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Neighborhood deprivation and warfarin, aspirin and statin prescription – a cohort study of men and women treated for atrial fibrillation in Swedish primary care

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Abstract

Background—We aimed to study differences in the prescribing of warfarin, aspirin and statins to patients with atrial fibrillation (AF) in socio-economically diverse neighborhoods. We also aimed to explore the effects of neighborhood deprivation on the relationship between CHADS2 risk score and warfarin prescription.

Methods—Data were obtained from primary health care records that contained individual clinical data that were linked to national data on neighborhood of residence and a deprivation index for different neighborhoods. Logistic regression was used to estimate the potential neighborhood differences in prescribed warfarin, aspirin and statins, and the association between the CHADS2 score and prescribed warfarin treatment, in neighborhoods with high, middle (referent) and low socio-economic (SES).

Results—After adjustment for age, socio-economic factors, co-morbidities and moves to neighborhoods with different SES during follow-up, adults with AF living in high SES

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Conflict of interest

The authors report no relationships that could be construed as a conflict of interest.

neighborhoods were more often prescribed warfarin (men Odds ratio (OR) (95%confidence interval (CI): 1.44 (1.27–1.62); and women OR (95%CI): 1.19 (1.05–1.36)) and statins (men OR (95%CI): 1.23 (1.07–1.41); women OR (95%CI): 1.23 (1.05–1.44)) compared to their counterparts residing in middle SES. Prescription of aspirin was lower men from high SES neighborhoods (OR (95%CI): 0.75 (0.65–0.86) than in those from middle SES neighborhoods. Higher CHADS2 risk scores were associated with higher warfarin prescription which remained after adjustment for neighborhood SES.

Conclusions—The apparent inequalities in pharmacotherapy seen in the present study calls for resource allocation to primary care in neighborhoods with low and middle socio-economic status.

Keywords

Atrial fibrillation; cardiovascular epidemiology; CHADS2; neighborhood; pharmacotherapy; warfarin; Sweden; Socio-economic status

Introduction

Atrial fibrillation (AF) is the most common sustained cardiac arrhythmia with a prevalence of 1%–2% in the general population [1, 2]; and its prevalence is higher in the elderly [3]. Some of the risk factors for AF include, but are not limited to: increasing age, hypertension, diabetes mellitus, myocardial infarction, valvular heart disease, heart failure, obesity, obstructive sleep apnea, cardiothoracic surgery, smoking, exercise, alcohol use, hyperthyroidism, increased pulse pressure, and family history [4]. Atrial fibrillation is an independent risk factor for stroke, resulting in a 5-fold excess risk [5]. Given the debilitating consequences of stroke [6], it is imperative to identify individuals with increased risk for stroke among patients with AF. One of the commonly used scores to estimate stroke risk in patients with AF is CHADS2 [7]. Using this score, stroke risk is evaluated based on the presence of the following risk factors: congestive heart failure, hypertension, age of 75 years or older, diabetes mellitus and a history of stroke or previous transient ischemic attacks and thromboembolism [8–11].

Warfarin is the most commonly prescribed oral anticoagulant to help prevent stroke incidence among patients with AF. Anticoagulant (predominantly warfarin) therapy has benefits over antiplatelet (mostly aspirin) therapy [12]. Furthermore, we have previously shown that the mortality is lower among patients with AF who are prescribed statins, and that warfarin therapy is associated with lower mortality than that with aspirin; however, prescribing aspirin has shown to be better than no antithrombotic therapy at all [3, 13–15]. However, despite clear guidelines and stroke preventative evidence, the likelihood of having warfarin prescribed in accordance with the guidelines has shown to be low in Sweden [16], other European countries [17], as well as in the USA [18]. The benefits of statin therapy in AF have been discussed, and no final conclusions about it have been made [19].

