

SAMPLE CHAPTER FROM:

Attention Deficit Hyperactivity Disorder

The NICE Guideline on Diagnosis and Management
of ADHD in Children, Young People and Adults

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2. ATTENTION DEFICIT HYPERACTIVITY DISORDER

2.1 THE DISORDER

This guideline is concerned with the management of attention deficit hyperactivity disorder (ADHD) as defined in the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (Text Revision) (DSM-IV-TR) as well as hyperkinetic disorder, as defined in the International Classification of Diseases, 10th revision (ICD-10) in primary, community and secondary care.

2.1.1 The concept and its history

The definitions of ADHD and hyperkinetic disorder are based on maladaptively high levels of *impulsivity*, *hyperactivity* and *inattention*. They are all based on observations about how children behave: ‘impulsivity’ signifies premature and thoughtless actions; ‘hyperactivity’ a restless and shifting excess of movement; and ‘inattention’ is a disorganised style preventing sustained effort. All are shown by individual children to different extents, and are influenced by context as well as by the constitution of the person.

Historically, the origins of the concept were in the idea that some disturbances of behaviour were the result of brain damage or ‘minimal brain dysfunction’ (MBD), such as were seen in the pandemic of encephalitis in the 1920s or after traumatic birth. These neurological formulations, however, were called into question when epidemiological science examined systematically the causes of behaviour problems in childhood.

In the place of unsubstantiated brain damage theories, the classification of mental disorders emerging in the 1980s in the American Psychiatric Association’s diagnostic scheme, DSM-III (later DSM-IV) and the World Health Organization’s classification of diseases ICD-9 (now ICD-10), put to one side the aetiological theories and concentrated on the reliable description of problems at a behavioural level. Clinical and statistical studies indicated that impulsivity, hyperactivity and inattention were often associated and were disproportionately common in children referred for psychiatric help. North American and European practice diverged: in North America moderate to severe levels were recognised and termed ‘attention deficit hyperactivity disorder’; in most of Europe, only extreme levels were seen as an illness and called ‘hyperkinetic disorder’.

More recently, extensive biological investigations of both ADHD and hyperkinetic disorder have yielded some neuroimaging and molecular genetic associations; neurocognitive theories have emerged; and there is a better understanding of the natural history and the risks that hyperactive behaviour imposes. Nevertheless, the disorder remains one that is defined at a behavioural level, and its presence does not imply a neurological disease.

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There has also been a large increase in recognition of the problem and a corresponding rise in the numbers treated: from an estimate of 0.5 per 1,000 children diagnosed in the UK 30 years ago (Taylor, 1986), to more than 3 per 1,000 receiving medication for ADHD in the late 1990s (NICE, 2006b). The rates in the US have risen too, but from a much higher base; from about 12 per 1,000 30 years ago to about 35 per 1,000 in the late 1990s, with the increase continuing (Olfson *et al.*, 2003). The terminology in Europe has also changed, and ‘ADHD’ has become the diagnostic phrase most commonly used in practice, even when more restrictive criteria are being used.

2.1.2 Common problems associated with ADHD

It is very common for the core problems of ADHD in children to present together with other developmental impairments and/or mental health problems. There are many rather non-specific problems that are very common in ADHD, and can even be used – incorrectly – as grounds for the diagnosis (see Table 1).

These need recognising, and sometimes intervention, but they are not in themselves grounds for the diagnosis, because they can be the results of many different causes. Similarly, young people and adults may in addition show other associated problems, such as self-harm, a predisposition to road traffic (and other) accidents, substance misuse, delinquency, anxiety states and academic underachievement; similarly they are not in themselves grounds for the diagnosis and may result either from ADHD or from other causes.

Table 1: Common problems associated with ADHD in children

Non-compliant behaviour	Motor tics
Sleep disturbance	Mood swings
Aggression	Unpopularity with peers
Temper tantrums	Clumsiness
Literacy and other learning problems	Immature language

2.1.3 Changes with age

The problems associated with ADHD appear in different ways at different ages, as the individual matures and as the environmental requirements for sustained self-control increase (Taylor & Sonuga-Barke, 2008). Hyperactivity in a pre-school child may involve incessant and demanding extremes of activity; during the school years an affected child may make excess movements during situations where calm is expected rather than on every occasion; during adolescence hyperactivity may present as excessive

fidgetiness rather than whole body movement; in adult life it may be a sustained inner sense of restlessness. Inattention too may diminish in absolute terms, and attention span will usually increase with age; but it tends still to lag behind that of unaffected people, and behind the level that is expected and needed for everyday attainments.

2.1.4 Course of the disorder

Onset

The core behaviours of ADHD are typically present from before the age of 7 years, but at all ages presentation as a problem is very variable (Sayal *et al.*, 2002). Mild forms need not be impairing at all (Mannuzza *et al.*, 1998). Extreme forms are considered to be harmful to the individual's development in most cultures, but there are cultural differences in the level of activity and inattention that is regarded as a problem (Sonuga-Barke *et al.*, 1993). While both teachers and parents can find it hard to deal with or live with a hyperactive child, their tolerance and ability to cope may determine whether the hyperactivity is presented as a problem. Children with hyperactivity rarely ask for help themselves. Inattention without hyperactivity often is not present as a problem even though an inattentive child may have a marked cognitive impairment. The presentation to the clinician therefore depends on a complex blend of the skills and tolerance of adults surrounding the child and the qualities of the children themselves.

Course and impairment

The core problems of ADHD and the associated features can persist over time and impair development in children. Several studies have followed diagnosed school-children over periods of 4 to 14 years; all have found that they tend to show, by comparison with people of the same age who have not had mental health problems, persistence of hyperactivity and inattention, poor school achievement and a higher rate of disruptive behaviour disorders. The various studies have been reviewed, successively by Hechtman and Weiss (1983), Klein and Mannuzza (1991), Hill and Schoener (1996) and Faraone and colleagues (2006).

The risk of later maladjustment also affects children not referred to clinics and those not treated at all. Longitudinal population studies have shown that hyperactive-impulsive behaviour is a risk for several kinds of adolescent maladjustment (Moffitt 1990; Taylor *et al.*, 1996). Lack of friends, work and constructive leisure activities are prominent and affect the quality of life. Severe levels of hyperactivity and impulsivity also make children more likely to develop an antisocial adjustment and more likely to show personality dysfunction or substance misuse in later adolescence and adult life.

