Socioeconomic Factors in *Helicobacter pylori* Infection among Danish Adults

Steffen Jais Rosenstock, MD, Leif Percival Andersen, MD, Charlotte Vallentin Rosenstock, MD, Olaf Bonnevie, MD, DMSci, and Torben Jørgensen, DMSci

ABSTRACT

Objectives. This study examined the relationship between housing conditions, educational level, occupational factors, and serologically diagnosed acute and chronic *Helicobacter pylori* infection.

Methods. Immunoglobulin G and immunoglobulin M serum antibodies against *H. pylori* were measured in 3589 Danish adults who participated in a population study.

Results. Low socioeconomic status (odds ratio [OR] = 2.2, 95% confidence interval [CI] = 1.7, 3.0), short duration of schooling (OR = 2.0, 95% CI = 1.3, 2.5), lack of training/education (OR = 1.4, 95% CI = 1.2, 1.7]), unskilled work (OR = 1.7, 95% CI = 1.2, 2.5), and high work-related energy expenditure (OR = 1.4, 95% CI = 1.1, 1.9) increased the likelihood of chronic *H. pylori* infection. Infection was frequent in people who had lived abroad. Increased levels solely of immunoglobulin M antibodies were found more often in people who were divorced (OR = 2.3, 95% CI = 1.2, 4.4) or unmarried (OR = 2.0, 95% CI = 1.1, 3.8) or who worked long hours (OR = 2.0, 95% CI = 1.1, 4.0).

Conclusions. Educational and occupational factors relate to the likelihood of chronic *H. pylori* infection in adults. The rate of acute infection is high in single individuals. (*Am J Public Health.* 1996;86: 1539–1544)

Introduction

Helicobacter pylori prevalence rates have been shown to reflect socioeconomic status in childhood.[1–3] Socioeconomic status is a compound measure that is mostly constructed from information on income, housing conditions, educational level, and occupational factors. Very little data currently exist on the individual effects of these factors on *H. pylori* infection rates. Socioeconomic status could therefore be a proxy for other, as yet unidentified risk factors for *H. pylori* infection. Epidemiological studies have shown that peptic ulcer disease is more common in people of low socioeconomic status.[4–10] In view of the present knowledge on *H. pylori* infection, it could be speculated that *H. pylori* is the agent that bridges the gap between the environment and the gastroduodenal mucosa.

Previous studies in this field have focused on factors predicting the existence of chronic *H. pylori* infection and used increased immunoglobulin G (IgG) antibody levels as a marker for infection. Acute infection with *H. pylori* remains undiagnosed in most cases. Increased levels solely of immunoglobulin M (IgM) antibodies to *H. pylori* are assumed to reflect acute infection.[11] Serologically diagnosed acute *H. pylori* infection may thus prove to be useful in attempts to identify factors involved in acquiring *H. pylori.* The aim of this study was to identify various socioeconomic factors associated with the presence of serologically diagnosed acute and chronic *H. pylori* infection in an unselected population of adults.

Methods

Study Population and Acquisition of Serum Samples

In 1982, an age- and sex-stratified sample consisting of 4807 men and women, born in 1922, 1932, 1942, and 1952 and residing in the western part of Copenhagen County, was drawn from the National Danish Civil Registration System, in which all people living in Denmark are registered by a unique 10-digit number. The composition of sex, age, occupation, and marital status in the sampling area was compared with national statistics to ensure sample validity. In comparison with Copenhagen County as a whole, there was an overrepresentation of unskilled workers and younger people (those less than 50 years of age). In comparison with the entire country, there was a minor underrepresentation of workers employed in agriculture, horticulture, and fishery, and there were fewer self-employed people and unskilled workers.

