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# Technical document for sub-national English atrial fibrillation prevalence estimates:

## Application of Age-sex rates in a Swedish region to the English population

# About Public Health England

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## Executive Summary

The estimates were developed using age-sex specific prevalence rates determined from a study in a town in northern Sweden[1]. This is a study based upon a well-defined population of 76,000 people living in Skellefteå as of December 31st 2010. The Skellefteå study reports granular age-sex specific prevalence rates of AF in that population. The aggregated age-specific estimates are compared to observed prevalence reported in the Quality and Outcomes Framework. This permits comparison between the number of cases reported by GP practices and the likely undiagnosed prevalence. The method assumes that the population and risk factor profiles (and thus prevalence of atrial fibrillation) within the Skellefteå study mirror those of GP and clinical commissioning groups in England.

AF estimates have been produced at general practice (GP) level and clinical commissioning group (CCG). The estimates are available to download at:

https://www.gov.uk/government/publications/atrial-fibrillation-prevalence-estimates-for-local-populations.

## Introduction

The atrial fibrillation (AF) prevalence estimates provide estimates of expected AF for all people in England, for Clinical Commissioning Groups and General Practices.

AF is a heart condition and is the most common form of cardiac arrhythmia. AF is associated with increased risk of stroke as well as reduced cardiac performance and early mortality. Stroke patients with uncontrolled AF are more likely to be diagnosed with severe stroke which can lead to poorer outcomes. AF is often asymptomatic, frequently unrecognised and consequently it is difficult to quantify the true prevalence in the general population.

When developing sub-national prevalence models for areas in England, it is often common practice to use nationally representative health surveys, which are used to model estimates to smaller areas using a variety of statistical techniques. National health surveys have the benefit of being representative of larger areas allowing the results to be scaled to different populations, both locally and nationally. Currently there is no provision, or plans for the measurement of AF within the Health Survey for England (HSE), nor are there any current national scale surveys that attempt to measure AF. This means an estimation approach based on a national survey to model sub-national prevalence estimates is not currently possible for AF.

[1] Norberg *et al* . Estimating the prevalence of atrial fibrillation in a general population using validated electronic health data. *Clin Epidemiol.* 2013: **5**: 475-481.

## Previous AF prevalence estimates

Previous attempts at estimating the prevalence of AF in the UK have been largely based upon defined prospective cohort studies. Three notable studies had differing aims and objectives in the detection of AF.

The ECHOES[2] (Echocardiographic Heart of England Screening) study was established primarily to identify the prevalence of heart failure and also the occurrence of left-ventricular dysfunction. It was a large study that covered 16 general practices in England and designed to be reflective of the socio-economic and geographical fabric of England. The study was conducted between March 1995 to February 1999, and the results may be indicative of the period.

The SAFE[3] study attempted to assess the cost effectiveness of systematic screening versus the routine practice in the detection of AF in people aged 65 and over. This was carried out in 50 general practices in the West Midlands, UK. The West Midlands is a diverse geographic area which is broadly reflective of England, however, it is made up of diverse ethnic groups and is characterised by high levels of deprivation in proportions that are not wholly reflective of England.

Perhaps the most relevant study of AF in a British general population is the Renfrew/Paisley Study[4]. This study attempted to describe the pattern of risk factors, behaviours and prevalence of a number of cardiovascular diseases. This had a narrow age band of 45-64 and although the 80% response rate was good, the population could not be described as being reflective of England. The cohort was drawn from an urban area with high levels of deprivation as well as higher proportions of smoking, angina, breathlessness and chronic bronchitis. Not only is the study not generalizable to other parts of England and the UK, it is now quite out-of-date.

While there have been some attempts to measure the prevalence of AF, these have either been small-scale cohorts, studies with limited range or are no longer applicable to a wider general population. There are currently no whole population coverage estimates of AF prevalence in England.

There are a number of studies that estimate prevalence in other countries, notably the Rotterdam Study[5] and the Framingham Study[6], although these studies tend to focus on AF in those aged 45 and above. While this is the age group in which the main burden of AF falls, they do fail to identify the cases and prevalence of AF in younger age groups. The most recent

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[2] Davis *et al*. Prevalence of atrial fibrillation in the general population and in high-risk groups: the ECHOES study. *Europace* 2012: **14**:15531559.
[3] Hobbs *et al*. A randomised controlled trial and cost-effectiveness study of systematic screening (targeted md total population screening) versus routine practice for the detection of atrial fibrillation in people aged 65 and over: The SAFE study. *Health Technol Assess* 2005: **9**:1-74.
[4] Stewart *et* al. Population prevalence, incidence, and predictors of atrial fibrillation in the Renfrew/Paisley study. *Heart* 2001:**86**:516-521.
[5] Heeringa *et al*. Prevalence, incidence and lifetime risk of atrial fibrillation: The Rotterdam study. *Eur Heart J* 2006: **27**:949-953.
[6] Benjamin *et al* . Independent Risk Factors for Atrial Fibrillation in a Population-Based Cohort: The Framingham Heart Study. *JAMA* 1994; **271**:840-844.

estimates of AF prevalence, used validated electronic health care data and presented age and sex stratified prevalence, including those aged below 45 and were published based upon Skellefteå, a region in Northern Sweden[7].

