

# Epidemiology of Anxiety Disorders

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**Abstract** This chapter presents an overview of the descriptive epidemiology of anxiety disorders based on recently completed surveys of the general population. The overall prevalence of anxiety disorders is shown to be quite high, but with considerable variation from the most prevalent (specific phobias) to the least prevalent (agoraphobia without a history of panic disorder) disorders. Age-of-onset (AOO) of anxiety disorders is typically in childhood or adolescence and the course is often chronic-recurrent. Anxiety disorders are highly comorbid with each other and with other mental disorders. Because of their early AOO, they are often the temporally primary disorders in comorbid profiles, raising the question whether early interventions to treat anxiety disorders might have a positive effect on the onset, persistence, or severity of secondary disorders such as mood and substance use disorders. This possibility has not yet been extensively explored but warrants further study given the high societal costs of anxiety disorders.

**Keywords** Epidemiology · Anxiety disorders · Agoraphobia · Generalized anxiety disorder · Obsessive-compulsive disorder · Separation anxiety disorder · Comorbidity · Societal costs

## 1 Introduction

This chapter presents an overview of the descriptive epidemiology of anxiety disorders. We focus largely on evidence from general population epidemiological surveys about the prevalence, age-of-onset, course, comorbidity, and severity of mental disorders, although some findings are also reported from clinical epidemiological studies. In light of the fact that DSM criteria have been used much more widely than ICD criteria in epidemiological studies, most results involve disorders described according to the definitions and criteria of the DSM system, although a few important differences with ICD disorders are also highlighted.

The majority of contemporary epidemiological studies on the prevalence and correlates of mental disorders are based on a single diagnostic instrument, the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI) (Robins et al. 1988). The CIDI is a fully structured interview; that is, it is based on questions that for the most part have yes/no responses, making it possible for a trained lay interviewer to administer the interview. The initial version of the CIDI, which was developed in 1989, was based on extensive field trials carried out in close to two dozen countries throughout the world (Wittchen 1994). Results of CIDI surveys carried out over the next decade led to the expansion and refinement of the CIDI and to the creation of the WHO World Mental Health (WMH) Survey Initiative, an ongoing program aimed at carrying out and comparing the results of parallel CIDI surveys in many countries throughout the world ([www.hcp.med.harvard.edu/wmh](http://www.hcp.med.harvard.edu/wmh)). Much of the research reviewed in this chapter comes from the WMH surveys (Kessler and Üstün 2008).

As the CIDI can be administered by lay interviewers, it is noteworthy that clinical reappraisal studies have been carried out to compare diagnoses based on the CIDI with diagnoses made in clinician-administered follow-up interviews. Although the results of the clinical reappraisal studies of the original CIDI were mixed (Brugha et al. 2001; Wittchen et al. 1995), concordance of CIDI-based diagnoses with diagnostic decisions based on independent clinician-administered interviews is generally quite good for the more recent version of the CIDI developed for the WMH surveys (Haro et al. 2006). However, no rigorous clinical reappraisal studies have yet been carried out in developing countries, where prevalence estimates in CIDI surveys have sometimes been implausibly low (Gureje et al. 2006). As a result, data on the epidemiology of anxiety disorders in less developed countries need to be interpreted with caution.

Another important consideration of data quality concerns analysis of lifetime prevalence and age-of-onset distributions in CIDI surveys. The term lifetime prevalence in the context of cross-sectional studies refers to the frequency at which respondents acknowledged having met the full criteria for a given disorder at some point in their life. In general population samples with a large age span that means that the period of risk to have or have had the disorder varies from one person to the other, depending on current age at the time of examination. In the case of early onset disorders, such as for many anxiety disorders, considerable recall bias may occur and the precision of the retrospective age of onset of information might lack precision. Most community epidemiological surveys find that lifetime anxiety disorder prevalence estimates are lower among older than among younger respondents (Kessler et al. 2007b). This pattern could be due to forgetting a disorder that was a problem long ago, earlier mortality of people with anxiety disorders than others in the population (Bruce et al. 1994), a genuine increase in the prevalence of anxiety disorders in recent cohorts, methodological factors of the diagnostic assessment instrument or a combination of both methodological and substantive processes. Although no definitive data exist to distinguish among these possibilities, it is noteworthy that they all imply that the lifetime prevalence estimates of anxiety disorders in community surveys in higher age ranges should be considered lower bounds on the true prevalence in recent cohorts.

