

# Tinnitus in middle-age: prevalence and incidence

BY MARK EDMONDSON-JONES AND DEBORAH HALL

Population-based studies of tinnitus provide crucial underpinning evidence which highlights the need for further research on the effective diagnosis and clinical management of this heterogenous condition. Furthermore, such studies provide evidence of the burden of this condition both on the general population but also on the provision of healthcare services.

Prevalence estimates of tinnitus in the general population provide a snapshot of the proportion of people experiencing the condition at any single point in time. In contrast, estimates of incidence tell us about the risk of developing tinnitus over a period of time by considering new cases over a defined time period. As such prevalence and incidence provide two complementary viewpoints of a condition's scale, both of which are important to policy-makers as well as providing contextual information for clinicians and researchers.

A number of studies have investigated the prevalence of tinnitus by sampling individuals from a specified population and then assessing their experience, if any, of tinnitus symptoms. Estimates of

prevalence vary significantly between studies many of which measure tinnitus according to differing criteria. The National Study of Hearing (NSH) [1] was a large survey which asked whether participants experienced prolonged spontaneous tinnitus (PST), defined as lasting at least five minutes and not being triggered only by loud noises. This study reported rates of PST of 9.8% for ages 41-50 increasing to 16.0% for ages 61-70.

More recently the UK Biobank project [2] has gathered hearing data on over 160,000 middle-aged participants (aged 40-69) within the UK recruited between 2006 and 2010. Data from this study have been analysed [3] and the prevalence of tinnitus, and troublesome tinnitus, reported. This study found the prevalence of tinnitus to be somewhat

higher than the earlier NSH increasing from 12.3% (males) / 9.5% (females) at age 40-44 to 26.4% (males) / 19.3% (females) at age 65-69 (see Figure 1).

The breadth of the UK Biobank assessment makes this a powerful resource for research relating to health conditions including some relating to hearing. We have investigated associations between tinnitus and personality [3] and diet [4]. The former study revealed that having allowed for known confounders of age, sex, deprivation and hearing difficulty both current and bothersome tinnitus were strongly associated with various characteristics linked with the personality trait of neuroticism according to the Eysenck Personality Inventory. Meanwhile, the latter study identified modest, but significant,

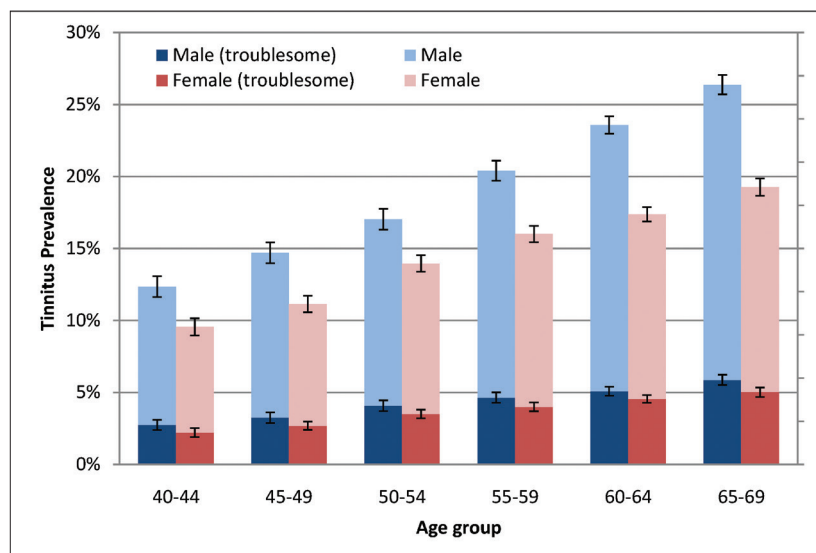


Figure 1: Prevalence estimates of self-reported current tinnitus (light shading) and current bothersome tinnitus (dark shading) among males (blue) and females (red) with 95% confidence intervals