Although ADHD symptoms persist in the majority of cases, it is important to remember that many young people with ADHD will make a good adjustment to adulthood and be free of mental health problems. A good outcome may be more likely when the main problem is inattention rather than hyperactivity-impulsivity, when antisocial conduct does not develop, and when relationships with family members and other children remain warm. More research is needed on the influences on

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eventual outcome, and should include enquiry about the possible benefits (and risks) of early diagnosis and treatment.

2.2 DIAGNOSIS AND ASSESSMENT

2.2.1 Diagnostic systems and criteria

The most commonly used criteria for the diagnosis of both children and adults are those provided in DSM-IV-TR and in ICD-10.

The DSM criteria break down symptoms into two groups: inattentive and hyperactive-impulsive. Six of the nine symptoms in each section must be present for a ‘combined type’ diagnosis of ADHD. If there are insufficient symptoms for a combined diagnosis then predominantly inattentive (ADHD-I) and hyperactive (ADHD-H) diagnoses are available. Additionally, symptoms must be: chronic (present for 6 months), maladaptive, functionally impairing across two or more contexts, inconsistent with developmental level and differentiated from other mental disorders (see Table 2).

The ICD uses a different nomenclature; the same symptoms are described as part of a group of hyperkinetic disorders of childhood, and inattention, hyperactivity and impulsivity must all be present; so only ‘combined-type’ ADHD qualifies. In addition, the research diagnostic criteria of the ICD provide an even more restricted set of requirements: the symptom counts must all be met in more than one context. Furthermore, there are quite strict exclusion criteria: whereas coexisting psychiatric disorders are allowed under DSM-IV-TR, the diagnosis of hyperkinetic disorder is not made when criteria for certain other disorders, including anxiety states, are met – unless it is plain that hyperkinetic disorder is additional to the other disorder (see Table 3).

Table 2: DSM-IV-TR criteria for attention deficit hyperactivity disorder

1. Either A or B.
A. Inattention – Six or more symptoms persisting for at least 6 months to a degree that is maladaptive and inconsistent with developmental level.
Often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities
Often has difficulty sustaining attention in tasks or play activities
Often does not seem to listen when spoken to directly
Often does not follow through on instructions; fails to finish schoolwork, chores or workplace duties (not due to oppositional behaviour or failure to understand instructions)

Table 2: (Continued)

	Often has difficulty organising tasks and activities
	Often avoids, dislikes, or is reluctant to do tasks requiring sustained mental effort
	Often loses things necessary for tasks or activities
	Is often easily distracted by extraneous stimuli
	Is often forgetful in daily activities
B. Hyperactivity-impulsivity – Six or more symptoms persisting for at least 6 months to a degree that is maladaptive and inconsistent with developmental level.	
Hyperactivity	Often fidgets with hands or feet or squirms in seat
	Often leaves seat in classroom or in other situations where remaining seated is expected
	Often runs or climbs excessively where inappropriate (feelings of restlessness in young people or adults)
	Often has difficulty playing or engaging in leisure activities quietly
	Is often ‘on the go’ or often acts as if ‘driven by a motor’
	Often talks excessively
Impulsivity	Often blurts out answers before questions have been completed
	Often has difficulty awaiting turn
	Often interrupts or intrudes on others (for example, butts into conversations or games)
2. Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years.	
3. Some impairment from symptoms is present in two or more settings (for example, at school or work and at home).	
4. There must be clear evidence of significant impairment in social, school or work functioning.	
5. The symptoms do not happen only during the course of a pervasive developmental disorder, schizophrenia or other psychotic disorder. The symptoms are not better accounted for by another mental disorder (for example, mood disorder, anxiety disorder, dissociative disorder, or a personality disorder).	

Adapted from *Diagnostic and Statistical Manual of Psychiatric Disorders DSM-IV-TR* (2000) with permission from the American Psychiatric Association.

Table 3: ICD-10 criteria for hyperkinetic disorders

1. Inattention – At least six symptoms of attention have persisted for at least 6 months, to a degree that is maladaptive and inconsistent with the developmental level of the child:
Often fails to give close attention to details, or makes careless errors in school work, work or other activities
Often fails to sustain attention in tasks or play activities
Often appears not to listen to what is being said to him or her
Often fails to follow through on instructions or to finish school work, chores or duties in the workplace (not because of oppositional behaviour or failure to understand instructions)
Is often impaired in organising tasks and activities
Often avoids or strongly dislikes tasks, such as homework, that require sustained mental effort
Often loses things necessary for certain tasks and activities, such as school assignments, pencils, books, toys or tools
Is often easily distracted by external stimuli
Is often forgetful in the course of daily activities
2. Hyperactivity – At least three symptoms of hyperactivity have persisted for at least 6 months, to a degree that is maladaptive and inconsistent with the developmental level of the child:
Often fidgets with hands or feet or squirms on seat
Often leaves seat in classroom or in other situations in which remaining seated is expected
Often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, only feelings of restlessness may be present)
Is often unduly noisy in playing or has difficulty in engaging quietly in leisure activities
Often exhibits a persistent pattern of excessive motor activity that is not substantially modified by social context or demands
3. Impulsivity – At least one of the following symptoms of impulsivity has persisted for at least 6 months, to a degree that is maladaptive and inconsistent with the developmental level of the child:

Table 3: (Continued)

Often blurts out answers before questions have been completed
Often fails to wait in lines or await turns in games or group situations
Often interrupts or intrudes on others (for example, butts into others' conversations or games)
Often talks excessively without appropriate response to social constraints
4. Onset of the disorder is no later than the age of 7 years.
5. Pervasiveness – The criteria should be met for more than a single situation, for example, the combination of inattention and hyperactivity should be present both at home and at school, or at both school and another setting where children are observed, such as a clinic. (Evidence for cross-situationality will ordinarily require information from more than one source; parental reports about classroom behaviour, for instance, are unlikely to be sufficient.)
6. The symptoms in 1 and 3 cause clinically significant distress or impairment in social, academic or occupational functioning.