## **2 Lifetime Prevalence and Course**

### ***2.1 Prevalence***

A number of recent literature reviews have presented detailed summary tables of prevalence estimates for individual anxiety disorders across many epidemiological surveys (Fehm et al. 2005; Goodwin et al. 2005; Lépine 2002; Lieb 2005; Lieb et al. 2005; Wittchen and Jacobi 2005). We discuss the main patterns found in these reviews in this section of the chapter. Interested readers are referred to the reviews for more detailed estimates.

A clear pattern in the lifetime prevalence data is that anxiety disorders as a group are always found to be the most commonly occurring class of mental disorders. Specific phobia is consistently estimated to be the most common lifetime anxiety disorder, with prevalence estimates usually in the 6–12% range. In the interpretation of anxiety disorders overall and specific phobia in particular one should always consider what types of specific phobias have been covered in the survey. Social phobia is typically found to be the next most common anxiety disorder, with lifetime prevalence sometimes as high as 10%. There is considerable cross-national variation, though, with a higher prevalence of social phobia in North America than in Western Europe and a high prevalence accompanied by a distinctive symptom profile (fear of embarrassing other people rather than of embarrassing oneself) in Asia, (so-called *taijin kyofusho*, a culture-bound syndrome of social phobia). PTSD is the third commonly occurring anxiety disorder, although here again prevalence estimates vary quite widely across countries. This is due to the wide variation in exposure to traumatic events, especially events involving interpersonal violence (more common in the US than Western Europe, and more common yet in countries that have experienced sectarian violence), but also events involving accidental death or injury (more common in developed countries where automobile accidents are common). Because of these differences in exposure, lifetime prevalence of PTSD is estimated to be only 1–2% in Western Europe, 6–9% in North America, and over 10% in countries that have been exposed to long-term sectarian violence. The other anxiety disorders have much lower prevalence. Agoraphobia without a history of panic disorder is usually estimated to be about 2%, similar to obsessive-compulsive disorder (OCD; 2–3%) and childhood separation anxiety disorder (SAD; 2–3%). More variability exists for panic disorder (2–5%), and generalized anxiety disorder (GAD; 3–5%). As discussed below, some of these prevalence estimates could change as a result of changes in diagnostic conventions in future classificatory systems.

## 2.2 *Age-of-onset*

Although fewer published data exist on retrospectively reported AOO distributions than on prevalence of anxiety disorders, a review of this literature shows several noteworthy AOO patterns (Kessler et al. 2007a). First, anxiety disorders typically begin much earlier than other commonly occurring classes of mental disorders, including mood disorders, disruptive behavior disorders, nonaffective psychoses, and substance use disorders. Tic disorders and most specific phobia are always found to have a modal AOO in childhood, with the vast majority of lifetime cases having onsets by the age of 18. Social phobia and OCD are always found to have a modal AOO in adolescence or early adulthood, with the vast majority of cases beginning by their twenties. Panic disorder, agoraphobia, and GAD are always found to have later modal and more widely dispersed AOO distributions, with median AOO in the early-mid twenties and an interquartile range of up to two

decades. PTSD, finally, is generally found to have the latest and most variable AOO distribution, presumably reflecting the fact that trauma exposure can occur at any time in the course of life. Somewhat earlier AOO estimates are generally found in studies of younger age cohorts and prospective-longitudinal studies than in cross-sectional studies where AOO is assessed retrospectively (Wittchen et al. 1999; Beesdo et al. 2007; Schreier et al. 2008). Yet it is noteworthy that the overall pattern of the earlier versus the later onset of anxiety disorders is not different.