There is an increasing amount of empirical evidence that neighborhood variables may shape the distribution of health-related behaviors of its residents independently of individual level sociodemographic factors, including socioeconomic status (SES), e.g. education, and marital status [20]. Furthermore, the risk of coronary heart disease is higher in more deprived neighborhoods [21]. Also, it has recently been shown that neighborhood deprivation is significantly associated with AF hospitalization in women [22]. However, less is known whether neighborhood deprivation may influence pharmacotherapy in AF patients. We hypothesize that prescribed pharmacotherapy differs depending on the neighborhood SES. Therefore, the objective of our study was to explore the relationship between neighborhood SES and prescribed warfarin, aspirin and statin therapy, in men and women diagnosed with atrial fibrillation in primary care. In addition, we intended to explore whether warfarin prescription differs across CHADS2 risk scores and if that difference is explained by neighborhood SES.

Methods

Patient Data

This study was based on patient data from 75 primary health care centers (PHCCs) in the middle parts of Sweden, mainly in Stockholm County. Men and women who visited any of the 75 PHCCs between 2001 and 2008 were included in the database (*n*=1 098 420). Two different patient samples were drawn from this database: one containing all patients with an AF diagnosis from 2002 to 2008 (n=12,283), and the other listing all alive patients with an AF diagnosis from 2007 and onwards (n=4,970). We used *Extractor* software (http://www.slso.sll.se/SLPOtemplates/SLPOPage1____10400.aspx, accessed September 19, 2010), to access patient files electronically. The files were transferred by authorized personnel to Statistics Sweden, the Swedish Government-owned statistics bureau, where the patients' unique 10-digit national identification numbers were replaced with random serial numbers to ensure anonymity.

Patient data were cross-referenced to national Swedish population-based registers [23–25]. These contain individual-level information on age, gender, education and marital status of everyone residing in Sweden, including the patients in our study samples. Thus, it was possible to link clinical data from the 75 PHCCs to socio-demographic data from population registers provided to us by Statistics Sweden [26]. The data in this large dataset were organized and analyzed using SAS software (SAS, Version 9.1. Cary, NC, USA.).

Information on drugs prescribed to the AF patients was obtained from patient records and was organized according to the Anatomic Therapeutic Chemical (ATC) Classification.

The inclusion criteria for selecting patients was that they were diagnosed with AF which was defined as the presence of ICD-10 code I48 included in the 10th version of the WHO's International Classification of Diseases.

ICD-10 codes for common cardio-metabolic co-morbidities were identified in patient records. These co-morbidities were: AF-related hypertension (I10–15), coronary heart disease (CHD; I20–25), cardiac heart failure (I50 and I110), non-rheumatic valvular diseases (I34–38), cardiomyopathy (I42), cerebrovascular diseases (I60–69), peripheral embolism (I74) and diabetes mellitus (E10–14). No diagnosis of rheumatic valvular diseases (I05–08) was recorded in these patients.

Individual socio-demographic variables

Gender: Men and women.

Age: AF patients were divided into five age groups: 45–54, 55–64, 65–74, 75–84 and 85+ years. Patients under 45 years of age were excluded since they were too few for stable statistical estimates.

Educational attainment was classified into three levels: ≤9 years (compulsory schooling or less), 10–12 years (some/completed secondary school education) and >12 years (college and/or university education).

Marital status was classified as married, unmarried, divorced or widowed.

Neighborhood socio-economic status

The neighborhoods were derived from Small Area Market Statistics (SAMS). These were originally created for commercial purposes and pertain to small geographic areas with boundaries defined by homogenous types of buildings. The average population in each SAMS neighborhood is approximately 2000 people for Stockholm and 1000 people for the rest of Sweden. Socio-economic status (SES) of these areas was classified as high, middle or low, based on a neighborhood deprivation index [22]. This index was derived from the following four variables: low educational status (<10 years of formal education), low income (<50% of the median individual income from all sources), unemployment and receipt of social welfare. The neighborhood deprivation index was categorized into three groups: more than one standard deviation (SD) below the mean (high SES or low deprivation level), more than one SD above the mean (low SES or high deprivation level), and within one SD of the mean (middle SES or moderate deprivation level).