Adapted from *ICD10: Classification of Mental and Behavioural Disorders* (1992) with permission from the World Health Organization.

Hyperkinetic disorder (ICD-10) therefore describes a group that forms a severe sub-group of the DSM-IV-TR combined subtype of ADHD. Hyperkinetic disorder is further divided into hyperkinetic disorder with and without conduct disorder.

With regard to adults, strict usage of the full diagnostic criteria may be inappropriate, because the criteria focus on childhood problems and do not take full account of the developmental changes mentioned above. Recommendations for identification in adult life have therefore included lowering of diagnostic thresholds and providing age-appropriate adjustment of the symptoms. Issues such as self-awareness and motivation in adult patients reinforce the importance of taking a thorough developmental and psychiatric history and mental state – though this should be a key feature of any diagnostic process. DSM-IV-TR allows a category of 'ADHD in partial remission' for individuals who no longer meet the full criteria; this criterion is particularly relevant for adults where some of the symptoms may have declined with age but where significant impairments related to the symptoms remain.

In this guideline, 'ADHD' is used as an umbrella term when discussing the disorder more broadly. Some of the earlier literature used the term 'hyperactivity' for the cluster of hyperactive, impulsive and inattentive symptoms. In this guideline 'hyperactivity' is restricted to mean the combination of symptoms that define overactive

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behaviour. The term 'ADHD symptoms' is used to refer to the combination of hyperactive, impulsive and inattentive symptoms.

Oppositional defiant disorder and conduct disorder are also diagnoses in the ICD and DSM schemes and need to be differentiated from ADHD. Oppositional defiant disorder refers to persistent and frequent disobedience and opposition to authority figures (such as parents, teachers or other adults), characterised by negative, hostile or defiant behaviour. The diagnosis should not be made unless these behaviours persist for more than 6 months and are considerably more frequent than normal for a person of the same developmental age. Conduct disorder represents more severe behavioural problems: a persistent pattern of behaviour that violates the societal rules and the rights of others. This includes aggression that can take the form of bullying or cruelty to animals, destruction of property, stealing and persistent lying (other than to avoid harm). All these oppositional and conduct disorder problems can be seen in some children with ADHD, but they are not essential features and should not be used as grounds for making the diagnosis of ADHD.

2.2.2 Differential diagnosis

Features of ADHD often coexist with other problems of mental health; and these other conditions may be both differential diagnoses (because they may produce behaviours superficially similar to those of ADHD) and comorbid disorders that need to be recognised in their own right.

DSM-IV-TR and ICD-10 treat coexisting conditions in different ways. In DSM, symptoms must not exist 'exclusively during the course of' autism spectrum disorders, schizophrenia or other psychotic disorders, and furthermore must not be 'better accounted for' by another mental disorder, such as affective disorders, anxiety disorders, dissociative and personality disorders. ICD-10 research diagnostic criteria go further and make such conditions exclusionary criteria without the need for judgement about whether they account for ADHD features. There is a potential danger in a strict application of these exclusionary criteria: it may lead to the overlooking of ADHD when it coexists with another problem, as described in Chapter 5.

What is clear is that the confounding effect of coexisting conditions needs to be evaluated for each individual, considering especially: global and specific learning disorders, neurological disorders, disorders of motor control, conduct and oppositional disorders, Tourette's syndrome, bipolar illnesses, other affective disorders including anxiety and depression, attachment and post-traumatic disorders, autistic spectrum disorders and borderline and antisocial personality disorders.

The confounding effects of stress, parent/carer/institutional/social intolerance or pressure, and individual or familial drug and alcohol misuse should also be taken into account. Hearing impairment and congenital disorders are particularly common examples of a range of medical conditions that need to be detected if present.

2.2.3 Controversies with diagnosis

The diagnosis of ADHD has attracted criticisms from many who challenge several assumptions associated with the process, as described in Chapter 5. Broadly these issues can be summarised into three categories:

- **Technical critiques** focus on the difficulties of diagnosis as a practical accomplishment. These include: the language and specificity of the criteria, accurate differentiation from coexisting conditions, and the lack of criteria and guidance for adult diagnosis in particular.
- **Sociological critiques** cover a broad range of issues, including the present gender, class and ethnicity disproportion in diagnosis, the ideological bases of the practice of psychiatry and the allegedly hegemonic practices of the American Psychiatric Association, and the existence and effects of social pressures, overstated reporting by the media and stereotyping.
- **Validity critiques** question the very existence of the disorder and emphasise the institutional and social conditions upon which they claim the diagnosis is contingent.

2.2.4 Assessment – the influence of key clinical characteristics

The assessment of ADHD is best understood when related to the key characteristics of ADHD (including hyperkinetic disorder), as set out in diagnostic schemes. These key features are:

- the presence of the core problems of inattention, hyperactivity and impulsivity
- the inappropriateness of these features in comparison with the qualities of people at a similar developmental level
- long duration of symptoms
- difficulties evident in more than one setting, such as the home, school or workplace and other social settings
- adverse impact on current and/or general development and psychosocial adjustment
- the need to distinguish from neurodevelopmental disorders associated with learning disabilities and cognitive problems, and other mental health disorders or problems – neither using those other problems as evidence for ADHD nor neglecting the presence of ADHD when it coexists with them
- the need to consider whether impairment is attributable solely to ADHD or is caused or exacerbated by other disorders (mental and physical) as well as personal and social circumstances.

2.2.5 Key assessment features

There is no single definitive psychological or biological test for ADHD. Diagnosis is the outcome of several strands of investigation that are directed to establishing:

- the extent and severity of the core symptoms and any associated problems

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- the characteristics of the symptoms in different situations
- the origins and developmental course of the symptoms
- how any symptoms compare with those seen in other people at the same developmental level
- the presence of other physical, mental health and/or learning disorders.

The complexity of assessment requires cooperation among a number of professionals employed by different agencies and using a wide variety of techniques – in other words, a multi-modal, multi-professional and multi-agency approach.

2.2.6 Key approaches

Essential components of a full assessment process include a clinical interview, a medical examination and administration of rating scales to parents and teachers (for example, self-report). Other components such as direct observation in educational settings, cognitive, neuropsychological, developmental and literacy skills assessments may or may not be indicated.