All sample members were invited to a general health examination through a standardized letter containing information about the project. Also included was a questionnaire concerning socioeconomic factors to be completed in advance.[12,13] Those who did not respond were sent follow-up letters. Individuals

Steffen Jais Rosenstock and Charlotte Vallentin Rosenstock are with the Glostrup Population Studies, Department of Internal Medicine, Glostrup Hospital, University of Copenhagen, Copenhagen, Denmark. Steffen Jais Rosenstock and Torben Jørgensen are with the Department of Surgery, Bispebjerg Hospital, University of Copenhagen. Leif Percival Andersen is with the Department of Clinical Microbiology, Hillerød Hospital, Hillerød, Denmark, and the Department of Clinical Microbiology, National University Hospital, Rigshospitalet, Copenhagen. Olaf Bonnevie is with the Department of Gastroenterology, Frederiksberg Hospital, University of Copenhagen.

Requests for reprints should be sent to Steffen Jais Rosenstock, MD, Department of Surgery K, Bispebjerg Hospital, Bispebjerg Bakke 23, 2400 NV, Copenhagen, Denmark.

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TABLE 1—Seroprevalence of Increased Levels of IgG and of Only IgM Antibodies to *H. pylori* among 3589 Danish Adults, by Sex and Age

		Increased IgG Antibody[a]			Increased IgM Antibody[b]		
Age, y	Total No.	No.	%	95% CI	No.	%	95% CI
				Men			
30	451	57	12.6	9.8, 16.0	14	3.1	1.5, 4.7
40	471	128	27.2	23.2, 31.2	5	1.1	0.1, 2.0
50	461	118	25.6	21.6, 29.6	4	0.9	0.0, 1.7
60	450	166	36.9	32.6, 41.6	1	0.2	0.0, 0.7
Total	1833	469	25.6	23.7, 27.7	24	1.3	0.8, 1.8
				Women			
30	454	62	13.7	10.5, 16.9	20	4.4	2.6, 6.3
40	456	111	24.3	20.4, 28.2	7	1.5	0.4, 2.7
50	448	136	30.4	26.1, 34.7	14	3.1	1.5, 4.7
60	398	149	37.4	32.6, 42.2	2	0.5	0.0, 1.2
Total	1756	458	26.1	24.0, 28.2	43	2.5	1.7, 3.2

Note. Ninety-five percent confidence intervals (CIs) were obtained from the binomial distribution. IgG = immunoglobulin G; IgM = immunoglobulin M.

[a]Increased IgG antibody levels to *H. pylori* irrespective of IgM and IgA antibody levels (males-females OR = 1.0, 95% CI = 0.8, 1.1; test for increasing trend with age: $\chi^2 = 125.97$, $df = 1, P < .001$).

[b]Increased levels solely of IgM antibodies to *H. pylori* (males-female OR = 0.5, 95% CI = 0.3, 0.8; test for decreasing trend with age: $\chi^2 = 25.3$, $df = 1, P < .001$).

who declined participation were contacted and interviewed by telephone whenever possible.[14]

The sample size was reduced to 4581 Danes because of the exclusion of 226 persons of foreign extraction. The response rate was 78.8% (3608/4581). Between November 1982 and February 1984, sera were obtained from 3589 responders and then stored at a temperature of −20°C.

The project was approved by the Regional Research Ethics Committee of Copenhagen County.

Antibody Detection and Cutoff Levels

In June 1993, all serum samples were thawed for the first time and analyzed. Circulating IgG antibodies against a low molecular weight fraction of *H. pylori* antigens and circulating IgM and immunoglobulin A (IgA) antibodies directed against heat-stable *H. pylori* antigens were measured in duplicate by in-house indirect enzyme-linked immunosorbent assay (ELISA).[15] Based on measurements of serum samples from patients with dyspepsia and known *H. pylori* status, a value below 100 ELISA units is considered negative.[16] Participants were considered seropositive for an antibody if serum antibody levels exceeded the cutoff level for seropositivity. Cut-off levels for seropositivity were assigned at ELISA units of 400 or more, 200 or more, and greater than 100 for the IgG, IgM, and IgA assays, respectively.[15] Borderline cases involved antibody levels between cutoff levels for seronegativity and seropositivity.