Reported AF prevalence varies between studies and varies between age group. For instance, the Rotterdam study estimated prevalence between 5.1 and 6.0%, whereas the ECHOES study reported prevalence between 1.6 and 2.4%. Prevalence has been reported between these estimates including 1.9 to 4.6%[8], and examples of much lower reported AF prevalence of between 0.6 to 0.8%[9] and 0.8 to 1.0%[10]. Norberg *et al* report AF prevalence in their study of 3.4% in men and 2.6% in women. Currently for England, the only reported prevalence of AF is through the Quality and Outcomes Framework which reports overall diagnosed AF prevalence of 1.6%[11].

There are a number of risk factors likely to increase the likelihood of a person developing AF, these include, age[12,9,8] ethnicity[13,14] diabetes[15,12], hypertension[16,12], obesity[17] and congestive heart failure [12]. While several studies point to increased risk of AF with a number of risk factors, the main risks appear to be ageing, being male and being Caucasian. With the exception of ethnicity, the estimates presented here attempt to take into account the biggest predictors of AF.

Differences in reported prevalence can be a result of differences in age distributions of populations; bias in population sample, the method in diagnosing AF or the efforts studies have gone to in order to verify the presence of previously diagnosed AF in a patient. Similarly, if the reported prevalence relies only on diagnosed cases (as is the case for QOF), then differences will exist between these figures and those that are reported with increased case finding. The time period of any study into AF is likely to have an impact on the reported AF, with AF prevalence having increased over time. Studies that report AF prevalence from several

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[7] Norberg *et al* . Estimating the prevalence of atrial fibrillation in a general population using validated electronic health data. *Clin Epidemiol.* 2013: **5**: 475-481.
[8] Schnabel *et al*. Atrial Fibrillation: Its Prevalence and Risk Factor Profile in the German General Population. *Dtsch Arztebl Int* 2012: **109**:293-299.
[9] Stewart *et* al. Population prevalence, incidence, and predictors of atrial fibrillation in the Renfrew/Paisley study. Heart 2001: **86**:516-521.
[10] Go *et al*. Prevalence of Diagnosed Atrial Fibrillation in Adults: National Implications for Rhythm Management and Stroke Prevention: the AnTicoagulation and Risk Factors in Atrial Fibrillation (ATRIA) Study. *JAMA* 2001: **285**:2370-2375.
[11] Quality and Outcomes Framework (QOF) – Prevalence, Achievements and Exceptions Report, England 2015-16 [Accessed 10/02/2017: www.content.digital.nhs.uk/catalogue/PUB22266/qof-1516-rep-v2.pdf]
[12] Benjamin *et al* . Independent Risk Factors for Atrial Fibrillation in a Population-Based Cohort: The Framingham Heart Study. *JAMA* 1994; **271**:840-844.
[13] Davis *et* al. Prevalence of atrial fibrillation in the general population and in high-risk groups: the ECHOES study. *Europace* 2012: **14**:15531559.
[14] Shen *et al* . Racial/ethnic differences in the prevalence of atrial fibrillation among older adults - a cross sectional study. *J.Natl Med. Assoc* 2010: **102**:906-913.
[15] Dublin *et al*. Diabetes Mellitus, Glycemic Control, and Risk of Atrial Fibrillation. *J Gen Intern Med* 2010: **25**:853-858.
[16] Schoonderwoerd *et al*. New risk factors for atrial fibrillation: causes of 'not-so-lone atrial fibrillation'. *Europace* 2008: **10**: 668-673.
[17] Watanabe *et al*. Metabolic syndrome and risk of development of atrial fibrillation: the Niigata preventive medicine study. *Circulation* 2008: **117**:1255-1260.

decades ago are likely to be underestimated when compared with current prevalence. The large study from Sweden is contemporaneous and thus likely to be most representative of current patterns of prevalence in a Western population.

## Data sources

General practice populations and QOF reported AF prevalence were obtained from NHS Digital. Age-sex specific prevalence rates of AF in 2010 were obtained from the work of Norbeg *et al*[18].