CHADS2 Score

A CHADS2 is a tool for assessing the risk of stroke in AF patients [7]. A high CHADS2 scores correspond to a higher risk of stroke. Well known risk factors for stroke in patients with AF are congestive heart failure, hypertension, age >75 years, diabetes, previous stroke and transient ischemic attack [8–11]. Each factor is given one point, except for stroke, which is given two points. CHADS2 scores range from 0–6, with a score of 0 indicating that none of the above factors are present. AF patients with a score of 0 should not be treated with warfarin as the risk of severe bleeding is higher than the risk of stroke. Intermediate stroke risk is classified by a score of 1. In most patients with a CHADS2 score of 2 or more, the benefits of warfarin therapy will outweigh the risk of bleeding. The association between CHADS2 score and survival after stroke in AF patients was previously analyzed by using ICD-codes in the Swedish Hospital Discharge Register [27]. In the present study, we used the same method to calculate the CHADS2 score of each AF patient in primary care.

Statistical analysis

Data were presented as mean and standard deviation if continuous and as counts and percentages if categorical. Logistic regression models were used to explore the relationship between neighborhood SES and warfarin, aspirin and statin prescription in primary care.

The following models were created: 1) Model A: neighborhood SES (unadjusted); 2) Model B: Model A and age-group, educational level and marital status; 3) Model C: Model B and comorbidities (hypertension, diabetes mellitus, coronary heart disease, congestive heart failure and cerebrovascular disease) and, when applicable, an interaction term between age-group and diagnosis; and 4) Model D: Model C and change of neighborhood socio-economic score during the follow-up.

Logistic regression models were also used to explore the relationship between CHADS2 risk score and warfarin prescription and whether this relationship is influenced by neighborhood SES. The following models were created: 1) Model A: CHADS2 risk score with no confounders; 2) Model B: Model A and age-group, educational level and marital status; 3) Model C: Model B and neighborhood SES and change of neighborhood socio-economic status during follow-up.

The two-sided significance level was set to 0.05.

Ethical considerations

Ethical approvals were obtained from regional boards at Karolinska Institutet and the Lund University.

Results

Patient characteristics at the beginning of the follow-up and from 2007 and onwards are presented in Table 1. Women were on average older than men. More men than women were married (66% vs 40%) and more women with AF were widowed. More than 40% of adults resided in middle SES neighborhoods (46% of men and 49% of women 49%), followed by high SES (men 40% and women 35%) and low SES neighborhoods (14% of men and 16% of women) at the beginning of the follow-up. Warfarin was prescribed to 56% of the men and 48% of the women; ASA was prescribed to 30% of the men and 38% of the women; and statins were prescribed to 30% of the men and 25% of the women at the beginning of the follow-up.

The majority of individuals (61%) did not change their place of residence between baseline and follow-up. However, some moved from higher to lower SES neighborhoods (men: 28.0%; women: 27.8%), while others moved from lower to higher SES neighborhoods (men: 10.7%; women: 11.1%).

The relationship between neighborhood SES and prescription of warfarin, ASA and statins is presented in Table 2. The odds of prescribing warfarin were higher among men and women living in high SES neighborhoods compared to their counterparts residing in low SES neighborhoods (men: OR = 1.44 (95% CI 1.27–1.63); women: OR = 1.19 (95% CI 1.05–1.36). These findings were independent of individual socio-demographic characteristics, presence of comorbid conditions and change of neighborhood SES between baseline and follow-up. After adjustment for covariates, the odds of warfarin prescription were lower among women from low SES neighborhoods compared to those from middle SES neighborhoods (OR = 0.81, 95% CI = 0.68–0.9)). In the unadjusted model, men from low SES neighborhoods were less likely to be prescribed warfarin compared to men from middle SES neighborhoods (OR = 0.86, 95% CI = 0.75–1.00). However, this relationship was partly explained by individual socio-demographic characteristics.