People with increased levels of IgG antibodies to *H. pylori* were assumed to harbor a chronic *H. pylori* infection regardless of IgM or IgA antibody levels. Increased levels solely of IgM antibodies to *H. pylori* (i.e., increased IgM levels unaccompanied by an increase in IgG or IgA levels) were interpreted as evidence of acute infection.[11] Increased IgG antibody levels to *H. pylori* and increased levels solely of IgM antibodies to *H. pylori* are hereafter referred to as "chronic *H. pylori* infection" and "acute *H. pylori* infection," respectively.

Study Variables

Socioeconomic status was categorized according to the family member with the highest educational and occupational level.[17] Education level was assessed by asking the participants whether they had completed primary school, secondary school, and high school or college. Vocational training/education was treated as a yes–no variable. Occupation (in people who were currently working) and former occupation (in those who were retired) were categorized in four groups: independent tradesman, public or civil servant, skilled workers, and semiskilled or unskilled worker. Weekly work hours (in those who were working) were dichotomized into 1 to 40 hours and 41 hours or more. Work-related energy expenditure was categorized in three groups: sedentary work, low work-related energy expenditure, and high work-related energy expenditure. Marital status was classified as married, unmarried, divorced, or widowed. Housing density, calculated as number of individuals per room, was categorized as low (<0.5 person per room), moderate (0.5 to 1.0 person per room), or high (>1.0 person per room). Number of children living at home served as a continuous variable. Geographical residency prior to study enrollment was assessed as number of years living in the municipality of Copenhagen, Copenhagen County, a provincial town, the countryside, or abroad. Participants were asked whether they currently lived in a house or condominium, a rented apartment, or a simple room.

Statistical Methods

The SPSS statistical application for Windows was used. Confidence intervals (CIs) for proportions were obtained from the binomial distribution.[18] Tests for trends were used to examine age trends in seroprevalences.[18] IgG, IgM, and IgA antibody measurements were transformed into nominal scales according to seropositivity and used as dependent variables in logistic regression analyses. Borderline cases (i.e., cases involving antibody levels between the lower and upper cutoff levels) were excluded. Study variables were initially fitted into sex- and age-adjusted regression models as explanatory variables. Variables that improved the fit of these models were incorporated into final regression models. Different final models were constructed because some variables were closely related. Odds ratios (ORs) were calculated as the antilogarithm of the coefficient (β) for the separate variables. Ninety-five percent confidence intervals for odds ratios were computed from the following equation: $CI = e^{\beta \pm 1.96SE(\beta)}$, where SE is the standard error of the fitted model. Because some odds ratios were close to unity and a number of strata contained only a few individuals, statistical power calculations were carried out. Study power ranged from 23% to 99%.[19] Final models on chronic *H. pylori* infection were constructed for participants less than 50 years of age and for participants 50 years of age or older to examine whether factors associated with *H. pylori* infection varied between age groups.

Results

Table 1 shows the sex- and age-specific prevalences of increased IgG antibody levels and increased levels solely of IgM antibodies to *H. pylori* in the study population.

Socioeconomic Variables

Whereas the odds of chronic *H. pylori* infection increased slightly with decreasing socioeconomic status, socioeconomic status did not affect the likelihood of acute *H. pylori* infection (Table 2). A twofold increased rate of acute *H. pylori* infection was seen in unmarried and divorced participants as compared with married participants. High housing density and residence in a rented apartment were significantly more often reported in people with chronic *H. pylori* infection than in other people. Former residency in a provincial town and a history of living abroad were associated with increased rates of chronic *H. pylori* infection. The odds of chronic infection decreased with higher levels of education (Table 2). Lack of vocational training/education and employment in unskilled and semiskilled occupations were common in people with chronic *H. pylori* infection. High occupational energy expenditure (vs sedentary work) significantly increased the likelihood of chronic *H. pylori* infection. Acute infection with *H. pylori* was significantly more often seen in people working 41 hours or more per week than in other employed people.