Clinical interview

A clinical interview is usually carried out by a paediatrician, psychiatrist, clinical psychologist or specialist nurse; and usually in a semi-structured format so that key issues can be systematically investigated. Although fully structured interview instruments, such as the Diagnostic Interview Schedule for Children (DISC) (Costello *et al.*, 1982), the Diagnostic Interview Scale (DIS) for adults (Robins *et al.*, 1981) and the Conners' ADHD Adult Diagnostic Interview for DSM-IV (Epstein *et al.*, 2001), are often used in research, the length and inflexibility of such instruments has, however, meant that they are seldom employed in clinical practice.

The chief aim of the interview is to detail the full range of problems and their history, together with family, health, social, educational and demographic information. It is also helpful to find out how patients and their families have tried to deal with any problems over the years and the impact of the problems on the family as well as the child. The interview is also designed to highlight any further, more specialist assessments that might be required to facilitate diagnosis and intervention planning.

A detailed clinical interview in child mental health practice will typically take between 2 and 3 hours, often arranged over two sessions. Frequently, persons other than the child are involved in the interview to provide additional information and perspectives. Time is also set aside to see young people individually with a similar opportunity for parents.

Standardised rating scales

These help in the evaluation of mental health, social and behavioural problems and possess normative data to enable comparisons with the general population, specific clinical groups or both. There are three main types:

1. Broad-band instruments that evaluate general behavioural and psychosocial functioning: the Strengths and Difficulties Questionnaire (Goodman, 2001) is a widely

available and used example. A longer example is the Achenbach scales (Achenbach, 2003; Achenbach & Rescorla, 2001), which cover the age range 18 months to 59 years with adult, parent, teacher and adolescent self-report versions. Another example is the long version of the Conners' Rating Scales (CRS) (Conners, 1997) for young people, which have versions for parents and teachers.

2. Narrow-band scales that are specific to ADHD symptomatology: examples include the Conners' scales for young people (Conners *et al.*, 1997), the Brown Attention Deficit Disorder Scale (Brown, 2001, 1996) with versions for adults and young people; ADHD Rating Scale (ADHD-RS) IV (DuPaul *et al.*, 1998); the Child Attention Profile (Dulcan & Popper, 1991; Barkley, 1990); and the Home Situations Questionnaire (Barkley & Murphy, 1998).
3. Other rating scales are used to evaluate other types of mental health symptomatology that coexist, or are associated, with ADHD such as anxiety, self-esteem, depression and conduct problems.

The limitations of rating scales include an inter-rater reliability that is at best moderate (Verhulst & van der Ende, 2002) as well as less than complete sensitivity and specificity for the diagnosis compared with a full diagnostic assessment. Many scales describe symptoms only and not their developmental appropriateness or the level of impairment. When developmental appropriateness is included, then it is by asking the rater to judge according to what is considered normal for a child of that age, which may be a difficult task for a non-expert rater and prone to errors of interpretation.

Educational and occupational adjustment

An understanding of a child or young person's adjustment at school or an adult's functioning in the workplace is an important component of the assessment process. In addition to providing information gathered by questionnaire, teachers may be asked to provide specific information on social and academic functioning. If there are particular problems with functioning at school, direct observation by the assessing clinicians of behaviour in the classroom and in other, less structured situations, may be undertaken.

Medical assessment

People referred for assessment for ADHD receive a specialist clinical assessment by a psychiatrist or paediatrician. One aim is to rule out undiagnosed disorders with symptoms that in rare instances may mimic or cause some aspects of ADHD, such as hearing impairment, epilepsy, thyroid disorder and iron deficiency anaemia. The possible contribution of prenatal and perinatal factors known to increase the risk of development of ADHD symptoms is noted (and parental questions about risk factors are responded to) and the assessment identifies physical signs of certain genetic conditions that have increased risk of ADHD. There may also be other coexisting physical, neurological and developmental disorders that need to be identified (including developmental coordination disorder, also known as dyspraxia, chronic tic disorders or Tourette's syndrome, and sleep disorders) which will then shape later management. After diagnosis, if ADHD is confirmed, and if drug therapy is being

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considered, examination involves baseline measurements of height and weight, blood pressure and pulse rate, with continued monitoring of these factors being an ongoing feature.

Psychological and psychometric assessment

Educational and clinical psychologists may undertake further assessments if learning difficulties, including poor literacy skills, dyslexia, or other problems such as dyscalculia or non-verbal learning difficulties, are suspected. These may help to explain the presence of attentional problems; and even if ADHD is present as well, they will need addressing as part of the management plan.

Global learning disabilities may also be present, particularly with hyperkinetic disorder; intellectual status needs to be understood so that therapy can be designed to be developmentally appropriate.

Cognitive impairments involving memory, attention or others are very likely to be present and ideally should be investigated further by clinical or educational psychologists. There are many such tests; of particular interest are specific ones to measure attention. One of the best known is the Test of Everyday Attention (Robertson *et al.*, 1994) for adults and the Test of Everyday Attention for Children (Manly *et al.*, 1998). There are also visual and auditory attentional subtests in neuropsychological batteries such as the NEPSY (Korkman *et al.*, 1998) for children. Auditory attention is also a feature of the Auditory Continuous Performance Test for children (Keith, 1994). There are also a number of versions of the Continuous Performance Test (Rosvold *et al.*, 1956) available and helpfully discussed by Barkley and Murphy (1998). Further research is recommended on the extent to which neuropsychological tests can effectively be used to guide psychological interventions.

2.3 EPIDEMIOLOGY

ADHD (as defined in DSM-IV-TR) is a common disorder. In the UK, a survey of 10,438 children between the ages of 5 and 15 years found that 3.62% of boys and 0.85% of girls had ADHD (Ford *et al.*, 2003). This survey was founded on careful assessment and included impairment in the diagnosis.

The more restricted diagnosis of hyperkinetic disorder in ICD-10, representing a severe sub-group of DSM-IV-TR combined type ADHD, is naturally less common; prevalence estimates are around 1.5% for boys in the primary school years.

