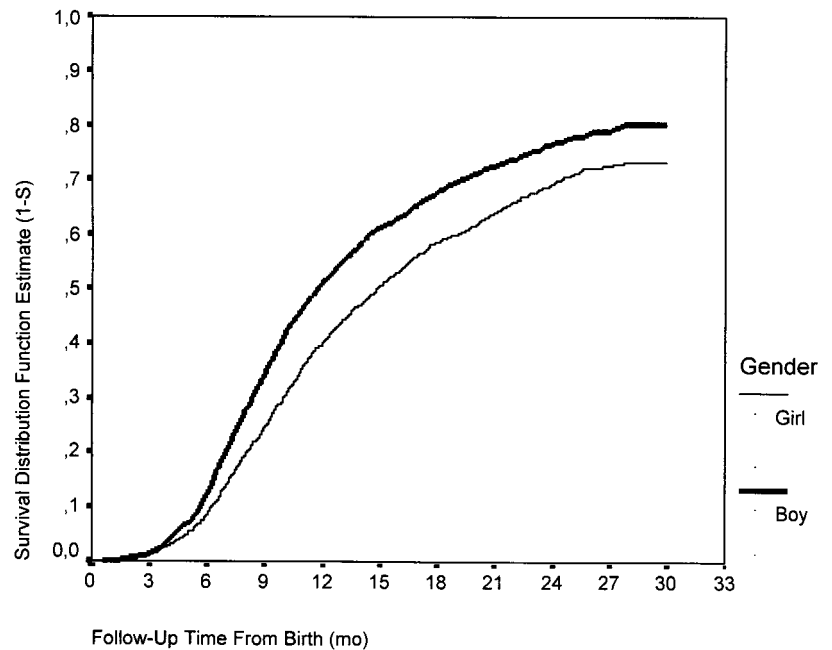


Fig 2. Kaplan-Meier survival curve (1-S). Cumulative incidence proportion of children receiving at least 1 prescription according to age and gender.

TABLE 2. Association Between Time Spent in Day Care Setting and Receiving at Least One Prescription of SA\*

	NDC		DCH		DCC	
	Incidence Rate	Incidence Rate	RR (95% Confidence Interval)	Incidence Rate	RR (95% Confidence Interval)	
Overall‡	40 (reference)	103	1.9 (1.7–2.0)	111	2.0 (1.7–2.3)	
Age group (mo)§						
0–5	20 (reference)	99	4.9 (3.6–6.8)	31	1.5 (0.5–4.7)	
6–11	74 (reference)	146	1.9 (1.8–2.2)	170	2.3 (1.8–2.9)	
12–17	56 (reference)	96	1.7 (1.5–2.0)	109	2.0 (1.5–2.8)	
18–23	51 (reference)	67	1.3 (1.1–1.7)	59	1.2 (0.7–1.9)	
24–35	43 (reference)	43	1.0 (0.6–1.7)	75	1.7 (0.6–4.7)	
Siblings‡						
0	30 (reference)	110	2.6 (2.3–3.9)	130	3.0 (2.3–4.0)	
≥1	48 (reference)	97	1.6 (1.4–1.7)	100	1.6 (1.3–2.1)	

\* Incidence rate is the number of events (children with at least 1 prescription) per 100 child-years spent in each setting. The RR is the incidence rate ratio shown with 95% confidence intervals, with the reference being incidence rate from NDC.

‡ Cox regression, adjusted for age groups. Adjusting for gender, birth weight, gestational age, smoking, siblings, marital status, and education did not change the risk estimates.

§ Mantel Haenszel method; stratified analysis.

children actually spent in the setting, which may vary among receivers and nonreceivers of prescriptions; 3) Records of antibiotic prescriptions may not have been complete, as children may have redeemed prescriptions while they were away from the county (<2%), and inpatient use was not recorded. The association may be weakened if day care children are hospitalized more often, although most children are discharged from a hospital with a prescription before the end of the treatment period; and 4) Information on smoking during pregnancy, marital status, and education was obtained early in pregnancy. Thus, women may have changed status during the study period. Although few women change their smoking habits, the proportion of smoking women increases postpartum.<sup>20</sup> It is unlikely that the bias would have major implications on our results because change of status was probably independent from the form of day care.