Final Models

Total population. Age, socioeconomic status, schooling, vocational training/education, work-related energy expenditure, occupation, and geographical residency remained significantly associated with chronic *H. pylori* infection in multivariate adjusted models (Table 3). Housing density and type of housing were eliminated from the final model when geographical residency was incorporated into analyses. History of former residency in the municipality of Copenhagen increased the likelihood of both chronic (Table 3) and acute (Table 4) *H. pylori* infection.

The relationship between increased levels of IgM antibodies and female sex, young age, long working hours, and single marital status persisted in multivariate analyses (Table 4).

Age groups. Age, socioeconomic status, vocational training/education, and work-related energy expenditure were

TABLE 2—Sex- and Age-Adjusted Odds Ratios of Seropositivity for Increased Levels of IgG and of Only IgM Antibodies to *H. pylori* among 3589 Danish Adults, by Socioeconomic Factors

	Total No.	Increased IgG Antibody[a] OR	Increased IgG Antibody[a] 95% CI	Increased IgM Antibody[b] OR	Increased IgM Antibody[b] 95% CI
Socioeconomic status					
High[c]	975	1.0	. . .	1.0	. . .
Moderate–high	1179	1.0	0.8, 1.3	0.9	0.5, 1.6
Low–moderate	991	1.3	1.1, 1.6	1.1	0.6, 2.0
Low	444	2.2	1.7, 2.9	1.0	0.4, 2.8
Marital status					
Married[c]	2591	1.0	. . .	1.0	. . .
Unmarried	403	0.9	0.6, 1.2	2.0	1.1, 3.8
Divorced	493	1.1	0.9, 1.4	2.2	1.2, 4.2
Widowed	102	1.4	0.9, 2.3	1.5	0.2, 11.9
Housing density[d]					
Low[c]	378	1.0	. . .	1.0	. . .
Moderate	3004	1.3	1.0, 1.6	0.7	0.3, 1.6
High	202	1.6	1.1, 2.4	0.9	0.3, 2.9
No. children living at home[e]	1974	1.0	0.8, 1.2	0.8	0.6, 1.2
Type of housing					
House/condominium[c]	1257	1.0	. . .	1.0	. . .
Rented apartment	2276	1.2	1.1, 1.4	0.7	0.4, 1.2
Simple room	56	1.3	0.7, 2.4	1.5	0.3, 7.1
Geographical residency[f]					
Municipality of Copenhagen	2418	1.00	0.99, 1.01	1.02	1.00, 1.04
Copenhagen County	3589	0.99	0.98, 1.00	0.98	0.96, 1.00
Provincial town	1398	1.02	1.01, 1.03	0.99	0.95, 1.02
Countryside	1147	1.00	0.99, 1.01	1.01	0.97, 1.04
Abroad	364	1.05	1.01, 1.10	1.05	0.85, 1.30
Education level					
Primary school[c]	2252	1.0	. . .	1.0	. . .
Secondary school	981	0.7	0.6, 0.8	1.0	0.6, 1.7
High school/college	356	0.5	0.4, 0.7	1.1	0.5, 2.2
Vocational training/education					
Yes[c]	2536	1.0	. . .	1.0	. . .
No	1053	1.5	1.2, 1.9	0.6	0.3, 1.1
Occupation[g]					
Independent tradesman[c]	248	1.0	. . .	1.0	. . .
Public or civil servant	1846	1.1	0.8, 1.5	1.8	0.4, 7.7
Skilled worker	340	1.1	0.8, 1.7	2.8	0.6, 13.9
Semiskilled or unskilled worker	669	1.8	1.3, 2.6	1.8	0.1, 20.8
Work-related energy expenditure[h]					
Sedentary work[c]	857	1.0	. . .	1.0	. . .
Low expenditure	1455	1.2	1.0, 1.5	1.1	0.6, 2.0
High expenditure	672	1.5	1.2, 2.0	1.2	0.5, 2.7
Weekly work hours[i]					
1–40[c]	2496	1.0	. . .	1.0	. . .
≥41	529	1.0	0.8, 1.3	2.0	1.1, 3.8

Note. IgG = immunoglobulin G; IgM = immunoglobulin M; OR = odds ratio; CI = confidence interval.