In women, prescription of ASA did not differ across neighborhood SES. Among men, after adjusting for covariates, those from high SES were less likely to be prescribed ASA compared to their counterparts who resided in middle SES neighborhoods (OR = 0.75, 95% CI = 0.65–0.86). However, no statistically significant difference in aspirin prescription was observed between men living in middle SES neighborhoods and those residing in low SES neighborhoods. Furthermore, the odds of statin prescription in both men and women from high SES neighborhoods were 1.23 times higher than those of men and women from middle SES neighborhoods (men: OR = 1.23, 95%CI = 1.07–1.41; women: OR = 1.23, 95% CI = 1.05–1.44). This relationship was independent of the confounders. No difference in statin prescription was observed between women living in middle and low SES neighborhoods. In contrast, after adjusting for covariates, the odds of statins prescription was lower in men from low SES neighborhoods compared to their counterparts living in middle SES neighborhoods (OR = 0.70, 95% CI = 0.57–0.86).

The odds of having warfarin prescribed according to CHADS2 with adjustments for neighborhood SES are shown in Table 3. According to the guidelines, the odds of being prescribed warfarin were higher in individuals with high CHADS2 scores in models adjusted for age, educational level and marital status, and remained essentially unaltered when the models were adjusted for neighborhood SES. In both men and women, the odds of warfarin prescription increased with higher CHADS2 scores. After taking into consideration CHADS2 and individual socio-demographic characteristics, the odds of being prescribed warfarin were higher in both men and women living in high SES neighborhoods compared to their counterparts residing in middle SES neighborhoods (men: OR =1.42, 95% CI = 1.26–1.60; women: OR = 1.20, 95%CI = 1.05–1.38. In the fully adjusted model,, the odds of being prescribed warfarin were lower among women, but not in men, from low SES neighborhoods compared to their counterparts living in middle SES neighborhoods (OR = 0.82, 95 % CI 0.68–0.98).

Discussion

The main finding of the present study was that high SES of the neighborhood is associated with more favorable pharmacotherapy, with higher prescription rates of warfarin and statins in patients with atrial fibrillation, and less favorable pharmacotherapy, with higher prescription rates of aspirin, in low SES neighborhoods. Moreover, men in high socio-economic neighborhoods were less likely to be prescribed aspirin, whereas no significant association between aspirin prescription and neighborhood SES were seen in women.

The differences in pharmacotherapy between high, middle and low SES neighborhoods were in general more salient when the statistical models were adjusted for age, marital status, relevant co-morbidities, and change of neighborhood SES during the follow-up period.

Comparisons with other studies

The present findings are alarming, considering the socioeconomic divide in health [20], and the higher risk of cardiovascular disease in neighborhoods with low SES [21]. For example, in patients admitted for acute stroke in Ontario, it was shown that every 10 000 $ increase in median neighborhood income was associated with a 9% decreased risk of 30-day mortality [28]. Furthermore, with regards to pharmacotherapy, previous studies have shown that individuals from low SES regions, when seeking care at the emergency department, were less likely to receive opioid treatment for the same level of pain as compared to individuals from wealthier regions in the US [29]. Furthermore, lower odds of having statins prescribed after myocardial infarction has also been shown in low SES neighborhoods in the USA [30]. This study extends the findings from the literature by reporting the relationship between neighborhood SES and pharmacotherapy in patients diagnosed with AF. Furthermore, we have previously shown that warfarin treatment was not associated with the stroke risk based on CHADS2 scores in primary care patients in 2002 and in 2007 [16]. The novel contribution of this study is the inclusion of neighborhood socioeconomic characteristics.