## Statistical analysis

To compare reported AF prevalence in QOF to those that would be estimated by applying age-sex specific prevalence rates from the Skellefteå study, General Practice list sizes were obtained from NHS Digital[19]. These populations were obtained in 5-year age bands which were then aggregated into the age groups as listed in Table 1. Age-sex specific prevalence rates were applied to each GP practice population before aggregation to GP practice and then Clinical Commissioning Group areas. This method mirrors the process undertaken to derive overall QOF crude prevalence rates.

## Table 1: Age distribution and age-specific rates of AF in reference population[18]

| Age group | Male | | | Female | | |
|---|---|---|---|---|---|---|
| (years) | Population (n) | AF (n) | Prevalence (%) | Population (n) | AF (n) | Prevalence (%) |
| 0-19 | 8,894 | 0 | 0 | 8,394 | 0 | 0 |
| 20-29 | 4,389 | 4 | 0.1 | 3,804 | 0 | 0 |
| 30-39 | 4,445 | 15 | 0.3 | 4,076 | 4 | 0.1 |
| 40-44 | 2,502 | 26 | 1.0 | 2,360 | 1 | 0 |
| 45-49 | 2,483 | 22 | 0.9 | 2,417 | 4 | 0.2 |
| 50-54 | 2,575 | 53 | 2.1 | 2,575 | 10 | 0.4 |
| 55-59 | 2,710 | 86 | 3.2 | 2,549 | 17 | 0.7 |
| 60-64 | 2,736 | 115 | 4.2 | 2,596 | 43 | 1.7 |
| 65-69 | 2,383 | 164 | 6.9 | 2,450 | 83 | 3.4 |
| 70-74 | 1,874 | 212 | 11.3 | 1,957 | 112 | 5.7 |
| 75-79 | 1,405 | 228 | 16.2 | 1,797 | 183 | 10.2 |
| 80-84 | 1,015 | 206 | 20.3 | 1,478 | 231 | 15.6 |
| 85-89 | 549 | 126 | 23.0 | 924 | 180 | 19.5 |
| 90-94 | 157 | 44 | 28.0 | 355 | 86 | 24.2 |
| 95-99 | 24 | 4 | 16.7 | 67 | 14 | 20.9 |
| 100+ | 1 | 0 | 0 | 4 | 1 | 25.0 |
| All | 38,142 | 1,305 | 3.4 | 37,803 | 969 | 2.6 |

[18] Norberg *et al*. Estimating the prevalence of atrial fibrillation in a general population using validated electronic health data. *Clin Epidemiol.* 2013: **5**: 475-481.
[19] NHS Digital: Number of Patients Registered at a GP practice – Oct 2016. [Accessed 10/02/2017: http://www.content.digital.nhs.uk/catalogue/PUB22008/gp-reg-patients-prac-quin-age.csv].

In order to compare the estimated prevalence to the observed prevalence, QOF data from the NHS Digital were obtained for each GP practice and combined with the estimated rates. Data were only used for GP practices that were present in both the QOF register and the population estimates from NHS Digital. Further data cleaning involved the removal of any GP practice where the population list size was <800. This is the same exclusion criterion used in the production of PHE's General Practice Profiles. A further justification of this approach is that we would anticipate the robustness of the method to decrease with smaller population sizes.

All data manipulation and analysis was undertaken using Stata (StataCorp. 2015. *Stata Statistical Software: Release 14.1*. College Station, TX: StataCorp LP).

## Limitations

1. The method assumes the Skellefteå region accurately reflects both behavioural and fixed risk factors for AF within England small area local populations factors found in England.
2. Estimates reported are based on a fixed age-sex distribution of AF as per the reference population. Some populations may be atypical of the reference population where the underlying AF prevalence may be higher or lower than that estimated.
3. The population from the reference group is likely to be predominantly Caucasian. This ethnic group has been shown to have higher prevalence of AF compared to other groups. Therefore application of these rates in areas in England where there is a much more diverse population may overestimate the actual prevalence of AF.
4. There are other risk factors for an individual developing AF, such as diabetes and hypertension. Due to the lack of data collected on risk factors in relation to AF as an outcome, the estimates are not able to adjust for these risk factors in the local population.
5. No range of variation has been produced with the point estimates and no sensitivity estimates have been created at this current time.
6. These are estimates, and without verified baseline data, it is difficult to understand how close to the truth these estimates are.
7. QOF data are not broken down by age, making a comparison between age-groups and different data sources (and thus a tool for increased case finding) impossible.

## Contact:

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