Our findings regarding the cumulative incidence

proportions of antibiotic users are similar to those of a Swedish study from Växjö<sup>21</sup> and higher than those reported by Tierp<sup>22</sup> and Jämtland.<sup>23</sup> Comparison with these studies of children born in the 1980s must be cautious, as later Swedish studies have documented a 40% increase in antibiotic prescription rates for children during 1987 to 1993.<sup>24</sup> An American study from 1996, based on questionnaires to parents, showed that 70% of 6-month-old children had used at least 1 antibiotic.<sup>25</sup>

The use of SA was lowest among children cared for at home, as reported in all other studies. Children attending DCC or DCH were facing the same risk of receiving antibiotic prescription drugs, as reported in several Swedish studies.<sup>1,3,11,12</sup> However, Reves and Jones<sup>13</sup> reported that 36% of children in DCC in the United States received antibiotics compared with 7% of children in DCH and 8% of NDC children. Ståhlberg<sup>14</sup> also found that children in DCC had a higher (nonsignificant) risk than DCH children in 1978. This

**TABLE 3.** Relative Risk of Receiving a Prescription of Systemic Antibiotics During the First Three Months After Enrollment in the First Day Care Setting ( $N = 3981$ )

	<i>n</i>	Percentage With Prescription	RR (95% Confidence Interval)*
Gender			
Girl	1941	27.3	1.0 (reference)
Boy	2040	37.6	1.5 (1.3–1.6)
Age at enrollment (mo)			
0–4	135	23.7	0.6 (0.4–0.9)
5–7	1598	34.4	1.0 (reference)
8–12	1293	35.0	0.9 (0.8–1.0)
13–17	638	27.6	0.6 (0.5–0.7)
18–23	281	28.5	0.6 (0.5–0.8)
24–35	36	13.9	0.3 (0.1–0.6)
Prescription before enrollment			
No	2954	29.4	1.0 (reference)
Yes	1027	41.6	1.8 (1.6–2.1)
Total	3981	32.6	

\* Cox regression, RR estimates incidence rate ratio. Adjusting for confounders was performed in a multivariate model including all the variables present in the table. None of the other potential confounders changed the risk estimate.

variation may spring from cultural differences in the settings or, more likely, from differences in study design. Our study included a large group of children with a follow-up period of >1 year, whereas Reves' and Ståhlberg's studies included fewer children during 8 weeks. Moreover, they may be confounded by skewness in social status, race, and age.

In our study, the RR of receiving prescription antibiotics was lower for day care children who had older siblings compared with children without siblings. This may be attributable to the earlier exposure to infectious agents from the siblings and thereby activation of the immune system, which make them less vulnerable to infections while they attend day care. Another explanation could be improvement of the parents ability to cope with a sick child with the next child.

The Swedish studies showed a slightly lower RR of ~1.5.<sup>1,12</sup> This may be explained by the longer parental leave period in Sweden, which means that most children will not be attending day care until after their first birthday. The difference may stem from different analytic methods. Our study censored the information by the first prescription or at the end of the study period, whereas these other studies counted the total number of prescriptions and divided this number with the total number of child-months in each day care type during the study period.

We did not have information on prescriber behavior or parental attitude. Therefore, the effect ascribed to day care may originate to some extent in parental demand for medication, and not in the degree of infectious illness. Parents who work outside the home may be more disposed to ask for antibiotics for their children to shorten the amount of time that they have to stay away from work.

Our study demonstrated variation in RR in different age groups, and it is one of the first studies to

include age on enrollment as a risk factor for use of antibiotics. In Denmark, the parental leave-period extends to ~6 months after delivery. At 6 to 9 months old, humoral immunity is at a nadir.<sup>26</sup> This may partly explain the larger vulnerability to day care exposure among the youngest children, and why age on enrollment in day care affects the risk of receiving prescription SA during the 3 months after enrollment.