This early onset, coupled with the fact that significant associations exist between early-onset anxiety disorders and subsequently the first onset of other mental (Beesdo et al. 2007) and substance use disorders (e.g., Zimmermann et al. 2003), has led some commentators to suggest that aggressive treatment of child-adolescent anxiety disorders might be effective in preventing the onset of the secondary disorders that are found in the vast majority of people with serious mental illness (Wittchen et al. 2000a, b; Kendall and Kessler 2002). It is noteworthy in this regard that despite their generally early AOO, first treatment of anxiety disorders usually does not occur until adulthood, often more than a decade after the onset of the disorder (Christiana et al. 2000).

Reasons for the delay of treatment may be quite diverse and remain understudied. They range from system barriers, such as financial constraints and uncertainty over where to go for help (Olfson et al. 2000), to nonrecognition in primary care as the most frequent gatekeeper for treatment Wittchen et al. (2000a, b), to illness related factors, such as in the case of social phobia, where feelings of being ashamed or embarrassed because of their mental disorder were found to play a role (Patel et al. 2002).

### **2.3 Persistence**

Progression of illness has received far less attention in epidemiological studies of anxiety disorders than either prevalence or AOO. However, estimates of recent prevalence (variously reported for the year, 6 months, or 1 month before interview) are often reported in parallel with estimates of lifetime prevalence, and indirect information about the persistence of the disorder can be obtained by computing recent-to-lifetime prevalence ratios. The 12-month to lifetime prevalence ratios for anxiety disorders are typically in the range 4–6, with the highest ratios usually found for specific phobia and the lowest for GAD (e.g., Kringle et al. 2001). Ratios as high as these strongly imply that anxiety disorders are quite persistent throughout the life course. More detailed analyses of these ratios could be carried out by breaking them down separately for subsamples defined by age at the interview or by the time since the first onset, but we are unaware of any published research that has reported such analyses. Our own preliminary analyses of this sort in the WMH data suggest, as one might expect, that the 12-month to lifetime prevalence ratios decline with increasing age. The more striking result, though, is that this decline is fairly modest, suggesting that anxiety disorders are often persistent throughout the

entire life course. The few long-term longitudinal studies that exist in representative samples of people with anxiety disorders show that this persistence is usually due to a recurrent-intermittent course that often features waxing and waning of episodes of different comorbid anxiety disorders (Wittchen et al. 2000a, b; Bruce et al. 2005).

### 3 Special Issues Concerning Particular Anxiety Disorders

Uncertainties exist about diagnostic boundaries for a number of the anxiety disorders. Because of this, prevalence estimates could change considerably with future versions of the DSM or ICD systems depending on the revisions made to diagnostic criteria. This section of the chapter presents a brief overview of several anxiety disorders that are the focus of questions about appropriate diagnostic criteria: GAD, OCD, and SAD.

#### 3.1 *Agoraphobia Without a History of Panic Disorder*

Agoraphobia is considered by many experts (especially in the US) to be a response to panic (Klein and Gorman 1987), which means that agoraphobia without panic disorder would only occur when the agoraphobia was caused by a fear of recurrence of panic-like symptoms rather than by a fear of recurrence of panic attacks. DSM-III-R was revised to embody this perspective, requiring fear of either panic attacks or panic-like symptoms as the precipitating factor for a diagnosis of agoraphobia. The ICD system, in contrast and in line with the traditional perspective that views agoraphobia as one of the core phobic disorders, along with social and specific phobias (Wittchen et al. 2008), allows for the possibility that agoraphobic fears and avoidance is caused by a broader range of fears, such as of open spaces, public transportation or about being trapped or about being safe when outside the home. Many experts outside the US subscribe to this broader view of agoraphobia. Consistent with the ICD perspective, community epidemiological surveys consistently find that agoraphobia without a history of prior panic attacks or panic-like symptoms is as common as, if not more common than, agoraphobia with a history of prior panic (Andrews and Slade 2002; Wittchen et al. 1998b).