Potential explanations to the neighborhood SES divide in pharmacotherapy

Sweden has universal access to health care, including primary care and there is a discounted fee for primary care doctor visits, normally 150 SEK, and a total maximum fee of 900 SEK per year (about 90 euros or 100 USD), after which all healthcare is free of charge. Individuals in neighborhoods with low socio-economic status, despite the relatively low annual fee, are however likely to have small financial margins [31], and may refrain from seeking healthcare because of the cost. Men who refrained from health care because of the costs have been shown to more often have uncontrolled diagnosed hypertension [32], and it is possible that similar group of individuals are more common in neighborhoods with low SES, and have fewer recommended pharmacotherapies prescribed when diagnosed with AF. Aspirin is not considered to be effective in preventing stroke in high risk groups, such as patients with AF [12]. The low prescription rates of aspirin in high SES neighborhoods in men in the present study may be seen as a validation of the high prescription rates of warfarin in high SES neighborhoods. Low dose aspirin is available without prescription in many countries, but not in Sweden, so non-prescription use of aspirin is not a likely explanation to our findings.

Low awareness of guidelines and benefits of certain pharmacotherapies, as well as hesitance to treat according to guidelines by the doctors in low socio-economic neighborhoods may be more common [33], as it is possible that individuals in high socio-economic neighborhoods may be more prone to be informed as patients.

Finally, it is possible that “medication deserts”, areas with low access to pharmacies may explain some of our findings. It has been shown that pharmacies in low SES neighborhoods had more limited stock and hours of operation than those in neighborhoods with high SES [34].

Clinical implications

The results of the present study are in line with our initial hypotheses and expand prejudgemental claims in the popular culture about rich and poor individuals, such as in the song “Everybody knows” by Leonard Cohen: “The poor stay poor, the rich get rich - That's how it goes - Everybody knows”, to wealthy and deprived neighborhoods, in this case access to optimal pharmacotherapy to prevent stroke and early mortality in patients with AF. The highest clinical benefit with warfarin treatment is seen in elderly AF patients, with the highest risk of stroke [11]. Warfarin is generally considered to be under-prescribed in AF patients [35], and was prescribed in about half of the patients AF patients in the present study, which is in line with what is common in other Western countries [17]. The findings of the present study can possibly be extrapolated to pharmacotherapies in other patient groups as well, such as those with hypertension and dyslipidemia [32, 36], although this was not the scope of the present study. In fact, some of our results were more salient after adjustments for co-morbidities. Statins are widely recommended in patients with coronary heart disease and diabetes [37], and accounting for these and other relevant co-morbidities increased the differences between neighborhood socio-economic groups.

Limitations and strengths

This study has some limitations. We only had data on prescriptions in primary health care, while AF patients may have been prescribed relevant pharmacotherapy at hospitals. In addition, data on all diagnoses may not be complete in all patients, though information about diagnoses of clinically important diseases such as cardiovascular disease and diabetes would most likely be present in the patient records and therefore included in our data set. We lacked clinical data on liver function, history of anemia, co-morbidities requiring surgery, and history of major bleedings, which all influence warfarin therapy decisions. We did not use the currently used CHA2DS2-Vasc score on when to prevent stroke in AF patients [38, 39], that could have yielded different results. However, we chose to use CHADS2 in the present study as it was the recommended guideline in Sweden during the defined follow-up period. One of the key strengths of this study was that we were able to link clinical data from individual patients to >99% complete national socio-demographic data. Furthermore, clinical data were also highly complete as less than 2% of the total number of diagnoses were missing in the primary health care center records [40]. The comprehensive nature of our data made it possible to analyze data for men and women across all socioeconomic backgrounds and marital status groups. Finally, a major strength of this study was its use of primary health care data, which may reflect AF in the population better than hospital data, as hospital data may be biased toward more severe cases, younger patients with AF, and other types of selection biases.

Conclusions

Individuals residing in low SES neighborhoods are more often inadequately treated and receive less warfarin according to treatment recommendations for AF, and possibly also for other cardiovascular diseases, as indicated by our results for statins. To address socioeconomic inequalities in pharmacotherapy in AF patients, more efforts and resources should be allocated to in primary care in deprived neighborhoods.

