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MORTALITY

Shortened Survival and Life Expectancy with a Diagnosis of Attention-Deficit and Hyperactivity Disorder (ADHD)

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Mental health disorders are harder to evaluate for life insurance because their diagnoses can be subjective. To make fair decisions, insurance medical directors use research from trusted sources to calculate risk based on survival data. This article reviews a study conducted on patients in the UK with a diagnosis of attention-deficit and hyperactivity disorder (ADHD).

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Mental health disorders are the most difficult medical impairments to underwrite. Most medical illnesses have either numerical or objective criteria for diagnosis. Although mental health disorders have objective criteria for diagnosis listed in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM), diagnoses can remain subjective both in patient presentation and observer interpretation. As medical directors of life insurance companies, we are obligated by state regulators and, ethically to our customers, to use evidence-based literature to guide the creation of medical impairment manual (MIM) recommendations for our underwriting decisions. These recommendations can only emanate from analyzing articles from peer-reviewed medical journals and converting their mortality and/or survival curves into mortality ratios and subsequent debits and/or credits.

OBSERVED STUDY POPULATION

This is a prospective, matched cohort study from 2000-2019. Subjects were collected from electronic health records from 10% of primary practices in the UK and included all patients who had a diagnostic code indicative of attention-deficit and hyperactivity disorder (ADHD). About 0.32% adults in the cohort had a confirmed diagnosis of ADHD. The National Health Service in the UK includes nearly all of the population, free of charge. The study cohort included 23,377 males and 6,622 females. The average age of entry diagnosis was 18.95 years for males and 22.10 years for females. Seventy-six percent of subjects entered the study between the ages of 18 and 24 years of age. The authors noted that up to 90% of those diagnosed with ADHD, the impairment persisted for the lifetime of the individual. Patient cohort exit was attributed to the earliest of the following events: date of death, date the study subject de-registered from the system, or date the practice no longer contributed to the database. The number lost to follow-up is unknown. The outcome was all-cause death, including deaths from unnatural causes including suicide and accidents. ADHD

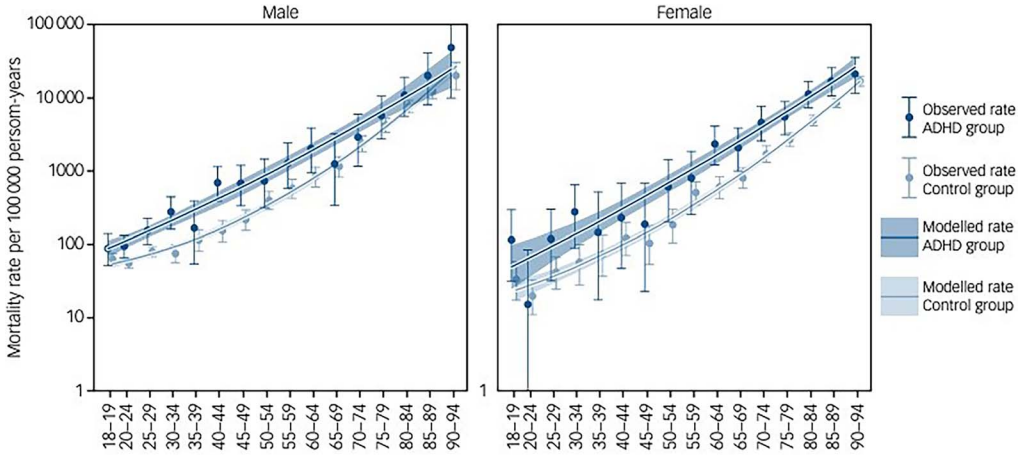

Figure 1. *Mortality rate per 100,000 person-years for participants with attention-deficit hyperactivity disorder (ADHD) vs comparison participants. Error bars and shaded areas indicate 95% CI.*

usually persists into adulthood with an increasing likelihood of high-risk behaviors and premature death. As a group, they have poorer education, employment, and financial outcomes. Subjects exhibited worse physical (cardiovascular) and mental health with an increased rate of depression, suicide, and self-harm. Alcohol, drug abuse, and smoking are more common.[1]

EXPECTED STUDY POPULATION

For each study participant, 10 comparison individuals were matched by age, sex, and primary care practice. The authors sampled comparison individuals who did not have ADHD on the date of study entry for the corresponding participant with ADHD.