[a]Increased IgG antibody levels to *H. pylori* irrespective of IgM and IgA levels (chronic *H. pylori* infection).

[b]Increased levels solely of IgM antibodies to *H. pylori* (acute *H. pylori* infection).

[c]Reference category.

[d]Housing density could not be calculated for 5 participants.

[e]Odds ratios are the increase in risk of *H. pylori* infection with each child living at home in people who still had children living at home.

[f]Odds ratios are the increase in risk of *H. pylori* infection with each year of living in the geographical area. Total number is the number of people who had a history of living in the area in question.

[g]Current or former occupation. A total of 441 persons gave no information on occupation, and 46 assisting spouses were excluded from analyses.

[h]A total of 578 persons were unemployed, and 28 persons gave no information on work-related energy expenditure.

[i]In all, 564 persons reported no weekly work hours.

TABLE 3—Multivariate Adjusted Odds Ratios of Seropositivity for Increased Levels of IgG Antibody to *H. pylori* among 3589 Danish Adults, by Age

	Increased IgG Antibody[a]					
	All Ages		Less than 50 y		50 y or More	
	OR	95% CI	OR	95% CI	OR	95% CI
Age, y						
30[b]	1.0	...	1.0	...	...	...
40	2.2	1.7, 2.9	4.2	1.9, 10.5	...	...
50	2.1	1.6, 2.8	...	...	1.0	...
60	3.2	2.3, 4.3	...	...	1.5	1.2, 1.9
Social status						
High[b]	1.0	...	1.0	...	1.0	...
Moderate–high	1.1	0.9, 1.3	1.2	0.5, 2.7	1.0	0.7, 1.3
Low–moderate	1.3	1.1, 1.6	1.2	0.8, 1.7	1.4	1.1, 1.9
Low	2.2	1.7, 3.0	2.7	1.8, 4.3	2.0	1.4, 2.8
Marital status						
Married[b]	...[c]	...	1.0	...	...[c]	...
Unmarried	...[c]	...	0.8	0.5, 1.1	...[c]	...
Divorced	...[c]	...	1.1	0.8, 1.5	...[c]	...
Widowed	...[c]	...	12.6	1.3, 126.8	...[c]	...
Geographical residency[d]						
Municipality of Copenhagen	1.01	1.00, 1.02	...[c]	...	...[c]	...
Provincial town	1.02	1.01, 1.03	...[c]	...	...[c]	...
Abroad	1.07	1.02, 1.12	...[c]	...	...[c]	
Education level						
Primary school[b]	1.0	...	1.0	...	1.0	...
Secondary school	0.8	0.6, 0.9	0.9	0.7, 1.3	0.6	0.5, 0.8
High school/college	0.5	0.4, 0.8	0.7	0.4, 1.1	0.4	0.2, 0.7
Vocational training/education						
Yes[b]	1.0	...	1.0	...	1.0	...
No	1.4	1.2, 1.7	1.5	1.1, 2.0	1.3	1.1, 1.7
Occupation[e]						
Independent tradesman[b]	1.0	...	...[c]	...	1.0	...
Public or civil servant	1.2	0.9, 1.7	...[c]	...	1.4	0.9, 2.3
Skilled worker	1.1	0.8, 1.7	...[c]	...	1.1	0.6, 2.0
Semiskilled or unskilled worker	1.9	1.3, 2.8	...[c]	...	1.9	1.1, 3.1
Work-related energy expenditure						
Sedentary work[b]	1.0	...	1.0	...	1.0	...
Low expenditure	1.2	0.9, 1.4	0.9	0.7, 1.2	1.6	1.1, 2.1
High expenditure	1.4	1.1, 1.9	1.4	1.1, 2.1	1.3	0.8, 1.9

Note. Several logistic regression models were constructed to account for interrelations between variables. IgG = immunoglobulin G; OR = odds ratio; CI = confidence interval.
[a]Increased IgG antibody levels to *H. pylori* irrespective of IgM and IgA levels (chronic *H. pylori* infection).
[b]Reference category.
[c]Variable was eliminated from the final regression model.
[d]Odds ratios are the increase in risk of having a chronic *H. pylori* infection per each year of living in the geographical area in question. Geographical residency was eliminated from the final model when analyses were stratified according to age.
[e]Current or former occupation.