Our results indicate that attending DCC or DCH increases the use of antibiotics to about the same degree. In the public planning of future day care services, DCH cannot be given priority over DCC or vice versa based on the present study. Preference to either setting may be rooted in other considerations such as children's emotional and social development. The risk of receiving antibiotics in relation to day care was highest in children <1 year old, suggesting that the extension of parental leave to more than the 6 months offered in Denmark may reduce the use of antibiotics.

#### ACKNOWLEDGMENTS

The study was funded by the Medical Research Unit, Ringkjøbing County, and the Danish Medical Research Council (Grant No. 9700677). Additional support was provided by Fonden til Lægevidenskabens Fremme [Fund for Medical Science Research], Rosalie Petersens Fond [Rosalie Petersen Fund], Kong Christian X Fond [King Christian X Fund], og Den Samfundsmedicinske Forskningsfond [The Sociomedical Research Fund]. The activities of the Danish Epidemiology Science Centre are financed by a grant from the Danish National Research Foundation.

We thank the staff at the Department of Health Insurance and Preventive Medicine and Hospital Registries in the County of Northern Jutland for excellent assistance in preparing the data for analysis. Associate professor Dr Svend Juul provided assistance with the statistical analysis.

#### REFERENCES

- Petersson C, Håkansson A. A retrospective study of respiratory tract infections among children in different forms of day care. *Scand J Prim Health Care*. 1990;8:119–122
- Wald ER, Guerra N, Byers C. Upper respiratory tract infections in young children: duration of and frequency of complications. *Pediatrics*. 1991;87:129–133
- Strangert K. Respiratory illness in preschool children with different forms of day care. *Pediatrics*. 1976;57:191–196
- Hesselvik L. Respiratory infections among children in day nurseries. *Acta Paediatr Scand*. 1949;74:44–64
- Nielsen A, Lie RL, Keiding L, Madsen M. *Børns sundhed i Danmark [The Health of Children in Denmark]*. 2nd ed. Copenhagen, Denmark: Danish Institute of Clinical Epidemiology; 1998
- Bluestone CD. Clinical course, complications and sequelae of acute otitis media. *Pediatr Infect Dis J*. 2000;19(suppl):37–46
- Nurmi T, Salminen E, Ponka A. Infections and other illnesses of children in day-care centers in Helsinki. II: The economic losses. *Infection*. 1991;1:331–335
- Osterholm MT. Infectious disease in child day care: an overview. *Pediatrics*. 1994;94:987–990
- Mölstad S, Arvidsson E, Eliasson I, Hovelius B, Kamme C, Schalen C. Production of betalactamase by respiratory tract bacteria in children: relationship to antibiotic use. *Scand J Prim Health Care*. 1992;10:16–20
- Kristinsson KG. Effect of antimicrobial use and other risk factors on antimicrobial resistance in pneumococci. *Microb Drug Resist*. 1997;3:117–123
- Petersson C, Håkansson A. A prospective study of infectious morbidity and antibiotic consumption among children in different forms of municipal day-care. *Scand J Infect Dis*. 1989;21:449–457
- Rasmussen F, Sundelin C. Use of medical care and antibiotics among preschool children in different day care settings. *Acta Paediatr Scand*. 1990;79:838–846