STATISTICAL ANALYSIS BY AUTHORS

A Poisson model was used to estimate the mortality rate for males and females with ADHD and the comparison population. This allowed the mortality rate curves to be smoothed by age. The estimated life expectancy at age 18 and beyond used the Periodic Life Table Method by the British Office of National Statistics.

MORTALITY ANALYSIS

Figure 1 shows the observed and control (expected) mortality rate curves per 100,000 for ages 18-19 to 90-94 for males and females. Table 1 lists the observed and control mortality rates for combined age and sex groups in the study. Table 2 shows interval mortality ratios for progressive age groups in males and females calculated from data in Table 1. For males and females, the mortality rates increased progressively for each as their cohort aged. The mortality rate is higher in females at study inception and throughout the follow-up.

For the calculation of mortality ratios in each age group interval, Table 2, the observed mortality rate of those with ADHD was divided by the control (expected) mortality rate. Except for the first and final age interval for each sex, mortality ratios were elevated in the 200 to 300% range. The author's calculated mortality ratios for the entire period were for males 189% and females 213%. Using conventional mortality methodology, each 1% additional mortality above 100% equals approximately 1 debit.[2–5] Additionally, the authors noted the years of life lost for individuals diagnosed with ADHD. For males in the study, the decreased life expectancy was 6.78 years, and for females, it was 8.64 years.

STRENGTHS OF THE STUDY

The study subjects were from the UK, an industrialized, western population whose anticipated mortality is similar to the United States.

Table 1. Mortality Rates (95% CIs)

	Mortality rate per 100,000	
Age	Males with Diagnosed ADHD	Comparison Males
18–24	91.71 (68.07–120.91)	57.37 (51.41–63.83)
25–34	185.60 (134.32–250.00)	78.28 (68.27–89.33)
35–44	385.73 (235,61–595.73)	130.03 (102.27–162.99)
45–54	689.43 (415.08–1076.62)	286.28 (230.49–351.49)
55–64	1545.42 (915.91–2442.43)	673.74 (540.36–830.07)
65+	4793.19 (3468.86–6456.40)	3805.61 (3445.26–4193.42)
	Females with Diagnosed ADHD	Comparison Females
18–24	49.68 (16.13–115.95)	24.12 (15.89–35.09)
25–34	172.54 (78.89–327.53)	46.07 (30.62–66.59)
35–44	184.58 (59.93–430.74)	96.47 (64.10–139.42)
45–54	370.33 (148.89–763.03)	136.59 (90.76–197.40)
55–64	1477.43 (860.66–2365.51)	544.21 (422.60–689.91)
65+	6834.67 (5590.08–8273.78)	3975.05 (3690.54–4275.67)

Diagnostic and treatment modalities are also similar. The follow-up was exceptionally complete due to the UK universal care medical system.

WEAKNESSES OF THE STUDY

The obvious weakness of the study is the bias toward the most seriously affected patients with ADHD, those whose symptoms necessitated entry into a medical system and are diagnosed with ADHD. The diagnoses were made by primary care medical personnel who may not be as sophisticated as a trained mental health professional. Undoubtedly, there are many more individuals with milder symptoms of ADHD who do not come to the attention of the medical system or whose diagnosis is made later in life, who have a more favorable prognosis and longer life expectancy.

Table 2. Interval Mortality Ratios for Subjects with ADHD

Age	Males %	Females %
18–24	160	198
25–34	237	375
35–44	297	191
45–54	241	271
55–64	229	271
65+	126	172

DISCUSSION

In both sexes, death in individuals with ADHD is primarily due to an increased incidence of high-risk personal behaviors, health habits, and suicides. Their mortality ratios are lower at the youngest and oldest ages. In the youngest age group, these individuals are newly diagnosed and have not lived long enough to have suffered the ill effects of their risky, life-decreasing behaviors. At the other end of the age spectrum, the oldest age group has likely culled those with the riskiest behavior, yielding an improved observed mortality. The actual risk assessment and rating of an applicant with ADHD is dependent on the individual's clinical history and severity of the impairment. Those with suspected or less severe manifestations have better outcomes. Lower ratings and greater life expectancies at older ages are appropriate.

It is important to note that these mortality ratios relate to the general population, whose expected mortality rate is greater than a select insurance population. Thus, for our applicant

population and medical impairment manual entries, the mortality ratios and ensuing debits and ratings are higher.

Note: Use of tables and graphs from this study did not require the permission of the authors or publishers.

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