TABLE 4—Multivariate Adjusted Odds Ratios of Increased Levels of Only IgM Antibody to *H. pylori* among 3589 Danish Adults

	Increased IgM Antibody[a]	
	OR	95% CI
Sex		
Male[b]	1.0	...
Female	2.2	1.4, 3.7
Age, y		
30[b]	1.0	...
40	0.5	0.2, 0.9
50	0.6	0.3, 1.2
60	0.1	0.1, 0.4
Marital status		
Married[b]	1.0	...
Unmarried	2.0	1.1, 3.8
Divorced	2.3	1.2, 4.4
Widowed	1.5	0.2, 12.4
Geographical residency[c]		
Municipality of Copenhagen	1.03	1.01, 1.05
Weekly work hours[d]		
1–40[b]	1.0	...
≥41	2.0	1.1, 4.0

Note. Several logistic regression models were constructed to account for interrelations between some variables. IgM = immunoglobulin M; OR = odds ratio; CI = confidence interval.
[a]Increased levels solely of IgM antibodies to *H. pylori* (acute *H. pylori* infection).
[b]Reference category.
[c]The odds ratio is the increase in risk of acute *H. pylori* infection per each year of living in the municipality of Copenhagen.
[d]In people who were currently employed.

associated with chronic *H. pylori* infection in both age groups (i.e., those less than 50 years of age and those 50 years of age or older) (Table 3). Chronic infection among people less than 50 years of age was found more often in widowed participants than in those who were married. Education level and occupation were significantly associated with chronic *H. pylori* infection only in people 50 years of age or older.

Concomitantly increased IgG and IgM. Socioeconomic factors were assessed in logistic regression analyses in which seropositivity for concomitantly increased IgG and IgM antibody levels to *H. pylori* (n = 49) was the dependent variable. A concomitant increase of IgG and IgM antibody levels to *H. pylori* was assumed to reflect recrudescence of a dormant *H. pylori* infection or reinfection/superinfection with *H. pylori*. Final models showed a high prevalence of recrudescent *H. pylori* infection in women who reported high housing densities (OR = 12.4, 95% CI = 1.2, 129.9).

Nonresponders

Information was obtained from 64.3% (n = 626) of the nonresponders by means of a brief telephone interview. An overrepresentation of tobacco smokers (64.6% vs 58.8%; $\chi^2 = 7.49$, $df = 1$, $P = .005$) and people belonging to the lowest socioeconomic status group (33.9% vs 22.9%; $\chi^2 = 34.4$, $df = 1$, $P < .0001$) was seen in the nonresponder group (as compared with the responder group). There were no other differences between responders and nonresponders.

Discussion

In the present study, the typical person with chronic *H. pylori* infection was an unskilled worker who was employed in a physically demanding job and who had little schooling and a history of living abroad or in urban districts.

Housing facilities and educational and occupational factors are often used to assess socioeconomic status. However, the widespread use of compound socioeconomic status variables could be problematic because this method may obscure the identification of underlying determinants. Schooling, vocational training/education, occupation, and work-related energy expenditure may all be traced back to the same determinant. However, these factors remained significant in final models regarding chronic *H. pylori* infection. This suggests independent relationships with *H. pylori* infection.