In the international scientific literature, prevalence estimates vary widely across studies. At one extreme, in Colombia, the prevalence rates were estimated to be 19.8% and 12.3% for boys and girls respectively (Pineda *et al.*, 2003). Such a wide range in prevalence estimates is unlikely to reflect true differences in the numbers of individuals with ADHD in various populations. Polanczyk and colleagues (2007) made a systematic review of prevalence studies and concluded that the great majority of variability derived from the methods used, such as the way symptoms were measured and the exact definitions used. There were relatively minor differences in different parts of the world and the review's summary of rates was around 5.3%.

This highlights the difficulties in making direct comparisons between studies and occurs for several reasons. ADHD symptoms are continuously distributed throughout the population with no natural threshold between affected and unaffected individuals (Taylor *et al.*, 1991). This particular problem can be successfully resolved by the application of strictly applied operational diagnostic criteria such as the DSM-IV-TR definition for ADHD or the research ICD-10 criteria for hyperkinetic disorder. However, even where the same diagnostic definitions are applied, there may still be differences in the thresholds applied for individual symptoms, which are rarely operationalised. For example, how severe should be avoidance of tasks requiring sustained attention or levels of fidgetiness before they are considered to be clinically significant?

Key criteria when defining ADHD are not only the presence of sufficient numbers of ADHD symptoms but also, importantly, their association with clinical and social impairments at home, school and in other settings. Surveys that include strict definitions of impairment alongside the symptom count find that prevalence of the syndrome (without evidence of impairment) is around twice the prevalence of the disorder when the syndrome is associated with impairment (Canino *et al.*, 2004). In the UK, a survey in Newcastle found that prevalence was 11% for the syndrome with no impairment, 6.7% when associated with moderately low impairment, 4.2% for moderate impairment and 1.4% for severe pervasive impairment (McArdle *et al.*, 2004).

Taking into account the differences in investigator training and measures used across studies it is not possible to draw firm conclusions from the large variation in prevalence rates cited in the literature. Having said that, small differences are likely to exist. One study from the US using the same diagnostic procedures reported small but significant differences in prevalence rates between African-Americans (5.65%), Hispanics (3.06%) and whites (4.33%) (Cuffe *et al.*, 2005); such differences might, however, be explained by different cultural tolerances for the symptoms of ADHD.

Adult ADHD

Prevalence for strictly applied operational definitions of ADHD decline with age. A recent review of longitudinal follow-up studies of individuals diagnosed with ADHD as children found that by age 25 only 15% retained the full ADHD diagnosis. However, a much larger proportion (65%) fulfilled criteria for either ADHD or ADHD in partial remission, indicating the persistence of some symptoms associated with clinical impairments in the majority of cases (Faraone *et al.*, 2006). Applying these figures to the prevalence range commonly seen in children of 4–8%, one would expect to find 0.6–1.2% of adults retaining the full diagnosis by age 25 years and a larger percentage (2–4%) with ADHD in partial remission. This is consistent with population surveys in adult populations that estimate prevalence of ADHD in adults to be between 3 and 4% (Faraone & Biederman, 2005; Kessler *et al.*, 2006).

These data suggest that ADHD in adults will be under identified if the same clinical criteria applied to children is applied to adults. ADHD symptoms follow a developmental decline that parallels the normal change in levels of inattentive, hyperactive and impulsive behaviours seen in the general population. Estimation of prevalence rates will vary unless age-adjusted criteria are applied in a similar way across studies.

2.4 AETIOLOGY

The diagnosis of ADHD does not imply a medical or neurological cause. Equally, the presence of psychosocial adversity or risk factors should not exclude the diagnosis of ADHD. The aetiology of ADHD involves the interplay of multiple genetic and environmental factors. ADHD is viewed as a heterogeneous disorder with different sub-types resulting from different combinations of risk factors acting together.

2.4.1 Genetic influences

ADHD symptoms show quite strong genetic influences. Twin studies suggest that around 75% of the variation in ADHD symptoms in the population are because of genetic factors (heritability estimate of 0.7 to 0.8) (Faraone *et al.*, 2005). The genetic influences appear to affect the distribution of ADHD symptoms across the whole population and not just in a clinically defined sub-group. No single gene of large effect has been identified in ADHD; rather several DNA variants of small effect – each increasing the susceptibility of ADHD by a small amount – have been associated. These findings have fuelled a controversy over whether ADHD should be considered as part of normal variation or as a categorically defined medical disorder (see Chapter 5). Testing for susceptibility genes is currently not justified in clinical practice given the small predictive value of the associated genes, which therefore lack direct clinical relevance.

2.4.2 Environmental influences

Biological factors

A range of factors that adversely affect brain development during perinatal life and early childhood are associated with an increase in the risk of ADHD or attention deficit disorder without hyperactivity. These include maternal smoking (Linnet *et al.*, 2003), alcohol consumption (Mick *et al.*, 2002) and heroin during pregnancy (Ornoy *et al.*, 2001), very low birth weight (Botting *et al.*, 1997) and fetal hypoxia, brain injury, exposure to toxins such as lead and deficiency of zinc (Toren *et al.*, 1996). Risk factors do not act in isolation, but interact with one another. For example, the risk of ADHD associated with maternal alcohol consumption in pregnancy may be stronger in those children with a dopamine transporter (DAT) susceptibility gene (Brookes *et al.*, 2006). Further research is required to confirm whether these act as direct risks for ADHD.

There is increased risk of ADHD symptoms in epilepsy and of ADHD in genetic conditions such as neurofibromatosis type 1 (Mautner *et al.*, 2002), and syndromes such as Angelman, Prader-Willi, Smith Magenis, velocardiofacial and fragile X (Hagerman, 1999). Secondary ADHD may follow traumatic brain injury (Gerring *et al.*, 1998).

Dietary factors

The influence of dietary factors in ADHD has attracted much public attention: food additives, sugar, colourings and 'E' numbers are often regarded as causes of ADHD, and elimination and supplementation diets are widely used, often without professional advice.

Nevertheless, epidemiological research indicates a link between additives and preservatives in the diet and levels of hyperactivity (McCann *et al.*, 2007); and at least a small proportion of children with ADHD demonstrate idiosyncratic reactions to some natural foods and/or artificial additives, and may be helped by a carefully applied exclusion diet (see Chapter 9).