Critics of this broader view argue that the people classified as having agoraphobia without a history of panic actually have a specific phobia or SAD rather than agoraphobia. However, investigation of this issue using a version of the CIDI designed to probe this diagnosis in depth found that the number of respondents who genuinely had agoraphobia without a history of panic was quite large (3.5% of the sample) even after clinical review of cases (Wittchen et al. 1998b). This estimate stands in sharp contrast to the 0.2% lifetime prevalence of agoraphobia without panic disorder reported in a very large, recent national survey of the US that operationalized the DSM-IV criteria rigorously (Grant et al. 2006). Whether the high prevalence of agoraphobia in the absence of prior panic-like symptoms holds

up in future epidemiological investigations is a matter of considerable importance, given the apparent severity of the syndrome in surveys where it has been rigorously evaluated (Andrews and Slade 2002; Wittchen et al. 1998b), but the number of such surveys are far too few to draw firm conclusions. This is a topic that is planned for analysis in the WMH surveys, which contained a special series of questions developed specifically to examine this issue.

### ***3.2 Generalized Anxiety Disorder***

Prevalence estimates of GAD have varied widely in community epidemiological surveys over the years due to the fact that the criteria for a diagnosis of GAD have changed dramatically in the various editions of the DSM: Most notable changes were the requirement that the anxious worrying as the core symptom had to persist for only 1 month or longer in the DSM-III but 6 months or longer in the DSM-III-R and DSM-IV and the considerable change of the mandatory associated psychic and somatic GAD symptoms. In an attempt to reduce the artificial overlap with other anxiety disorders, the latter were confined to a few “hypervigilance” items in DSM-IV instead of a longer list of fairly broad anxiety symptoms in DSM-III. Further complications have arisen from the fact that ICD-10 retained the longer list of symptoms of DSM-III and does not require the worry to be “excessive” to qualify for a diagnosis as DSM-IV does. Because of such variations in definition, lifetime prevalence estimates of GAD in recent epidemiological surveys have varied widely, from as low as 1% to as high as 66% (Kessler et al. 2005a) when the criteria are even further relaxed. Several large CIDI studies have examined whether episodes of GAD with durations less than 6 months might be less impairing than episodes lasting 6 months or longer (Ruscio et al. 2007). Shorter episodes (i.e., 1–5 months) were found to be nearly as impairing as longer episodes and quite similar in other characteristics such as comorbidity, course of the illness, and family history. Other CIDI research investigated the excessiveness requirement and found that, although GAD with excessive worry begins earlier in life and has a more severe and persistent course than GAD without excessive worry, the latter nonetheless is associated with substantial persistence and impairment compared to respondents without GAD (Ruscio et al. 2005). These results seem to argue for broadening the diagnostic criteria of GAD. If this broad definition is adopted, GAD will be one of the most common anxiety disorders.

### ***3.3 Obsessive-Compulsive Disorder***

As noted above, epidemiological surveys consistently find that OCD is one of the least prevalent anxiety disorders, with lifetime prevalence estimates consistently less than 3% (Ruscio et al. 2008). There is considerable interest, though, in the possibility

that a number of other disorders are part of an OCD spectrum that might be far more prevalent than OCD itself, including tic disorders, body dysmorphic disorder, trichotillomania and related self-harm disorders, and possibly even hypochondriasis (Goldsmith et al. 1998). The argument for the existence of this hypothesized spectrum is based on similarities across the different disorders in a subjective sense of compulsion, in difficulty inhibiting repetitive behaviors, in the age of the onset and the course of illness, in patterns of comorbidity, in family history, and in specificity of the response to the treatment (Neziroglu et al. 2006). Although some controversy exists about the notion of an OCD spectrum and the range of conditions that fall within this spectrum (Bienvenu et al. 2000; Richter et al. 2003), some experts have proposed that spectrum disorders should be reclassified in the ICD and DSM systems as subtypes of OCD (Yaryura-Tobias et al. 2000). Needless to say, if this happens, the estimated prevalence of OCD could increase substantially. As far as we know, no large-scale community epidemiological research yet exists on the prevalence of OCD spectrum disorders. Even if such data existed, they would not resolve the question whether OCD would still be appropriately grouped within the anxiety disorders.