The increase in risk of chronic *H. pylori* infection with decreasing socioeconomic status was modest. Hence, the rate of chronic infection was significantly increased only in people of low socioeconomic status. Underprivileged people are supported by social welfare in Denmark; thus, the impact of low socioeconomic status may be less pronounced in Denmark than in other countries. The higher proportion of nonresponders with low education levels and low socioeconomic status indicates that the seroprevalence of *H. pylori* infection found in the present study may be an underestimate of the true infection rate. Therefore, the statistical power of the associations found is weakened. There is, however, no reason to believe that there was a lower prevalence of *H. pylori* infection in nonresponders of low socioeconomic status than in responders of low socioeconomic status. If this were the case, the association found between *H. pylori* infection and socioeconomic status would be weakened or even disappear. Duration of schooling and vocational training/education may reflect socioeconomic status in childhood and adolescence. It is also possible that higher education levels lead to more knowledge of hygienic precautions, which subsequently may reduce the risk of infection.

Recently, high work-related energy expenditure was found to increase the likelihood of duodenal ulceration.[8] The present findings imply that *H. pylori* may be the agent that bridges the gap between occupational environment and gastroduodenal mucosa. Factors in the occupational environment could affect the virulence of the organism or interfere with the host's immune response to the infection.[20]

The association between housing density and chronic *H. pylori* infection became insignificant when the effect of former geographical residency was controlled. Crowded housing is more common in urban than in rural areas and could be a confounder rather than a true determinant. Nevertheless, sex-specific final models showed that chronic *H. pylori* infection was seen more often in women who reported high housing densities than in other women. Women living under crowded housing conditions are more likely to have close contact with children who may transmit the infection. The reason for the relatively weak association with chronic *H. pylori* infection may also have been that harmful housing conditions have become rare in Denmark.

H. pylori infection rates are considerably higher in developing countries than in developed countries.[21–23] Because *H. pylori* seems to be passed from person to person, the risk of becoming infected is likely to increase for people who reside in high-risk areas. This may account for the excess number of chronic *H. pylori* infections seen in this study among people who had lived abroad.

Although the relationship between chronic *H. pylori* infection and geographical residency was weak, the present data suggest that prior residency in urban areas may increase the likelihood of chronic infection. This finding is consistent with results of studies from both developed[24] and developing countries,[25,26] as well as results of studies on peptic ulcer disease.[27,28]

Studies on children have suggested that people may become infected repeatedly with different strains of *H. pylori* until they are exposed to an *H. pylori* strain that permanently inhabits the gastric mucous layer.[29] Thus, people with serological signs of acute infection in this study may eventually eliminate the bacteria. This feature could explain the discrepancies between factors found in this study to affect the rate of acute infection and factors shown to affect *H. pylori* prevalence rates in people with histology or culture-positive infections.[30] Interestingly, people who worked long hours frequently had serological signs of acute *H. pylori* infection. Some occupations probably entail a high risk of contact with people who may transmit *H. pylori*.[31,32]

In general, single people were more likely than married people to harbor an acute *H. pylori* infection. Single people may have changing partners, or they may be exposed to the infection later in life than married people.

When data were stratified according to age, marital status was associated with chronic *H. pylori* infection in those less than 50 years old, whereas education level and occupation were related to *H. pylori* infection status only in those 50 years old or older. The impact of schooling and occupation on *H. pylori* infection rates during the preceding 60 years therefore may not have been stable. A minimum of 9 years of schooling has become compulsory in Denmark within the past 40 years. Short-term schooling could thus be a better marker for childhood poverty in older than in younger participants. Likewise, the effect of semiskilled and unskilled work in older participants may reflect that people who grew up under poor social conditions 4 or 5 decades ago were less likely than those raised in affluent households to receive an education. Alternatively, people 50 years of age or older could, as a result of a cohort or period effect, carry an enhanced susceptibility to *H. pylori* infection throughout life.[33] The latter assumption is supported by the fact that the prevalence of *H. pylori* infection has declined within the past 3 decades.[34,35]

In conclusion, the predominance of people with short duration of schooling, lack of vocational training/education, semiskilled and unskilled occupations, and high work-related energy expenditure among those with chronic *H. pylori* infection could explain the previously reported association between low socioeconomic status and *H. pylori* infection. The relationship between housing density and *H. pylori* infection could reflect urban–rural differences in *H. pylori* infection rates. Long working hours, urban residency, and single marital status were associated with increased rates of acute *H. pylori* infection. □

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