Richardson (2004) reviewed the evidence on associations between ADHD and long-chain polyunsaturated fatty acids (PUFA) and commented on the brain's need throughout life for adequate supplies, a relative lack of omega-3 PUFA, and a possibility that males may be more vulnerable because testosterone may impair PUFA synthesis. Scientific uncertainties remain, however, concerning the physiological significance of different measures of PUFA metabolism and they are not used in practice.

Psychosocial factors

ADHD has been associated with severe early psychosocial adversity, for instance, in children who have survived depriving institutional care (Roy *et al.*, 2000). The mechanisms are not known but may include a failure to acquire cognitive and emotional control.

Disrupted and discordant relationships are more common in the families of young people with ADHD (Biederman *et al.*, 1992). Discordant family relationships, however, may be as much a consequence of living with a child with ADHD as a risk for the disorder itself. In established ADHD, discordant relationships with a harsh parenting style are a risk factor for developing oppositional and conduct problems. Parental hostility and criticism can be reduced in children where ADHD symptoms have been successfully treated with stimulants (Schachar *et al.*, 1997). Parents themselves may also have unrecognised and untreated ADHD, which may adversely affect their ability to manage a child with the disorder.

2.5 CURRENT CARE AND TREATMENT OF ADHD FOR CHILDREN IN THE NHS

2.5.1 Recognition and treatment strategies

The provision of treatments and interventions for children, young people and their families who have ADHD is varied. The ability to recognise and diagnose the disorder and the way in which services are provided and organised for this identified group are inconsistent as services move towards providing comprehensive child and adolescent mental health services (CAMHS) (Department of Health, 2004). The identification of affected people is unsystematic and driven largely by the extent to which

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parents are knowledgeable about the condition or recognise that their child might have hyperactive behaviour (Sayal *et al.*, 2002, 2006a). Historically, services for affected children and young people have mostly been provided by CAMHS, psychiatrists with a specialism in learning disability, or paediatricians based in child development centres or in community child health departments.

The willingness of children, young people and their families to seek help has sometimes been compromised by stigma associated with mental health services. Referral pathways can be complicated, and are subject to considerable variation in the local organisation of mental health services for children and young people. There can be difficulties with awareness and recognition of the symptoms by healthcare professionals in schools, primary and secondary care and by the other professionals who come into contact with this group (Schacher & Tannock, 2002).

Treatments and interventions for ADHD are varied and provided in a variety of settings, usually including specialist CAMHS or paediatric clinics.

Psychological therapies, parent training and other support

Psychological therapies include psychoeducational input, behavioural therapy, cognitive behavioural therapy (CBT) in individual and group formats, interpersonal psychotherapy (IPT), family therapy, school-based interventions, social skills training and parent management training to encourage the development of coping strategies for managing the behavioural disturbance of ADHD (Taylor *et al.*, 2004; Fonagy *et al.*, 2002). Advice is sometimes given to schools and residential institutions.

Remedial disciplines such as occupational therapy and speech and language therapy are sometimes involved in helping the development of individual children.

Families of children and young people who have ADHD may require social support for example, child care relief, help in the home and family support workers.

Dietary measures

Dietary supplements or restrictions are not commonly provided by health services as interventions for ADHD, but they are nevertheless used by many families, sometimes with advice from voluntary or private sectors. Paediatric dietitians are occasionally involved, especially when potentially hazardous regimes, such as exclusion diets, are contemplated.

Medication

In the UK, atomoxetine, dexamfetamine and methylphenidate are licensed for the management of ADHD in children and young people. The NICE technology appraisal (TA98) (NICE, 2006b) has concluded that these medications are effective in controlling the symptoms of ADHD relative to no treatment.

Methylphenidate is a central nervous system (CNS) stimulant. Its action has been linked to inhibition of the dopamine transporter, with consequent increases in dopamine available for synaptic transmission (Volkow *et al.*, 1998). It is a Schedule 2 controlled drug and is currently licensed for use in children over 6 years old (see the Summary of Product Characteristics for Ritalin [Novartis Pharmaceuticals UK Ltd, 2007], Equasym [UCB Pharma Limited, 2006], Equasym XL [UCB Pharma

Limited, 2008], Concerta XL [Janssen-Cilag Ltd, 2008a & b], Medikinet (tablets) [Flynn Pharma Ltd, 2007a], Medikinet XL [Flynn Pharma Ltd, 2007b]; all available from <http://emc.medicines.org.uk>). Both immediate-release (IR) and modified-release (MR) formulations are available in the UK. Common adverse effects include insomnia, nervousness, headache, decreased appetite, abdominal pain and other gastrointestinal symptoms, cardiovascular effects such as tachycardia, palpitations and minor increases in blood pressure. Growth can be affected, at least in the short term, so height and weight are monitored regularly and plotted on growth charts (*BNF for Children*; British Medical Association *et al.*, 2005).

Dexamfetamine is a sympathomimetic amine with a central stimulant and anorectic activity and is licensed as an adjunct in the management of refractory hyperkinetic states in children from 3 years old (see the Summary of Product Characteristics for Dexedrine [UCB Pharma Limited, 2005], available at <http://emc.medicines.org.uk>). Dexamfetamine is also a Schedule 2 controlled drug. The common adverse effects are similar to those of methylphenidate. Dexamfetamine is unlikely to be used as a first-line treatment for the majority of children or young people with ADHD because of a greater potential for diversion and misuse than the other medications (NICE, 2006b).

Atomoxetine is a selective noradrenaline reuptake inhibitor. It is licensed for the treatment of ADHD in children 6 years and older and in young people (see the Summary of Product Characteristic for Strattera [Eli Lilly and Company Ltd, 2008], available at <http://emc.medicines.org.uk>). Common adverse effects are abdominal pain, decreased appetite, nausea and vomiting, early morning awakening, irritability and mood swings. Increased heart rate and small increases in blood pressure have been observed in clinical trials. Cases of hepatic disorders associated with atomoxetine have been reported, and patients and parents should be advised of the risk and how to recognise the symptoms of hepatic disorders (*BNF for Children*; British Medical Association *et al.*, 2005). Furthermore, reports of suicidal ideation in a small number of affected children have led to recommendations that clinicians and parents should be alerted to a possible risk of self-harm.