### ***3.4 Separation Anxiety Disorder***

SAD is described in DSM-IV as a childhood disorder that seldom persists into adulthood. However, empirical studies in clinical samples suggest that adult SAD is more common than suggested by DSM-IV and that a substantial subset of those with the disorder have their first onsets in adulthood (Diener and Kim 2004). The WMH surveys are the only community epidemiological surveys of which we are aware that assessed adult SAD. Only US data have been reported so far (Shear et al. 2006). Lifetime prevalence estimates of childhood and adult SAD in this survey were 4.1% and 6.6%, respectively. Approximately one-third (36.1%) of respondents classified as childhood cases were found to persist into adulthood, while the majority (77.5%) of adult respondents with SAD at the time of interview reported first onsets in adulthood. In interpreting these results, it needs to be noted that adult SAD was found to be highly comorbid with other mental disorders, underscoring the need for further exploration of the boundaries between syndromal SAD, separation anxiety as an adjustment reaction, and normal response to the loss of an attachment figure in order to arrive at a clear and principled set of criteria for adult SAD in future editions of DSM and ICD.

## **4 Comorbidity Among the Anxiety Disorders**

Comorbidity among anxiety disorders is quite common, with up to half of the people with a lifetime anxiety disorder in some surveys meeting criteria for two or more such disorders (Kessler 1995). Furthermore, there is some evidence that anxiety disorders are more highly comorbid than other mental disorders both with



each other and with other mental and physical disorders (Toft et al. 2005). Factor analytic studies of common mental disorders consistently document separate internalizing and externalizing factors in which anxiety and mood disorders have high factor loadings on the internalizing dimension while most disruptive behavior disorders and substance use disorders have high factor loadings on the externalizing dimension (Kendler et al. 2003). In some studies, the internalizing disorders divide further into secondary dimensions that distinguish between fear disorders (panic, phobia) and distress disorders (depression, dysthymia, GAD) (Watson 2005). The locations of OCD and PTSD in this two-dimensional space are less clear because of not being studied as extensively as the other disorders, with the former appearing to be more related to the fear dimension (Watson 2005) and the latter more related to the distress dimension (Cox et al. 2002), although neither is strongly indicated by either of these dimensions. Social phobia additionally appears to be somewhat more strongly related to the distress dimension than are the other phobias. SAD has not been included in these factor analytic studies to date.

These results have recently been used by Watson (2005) to call into question the codification of anxiety disorders as a distinct class of disorders in the DSM and ICD systems and to suggest that a more useful organizing scheme in the upcoming DSM-V and ICD-11 revisions would be one that distinguished between fear disorders and distress disorders, with the latter including not only GAD and possibly PTSD but also unipolar depression and dysthymia. The argument for a class of fear disorders has the stronger support of the two in neurobiological research based on extensive investigation of fear brain circuitry (Knight et al. 2005). The possibility also exists that future research might lead to OCD being classified apart from both fear and distress disorders as part of a spectrum of impulse-control disorders based on evidence of differential comorbidity and differences in brain circuitry (Whiteside et al. 2004).

Studies of multivariate disorder profiles confirm the complexity of the comorbidity that exists among anxiety disorders. The most comprehensive of these analyses was carried out in the US National Comorbidity Survey Replication (Kessler and Merikangas 2004) by examining the multivariate profiles among 19 separate DSM-IV disorders (Kessler et al. 2005b). Of the 524,288 ( $2^{19}$ ) logically possible multivariate disorder profiles among these disorders, 433 were observed. Nearly 80% of these 433 involved highly comorbid cases (three or more disorders), accounting for 27.0% of all respondents with a disorder and 55.9% of all instances of these disorders.