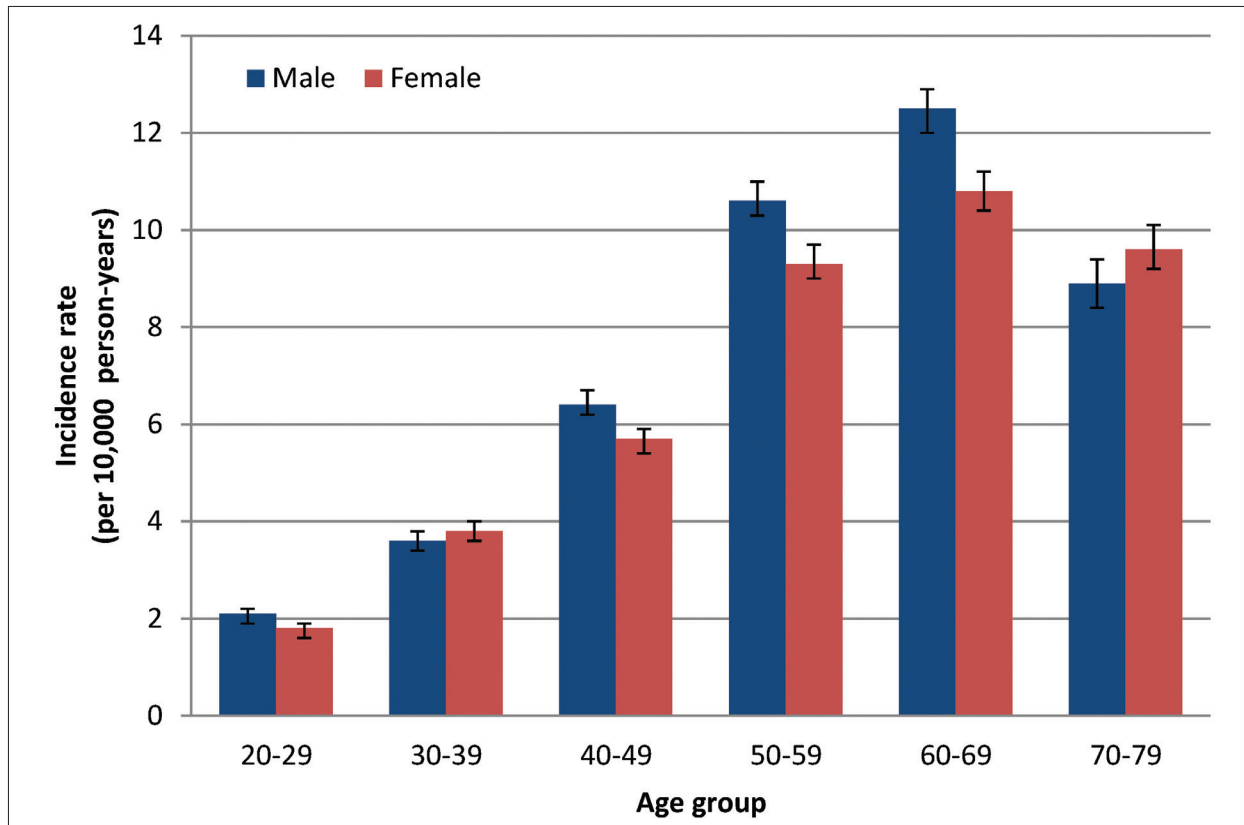


Figure 2: Incidence estimates of clinically significant tinnitus (per 10,000 person-years) among males (blue) and females (red) with 95% confidence intervals.

associations between intake of various foodstuffs and transient, persistent and bothersome tinnitus. In particular we noted that increased consumption of fruit and vegetables, consumption of certain (wholemeal/ wholegrain and 'other') bread types and dairy avoidance were associated with increased risk of persistent tinnitus, while fish consumption (both oily and non-oily), egg avoidance and increased caffeinated coffee consumption were associated with reduced risk of persistent tinnitus. While this association may not be the consequence of a directly causal mechanism it is hoped that it will inform clinicians' view of the complex interaction between lifestyle factors and tinnitus, and that it will help direct further research in this area.

Two prospective cohort studies have so far assessed the long-term incidence of tinnitus in the general population; one in the USA [5] and one in Australia [6]. While previous research goes some way towards addressing the incidence of self-reported tinnitus in the general population, it does not tell us about the impact and burden of chronic tinnitus for the health care system.

The National Health Service in England is one of the world leading

custodians of anonymised patient records relevant to primary care and hospital settings. In collaboration with epidemiologists in Germany, we recently published a study [7] in which we accessed these records over a 10-year period (2002 to 2011) to investigate the incidence of clinically significant tinnitus. This identified people who attended a GP appointment about their tinnitus and were referred to otorhinolaryngology or other relevant specialist or underwent a specific procedure on the ear within 28 days of the GP visit. The cumulative incidence indicated that one person out of every 171 was likely to have experienced clinically significant tinnitus across the 10-year period of the study. More specifically for middle-aged people (40-69 years), we identified almost 170,000 new cases of clinically significant tinnitus across the 10-year period. Overall, the incidence rate increased steadily across middle-age (see Figure 2), with the highest incidence observed in men and women aged 60 to 69. These age-specific trends mirror the same patterns reported elsewhere. In our own data from the UK Biobank for example, we saw a steadily growing prevalence with age across the 40 to 69 year old sample studied.

Independently of any increase in the prevalence of self-reported tinnitus we may be witnessing an increase in help-seeking for chronic conditions such as tinnitus. People nowadays have higher health expectations than they did several generations ago and so tinnitus presents a substantial and growing burden to our health care system, particularly when coupled with ageing populations in many Western countries and lifestyle changes which may increase susceptibility.

**“For middle-aged people (40-69 years), we identified almost 170,000 new cases of clinically significant tinnitus from 2002 to 2011.”**



References

1. Davis AC. The prevalence of hearing impairment and reported hearing disability among adults in Great Britain. *Int J Epidemiol* 1989;**18**:911-17.
2. Allen N, Sudlow C, Downey P, et al. UK Biobank: Current status and what it means for epidemiology. *Health Policy and Technol* 2012;**1**:123-26.
3. McCormack A, Edmondson-Jones M, Fortnum et al. The prevalence of tinnitus and the relationship with neuroticism in a middle-aged UK population. *J Psychosom Res* 2014;**76**:56-60.
4. McCormack A, Edmondson-Jones M, Mellor D et al. Association of dietary factors with presence and severity of tinnitus in a middle-aged UK population. *PLoS ONE* 2014;**9**:e114711.
5. Nondahl DM, Cruickshanks KJ, Wiley TL et al. Prevalence and 5-year incidence of tinnitus among older adults: The Epidemiology of Hearing Loss Study. *J Am Ac Audiol* 2002;**13**:323-31.
6. Gopinath B, McMahon CM, Rochtchina E, Karpa MJ, Mitchell P. Incidence, persistence, and progression of tinnitus symptoms in older adults: the Blue Mountains Hearing Study. *Ear Hearing* 2010;**31**:407-12.
7. Martinez C, Wallenhorst C, McFerran D, Hall HA. Incidence rates of clinically significant tinnitus: 10-year trend from a cohort study in England. *Ear Hearing* 2014;(in press).

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**Declaration of Competing Interests**  
None declared

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