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Table 1

Data on subjects aged 45+ years with a diagnosis of atrial fibrillation in primary care from 1 January 2001 to 31 December 2007

	All years (*N*=12,283)		Alive 31 Dec 2007 (N=4,970)	
	Men ***n*=6,646**	**Women** ***n*=5,637**	**Men** ***n*=2,741**	**Women** ***n*=2,229**
Age (years), mean (SD)	72.1 (10.2)	77.1 (9.3)	74.2 (9.9)	79.1 (8.8)
Age group (years)				
	n (%)	*n (%)*	*n (%)*	*n (%)*
45–54	370 (5.6)	105 (1.9)	93 (3.4)	16 (0.7)
55–64	1,222 (18.4)	521 (9.2)	414 (15.1)	157 (7.0)
65–74	2,042 (30.7)	1,266 (22.5)	771 (28.1)	421 (18.9)
75–84	2,340 (35.2)	2,534 (45.0)	1,032 (37.7)	974 (43.7)
85+	672 (10.1)	1,211 (21.5)	431 (15.7)	661 (29.7)
Neighborhood SES				
High	2,656 (40.0)	1,948 (34.6)	1,118 (40.8)	816 (36.6)
Middle	3,030 (45.6)	2,777 (49.3)	1,250 (45.6)	1,056 (46.4)
Low	960 (14.4)	912 (16.2)	373 (13.6)	357 (16.0)
Marital status				
Married	4,293 (66.0)	2,215 (39.6)	1,682 (61.4)	712 (31.9)
Unmarried	119 (9.0)	400 (7.2)	259 (9.5)	144 (6.5)
Divorced	991 (15.0)	786 (14.1)	424 (15.5)	338 (15.2)
Widowed	658 (10.0)	2,189 (39.2)	373 (13.6)	1035 (46.4)
Educational level				
Compulsory school	2,486 (39.5)	2,599 (52.5)	1,009 (38.3)	1027 (50.1)
Secondary school	2,367 (37.6)	1,628 (32.9)	1,008 (38.3)	710 (34.7)
College/university	1,437 (22.9)	724 (14.6)	617 (23.4)	312 (15.2)
AF-related disease				
Hypertension	2,768 (41.7)	2,758 (48.9)	1,258 (45.9)	1,211 (54.3)
Coronary heart disease	1,333 (20.1)	1,172 (20.8)	562 (20.5)	475 (21.3)
Heart failure	1,150 (17.3)	1,444 (20.3)	445 (16.2)	449 (20.1)
Valvular disease	294 (4.4)	277 (4.9)	82 (3.0)	70 (3.1)
Cardiomyopathy	60 (0.9)	30 (0.5)	13 (0.5)	7 (0.3)
Cerebrovascular disease	538 (8.1)	453 (8.0)	221 (8.1)	173 (7.8)
Intracranial bleeding	37 (0.6)	15 (0.3)	11 (0.4)	5 (0.2)
Peripheral embolism	21 (0.3)	29 (0.5)	9 (0.3)	14 (0.6)
Diabetes mellitus	1,294 (19.5)	1,072 (19.0)	582 (21.2)	437 (19.6)
Drugs				
Warfarin	3,716 (55.9)	2,691 (47.7)	1,738 (63.4)	1,278 (57.3)
Aspirin	1,962 (29.5)	2,116 (37.5)	728 (26.6)	719 (32.3)
Statins	1,964 (30.0)	1,430 (25.4)	727 (27.3)	476 (21.4)

Table 2

Logistic regression for drug prescriptions, i.e. warfarin, ASA and statins, for subjects aged 45+ years (N=12,283) with a diagnosis of atrial fibrillation in primary care, by neighborhood socio-economic groups (high, middle, low)