Importantly, the distribution of comorbidity in this analysis was found to be significantly different from the distribution one would expect to find if the multivariate structure among the disorders was due entirely to the two-way associations that are the focus of factor analysis, suggesting that the more typical factor analytic studies of comorbidity fail to detect an important structure. Based on this result, latent class analysis (LCA) was used to study nonadditive comorbid profiles. A seven-class LCA model provided the best fit to the data, with four classes featuring anxiety disorders prominently.

## 5 The Societal Costs of Anxiety Disorders

We noted earlier in the chapter, but did not emphasize, that early-onset anxiety disorders are powerful predictors of the subsequent onset and persistence of other mental and substance use disorders. It is important to note that these predictive associations are part of a larger pattern of associations that have been documented between anxiety disorders and a much wider array of adverse life course outcomes that might be conceptualized as societal costs of these disorders, including reduced educational attainment, early marriage, marital instability, and low occupational and financial status (Lépine 2002). A considerable amount of research has been carried out to quantify the magnitude of the short-term societal costs of anxiety disorders in terms of healthcare expenditures, impaired functioning, and reduced longevity (Marciniak et al. 2004). The magnitude of the cost estimates in these studies is staggering. For example, Greenberg et al. (1999) estimated that the annual total societal costs of active anxiety disorders in the US over the decade of the 1990s exceeded \$42 billion. This estimate excludes the indirect costs of early-onset anxiety disorders through adverse life course outcomes (e.g., the documented effects of child–adolescent anxiety disorders in predicting low educational attainment and consequent long-term effects on lower income) and through increased risk of other disorders (e.g., anxiety disorders predicting the subsequent onset of cardiovascular disorder). Similar evidence have recently become available from Europe (Andlin-Sobocki et al. 2005; Andlin-Sobocki and Wittchen 2005)

Based on results such as these, there is growing interest in evaluating the possibility that early and aggressive outreach and best-practices treatment of early-onset anxiety disorders might be cost-effective from a societal perspective in reducing a wide range of other adverse outcomes in the domains of health and social functioning (Kendall and Kessler 2002). There is also interest in the possibility that screening in the workplace and treatment of some anxiety disorders might have a positive return on investment (ROI) for employers by virtue of both increasing performance in the workplace and reducing healthcare costs associated with other disorders that are either partially caused or exacerbated by anxiety disorders. Large-scale workplace experiments have been carried out that document a substantially positive ROI of screening for, detecting, and providing best-practices treatment to depressed workers (Wang et al. 2007, 2008). Parallel workplace experiments are needed for anxiety disorders.

## 6 Conclusion

The results summarized here document that anxiety disorders commonly occur in the general population, often have an early age-of-onset, and are characterized by frequent comorbidity with each other as well as with other mental disorders. We

reviewed evidence to suggest that the current DSM and ICD definitions of anxiety disorders might substantially underestimate the proportion of the population with a clinically significant anxiety condition. It is noteworthy that research on comorbidity among anxiety disorders generally ignores the existence of anxiety spectrum conditions, a failing that should be rectified in future research.

Based on these results, along with results regarding the societal costs of anxiety disorders, we can safely conclude that anxiety disorders are common and consequential problems that are deeply interwoven with a wide range of other physical, mental, and broader personal difficulties in the general population. As early-onset conditions, anxiety disorders typically begin prior to the vast majority of the other problems with which they are subsequently associated. Yet, as noted earlier in the chapter, young people with early-onset anxiety disorders seldom receive treatment. This situation needs to be examined to determine if early intervention would help address the enormous public health burden created by anxiety disorders throughout the world. To do this will require a level of political will that has heretofore been lacking in even the most progressive countries in the world. One can but hope that future research focused on the long-term costs of illness and the impact of early effective treatment will correct this situation by documenting the cost-effectiveness of intervening as early as possible to detect and treat people suffering from these highly prevalent and impairing disorders.

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