Other medications, including atypical antipsychotics, bupropion, nicotine, clonidine, modafinil, tricyclic and other antidepressants are occasionally prescribed off-label to patients who do not respond to licensed medications. These drugs were not included in the NICE TA98 (NICE, 2006b).

Medications should only be initiated by an appropriately qualified healthcare professional with expertise in ADHD after a comprehensive assessment. Continued prescribing and monitoring of medications may be performed by GPs, under shared care arrangements (NICE, 2006b).

2.5.2 Multi-agency working

Multi-agency working in relation to ADHD currently appears to present a number of challenges. There appears to be potential for issues to arise regarding how paediatricians and psychiatrists work together. Both groups of professionals have individuals with ADHD on their caseload, but often there is only an informal arrangement in place

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regarding who takes which case. This informal approach may lead to disagreements regarding diagnosis and a lack of parity regarding the service provided and treatment options. In addition, while services do report including representatives from education as part of their team or steering group, and a few include representatives from the youth justice service and the voluntary sector, very few report inclusion of representatives from social services. It may be that collaborative working in this area is hampered at times by different models of disability and how to respond to it held by different agencies. Parents and carers also need to be able to be part of steering groups.

A number of successful multi-professional teams for ADHD are emerging with protocols for multi-professional working, including the role of GPs in monitoring aspects of care. There remain, however, difficulties regarding transitional arrangements between CAMHS and adult mental health services (AMHS), and a general lack of support for adults with ADHD because of the difficulties associated with getting a diagnosis and treatment. This is discussed further in Section 2.7. Furthermore, the parents of young people with ADHD often have mental health problems themselves, and find it difficult to get support from AMHS.

2.5.3 Health services for children and young people with ADHD

Children and young people with possible ADHD should have access to local services that can provide appropriate assessment and ongoing support. Services nationally remain highly variable regarding the number and range of professionals providing the service, models of service provision, the age of transition into adult provision, waiting times for first appointments and whether the needs of children with a learning disability are met by the service.

Children identified as requiring assessment for ADHD are generally seen by tier 1 services and then referred to more specialist services for full assessment or treatment. Referrals into health services may be made to primary mental health workers, nurses, child psychiatrists, psychologists, and general or specialist paediatricians depending on local protocols and services. Children may therefore be assessed and treated by a range of professionals and there does appear to be a lack of consistent assessment and treatment protocols. In some services there is also a lack of availability of psychosocial approaches or the ability to assess or manage coexisting conditions.

Transition to adult services

The age of transition into AMHS continues to vary between the age of 16 and 19 with services working towards age 18 as recommended in the NSF for Children (Department of Health, 2004). The transition between services remains a challenge in some areas because of different thresholds for referral into AMHS and models of service provision. Unfortunately there continue to be gaps in provision for some young people once they have left Children's Services with GPs continuing to monitor and prescribe medication for ADHD without specialist advice or support.

2.6 ADHD FROM AN EDUCATIONAL PERSPECTIVE

Many studies (for example, Barkley *et al.*, 1990) have noted that children with ADHD achieve lower grades in academic subjects than their peers. More recently this trend has been found for children with teacher-identified ADHD characteristics (Merrell & Tymms, 2001; McGee *et al.*, 2002; Merrell & Tymms, 2005a). Such children, identified at the end of their first year at school, have significantly lower reading and mathematics attainment at that point than children with no observed behavioural problems. By the end of primary school they have fallen even further behind, in particular those children with symptoms of inattention. Wolraich and colleagues also suggest that inattention is a key ingredient of poor academic achievement (Wolraich *et al.*, 2003). Using rating scales based on the diagnostic criteria published in DSM-IV-TR, the proportion of children observed by their class teachers to be inattentive, hyperactive and/or impulsive in the classroom has been estimated to be between 8.1 and 17% (Wolraich *et al.*, 1996; Gaub & Carlson, 1997; Merrell & Tymms, 2001; Wolraich *et al.*, 2003). A later study by Wolraich and colleagues (2004) found that teachers' screening of elementary pupils gave a higher estimate of 25% of their pupils having a high risk of ADHD.

When children start school, aged 4 or 5 years, their teachers could be very well placed to identify ADHD characteristics. The challenges of the school setting are likely to make those difficulties more obvious and may be picked up by teachers who are experienced in observing a wide range of children's behaviour. However, Bailey (2006) warns that inattentive, hyperactive and impulsive behaviour could be a reaction to the expectations and constraints of the school environment, and it is important to bear in mind that this might be the case for some children.

Theoretically, once children with ADHD symptoms have been identified, further assessment can be undertaken and interventions put in place at an early stage, although Tymms and Merrell's (2006) research did not support screening. Early interventions can be successful in reducing behavioural problems and negative outcomes and the earlier they are implemented, the better (Farrington, 1994). O'Shaughnessy and colleagues (2003) have suggested that coordinated school-wide identification and interventions for children with behavioural problems increase the likelihood of improving their outcomes. Even though many studies have found that classroom-based interventions have a positive impact on the behaviour of children with ADHD and to a lesser extent on their academic progress (Purdie *et al.*, 2002), at the present time teachers in England are not systematically trained to use these classroom management and teaching strategies.

All children and young people, including those with ADHD, have the right to a school experience that provides a broad, balanced and relevant curriculum, including the National Curriculum, which is appropriately differentiated according to their needs. This has implications for the provision of initial teacher training and in-service professional development. Furthermore, a whole school approach to promoting positive behaviour outside as well as inside the classroom is desirable, therefore training should extend to non-teaching members of staff (Philbrick *et al.*, 2004). Several studies have shown that teachers' and student teachers' perceived competence in the

management of children with ADHD in the classroom is variable and is correlated with their professional knowledge and experience (Avramidis, 2000; Bekle, 1994; Sciuotto *et al.*, 2000). At the present time training is lacking, as illustrated by the report from the Education and Skills Select Committee's inquiry into special educational needs (House of Commons Education and Skills Committee, 2006), which recommended that 'the Government needs to radically increase investment in training its workforce so that all staff, including teaching staff, are fully equipped and resourced to improve outcomes for children with special educational needs (SEN) and disabilities'.