13. Reves RR, Jones JA. Antibiotic use and resistance patterns in day care centers. *Semin Pediatr Infect Dis*. 1990;1:212–221
14. Ståhlberg M. The influence of form of day care on occurrence of acute respiratory tract infections among young children. *Acta Paediatr Scand*. 1980;282(suppl):1–87
15. Steffensen FH, Schönheyder HC, Mortensen JT, Nielsen K, Sørensen HT. Changes in reimbursement policy for antibiotics and prescribing patterns in practice. *Clin Microbiol Infect*. 1997;3:653–657
16. Steele RW, Kearns GL. Antimicrobial therapy for pediatric patients. *Pediatr Clin North Am*. 1989;36:1321–1349
17. IDA—en integreret database for arbejdsmarkedsforskning [IDA—An Integrated Database for Labor Market]. Copenhagen, Denmark: The National Statistical Office of Denmark; 1991
18. Armitage P, Berry G. *Statistical Methods in Medical Research*. 3rd ed. Cambridge, MS: Blackwell Science; 1994
19. Greenland S. Modeling and variable selection in epidemiologic analysis. *Am J Public Health*. 1989;79:340–349
20. Wisborg K, Henriksen TB, Obel C, Skajaa E, Østergaard JR. Smoking during pregnancy and hospitalization of the child. *Pediatrics*. 1999; 104(4). URL: <http://www.pediatrics.org/cgi/content/full/104/4/e46>
21. Håkansson A, Petersson C. Drug consumption during the first 18 months of life of infants from smoking and non-smoking families. *Br J Gen Pract*. 1992;42:362–365
22. Rasmussen F. Use of antibiotics and prescription drugs in general during the first 9 years of life in a Swedish community. *Paediatr Perinat Epidemiol*. 1988;2:346–358
23. Wessling A, Söderman P, Boëthius G. Monitoring of drug prescriptions for children in the County of Jämtland and Sweden as a whole in 1977–1987. *Acta Paediatr Scand*. 1991;80:944–952
24. Wessling A, Boëthius G. Fortsatt ökning av antibiotikaforskrivning til barn. Vad är det vi behandlar? [Continuous increase of prescription of antibiotics for children. What are we treating?] *Läkartidningen [Physician's Journal]*. 1995;92:1907–1909
25. Bergus GR, Levy BT, Levy SM, Slager SL, Kiritsy MC. Antibiotic use during the first 200 days of life. *Arch Fam Med*. 1996;5:523–526
26. Johansson SG, Berg T. Immunoglobulin levels in healthy children. *Acta Paediatr Scand*. 1967;56:572–579

## **Influence of Day Care Attendance on the Use of Systemic Antibiotics in 0- to 2-Year-Old Children**

Nana Thrane, Charlotte Olesen, Jens Tølbøll Mortensen MD, Charlotte Søndergaard, Henrik Carl Schønheyder and Henrik Toft Sørensen

*Pediatrics* 2001;107:e76

DOI: 10.1542/peds.107.5.e76

<b>Updated Information &amp; Services</b>	including high resolution figures, can be found at: <a href="/content/107/5/e76.full.html">/content/107/5/e76.full.html</a>
<b>References</b>	This article cites 21 articles, 3 of which can be accessed free at: <a href="/content/107/5/e76.full.html#ref-list-1">/content/107/5/e76.full.html#ref-list-1</a>
<b>Citations</b>	This article has been cited by 2 HighWire-hosted articles: <a href="/content/107/5/e76.full.html#related-urls">/content/107/5/e76.full.html#related-urls</a>
<b>Subspecialty Collections</b>	This article, along with others on similar topics, appears in the following collection(s): <b>Infectious Disease</b> <a href="/cgi/collection/infectious_diseases_sub">/cgi/collection/infectious_diseases_sub</a>
<b>Permissions &amp; Licensing</b>	Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at: <a href="/site/misc/Permissions.xhtml">/site/misc/Permissions.xhtml</a>
<b>Reprints</b>	Information about ordering reprints can be found online: <a href="/site/misc/reprints.xhtml">/site/misc/reprints.xhtml</a>

PEDIATRICS is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. PEDIATRICS is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2001 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 0031-4005. Online ISSN: 1098-4275.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



# PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

## **Influence of Day Care Attendance on the Use of Systemic Antibiotics in 0- to 2-Year-Old Children**

Nana Thrane, Charlotte Olesen, Jens Tølbøll Mortensen MD, Charlotte Søndergaard, Henrik Carl Schönheyder and Henrik Toft Sørensen

*Pediatrics* 2001;107:e76

DOI: 10.1542/peds.107.5.e76

The online version of this article, along with updated information and services, is located on the World Wide Web at:  
</content/107/5/e76.full.html>

PEDIATRICS is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. PEDIATRICS is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2001 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 0031-4005. Online ISSN: 1098-4275.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