	Men (n=6,646)				Women (n=5,637)			
	Model A	**Model B**	**Model C**	**Model D**	**Model A**	**Model B**	**Model C**	**Model D**
Warfarin								
High	**1.40 (1.26–1.55)**	**1.41 (1.26–1.58)**	**1.44 (1.28–1.62)**	**1.44 (1.27–1.62)**	**1.19 (1.06–1.33)**	**1.20 (1.05–1.36)**	**1.20 (1.05–1.36)**	**1.19 (1.05–1.36)**
Middle	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)
Low	**0.86 (0.75–1.00)**	0.88 (0.75–1.02)	0.86 (0.74–1.00)	0.87 (0.73–1.03)	**0.85 (0.73–0.99)**	**0.82 (0.69–0.96)**	**0.79 (0.67–0.94)**	**0.81 (0.68–0.98)**
Aspirin								
High	**0.72 (0.64–0.81)**	**0.74 (0.65–0.84)**	**0.74 (0.65–0.84)**	**0.75 (0.65–0.86)**	0.91 (0.81–1.03)	0.94 (0.82–1.08)	0.95 (0.83–1.09)	0.97 (0.84–1.12)
Middle	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)
Low	1.02 (0.87–1.19)	1.02 (0.86–1.21)	1.01 (0.85–1.20)	0.99 (0.82–1.20)	1.09 (0.94–1.27)	1.16 (0.97–1.38)	1.14 (0.96–1.36)	1.11 (0.91–1.34)
Statins								
High	1.11 (0.99–1.25)	1.12 (0.99–1.26)	**1.22 (1.07–1.39)**	**1.23 (1.07–1.41)**	**1.14 (1.00–1.30)**	1.12 (0.97–1.29)	**1.21 (1.04–1.41)**	**1.23 (1.05–1.44)**
Middle	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)
Low	0.87 (0.74–1.02)	**0.83 (0.70–0.98)**	**0.74 (0.61–0.89)**	**0.70 (0.57–0.86)**	0.98 (0.82–1.16)	0.96 (0.80–1.16)	0.86 (0.70–1.05)	0.85 (0.68–1.05)

Model A Unadjusted; Model B as Model A but also includes age-group, educational level and marital status; Model C as Model B co-morbidities of interest (hypertension, diabetes mellitus, coronary heart disease, congestive heart failure and cerebro-vascular disease, and multiplicative interaction terms between age-group and diagnoses); Model D as Model C but also includes change of neighborhood socio-economic score during follow-up. Data are presented as odds ratios and (95% confidence intervals).

Table 3

Logistic regression models of CHADS2 (dived into scores 0, 1 and 2–6) using prescription of warfarin treatment as the dependent variable, for subjects aged 45+ years (*N*=12,283) with a diagnosis of atrial fibrillation in primary care, by neighborhood socio-economic groups (high, middle, low)

	Men			Women		
	Model A	**Model B**	**Model C**	**Model A**	**Model B**	**Model C**
CHADS-2 score						
0	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)
1	1.07 (0.94–1.22)	**1.50 (1.29–1.74)**	**1.51 (1.30–1.75)**	0.93 (0.78–1.11)	**1.49 (1.21–1.82)**	**1.52 (1.24–1.87)**
2–6	1.13 (1.00–1.29)	**1.98 (1.68–2.32)**	**2.02 (1.72–2.37)**	0.93 (0.79–1.10)	**1.81 (1.46–2.24)**	**1.87 (1.51–2.32)**
Neighborhood level						
High	-	-	**1.42 (1.26–1.60)**	-	-	**1.20 (1.05–1.38)**
Middle	-	-	1 (ref)	-	-	1 (ref)
Low	-	-	0.87 (0.73–1.04)	-	-	**0.82 (0.68–0.98)**

Model A was unadjusted; Model B was adjusted for age-group, educational level and marital status; Model C was as model B, and also neighborhood socio-economic groups and change of neighborhood socio-economic status during follow-up. Data are presented as odds ratios and (95% confidence intervals).