2.7 ADULTS WITH ADHD

2.7.1 Treatment strategies for adults

The treatment strategies for adults with ADHD are essentially similar to those used in childhood. There are, however, some key differences that need to be taken into account. Identification has been uncommon in the UK, and there are currently very few specialist services in the NHS and only a few that offer diagnostic or treatment services within generic AMHS. Psychological treatment is not routinely offered to adults with ADHD and there have been few attempts to quantify the benefits of such interventions. Adults with ADHD are currently seen in a few specialist clinics and include both transitional cases diagnosed in childhood as well as adults who were not diagnosed during childhood. In many cases adults with ADHD have been diagnosed and treated for coexisting symptoms and syndromes. Because of the increased rates of ADHD among close family members, many have children with ADHD, and need additional help to provide effective support for their children.

Medication

While the number of drug trials in adults is far smaller than in children, they consistently demonstrate the effectiveness of stimulants to reduce the level of ADHD symptoms in adults fulfilling diagnostic criteria for ADHD. Treatment regimes in adults are similar to those used in children, although in a few cases higher doses are used. Although stimulants are the most studied and most effective treatment for ADHD in children and adults, their use in adults remains controversial across Europe. In the UK, treatment of ADHD in children has dramatically changed in the last decade with a marked increase in the diagnosis of ADHD and a doubling of stimulant prescriptions between 1998 and 2004 (NICE, 2006b). However, this change in perspective is only slowly filtering through to those engaged in treating the adult population. It remains an anomaly that many drugs that are considered to be safe and effective in children and young people are not licensed for use in adults.

Trial evidence for medication effects on ADHD in adults is described in Chapter 10. Stimulants are usually the first-choice pharmacological treatment for ADHD in both children and adults. In the UK, both methylphenidate and dexamfetamine are available, although as yet remain unlicensed for use in adults. There is some evidence

regarding the safety and effectiveness of stimulants in children, and an increasing amount of evidence for efficacy in adults. The effects of stimulants on ADHD symptoms are different from many other psychiatric treatments, as there is an immediate effect, starting within 30 minutes of an initial dose and continuing for 3 to 4 hours in the case of IR preparations. These preparations have to be taken several times throughout the day. MR preparations, which last approximately 8 to 12 hours and are usually taken only once a day, are particularly useful for those who become forgetful or disorganised once the effects of the medication begin to wear off.

The second-line choice of medication for ADHD in adults is usually atomoxetine. Third-line choices include bupropion, modafinil and antidepressants with noradrenergic effects such as imipramine, venlafaxine and reboxetine, although there is less consistent evidence for these medications in the reduction of ADHD symptoms in adults. Trial evidence is described in Chapter 10. Atomoxetine is licensed in the US for the treatment of ADHD in both children and adults, although in the UK it is only licensed for treatment of adults who started atomoxetine in childhood or adolescence.

Psychological treatments

Psychotherapeutic interventions that have been used to treat adults with ADHD include psychoeducation, use of support groups, skills training, CBT, coaching and counselling.

Psychological interventions applying a cognitive paradigm to teach strategies to manage ADHD have been used in adults with ADHD (Stevenson *et al.*, 2003; Stevenson *et al.*, 2002; Wilens *et al.*, 1999), usually as a complementary treatment to the use of stimulant medication, although they may be sufficient for adults where considerable moderation of symptoms has occurred with age. Qualitative research has suggested that psychological support begins at the time of diagnosis, following which adults with ADHD go through a process of adjustment in coming to terms with their diagnosis and the impact of the disorder on their lives (Young *et al.*, 2008a). Psychological treatment can then shift to focus on the treatment of coexisting psychiatric problems, psychological problems and skills deficits (Young, 1999, 2002; Young & Bramham, 2007). The aim is to help people develop methods to give structure to daily living and to improve interpersonal skills so they may function more successfully and achieve their potential. Indeed there is a strong evidence base for psychological treatment of many psychiatric problems that are associated with ADHD.

Other forms of psychotherapy such as counselling or client-based psychotherapies have had a role in helping some individuals come to terms with and better understand the way ADHD has influenced their personal and emotional lives. Coaching interventions parallel a mentoring paradigm by supporting people with ADHD to rehearse newly learned skills on a daily basis; these have been used as an adjunct to cognitive group programmes for adults with ADHD (Stevenson *et al.*, 2002, 2003). Formal studies of the effectiveness of psychotherapy and coaching have not yet been carried out, but many adults with ADHD report that they gain benefit from these approaches.

2.7.2 Special issues for adults diagnosed with ADHD

Educational and occupational disadvantage

Adults with ADHD commonly report a history of erratic academic performance and underachievement. These problems begin in primary school years and often continue into adolescence and young adulthood. This is a time when young people have important decisions to make regarding their future, yet, compared with their peers, young people with ADHD are less likely to make plans (Young *et al.*, 2005a). Academic difficulties are most likely strongly associated with ADHD symptoms. Individual or small group tuition, additional time in examinations (in a separate room if necessary), help with time management, goal setting, task prioritisation and study techniques, may help reduce their impact.

With increasing age, in further education and/or the workplace, young people are expected to take greater personal responsibility for structuring and organising their time, prioritising tasks and meeting deadlines. This may explain why adults with ADHD often underachieve academically compared with the expectations and achievements of their family members. They often deviate from family expectations of job status by being employed in significantly lower-ranking jobs than those of their siblings. While some individuals with ADHD find work that is compatible with their symptoms, many report higher rates of employment problems, including a higher turnover of jobs and periods of unemployment. They also try out many different types of occupations as opposed to developing a career (Young *et al.*, 2003).

Substance misuse

The reason for the increased level of substance use disorders among individuals with ADHD is complex. ADHD is a risk factor for substance use disorders through three potential mechanisms: (1) increased levels of reward-seeking (risk-taking) behaviours; (2) increased level of psychosocial impairments (oppositional defiant disorder and conduct disorder in childhood that are themselves associated with substance misuse); and (3) self-medication for ADHD symptoms.

In most cases severe substance use disorders should be treated first because of the known risks and impairments associated with such behaviour. Ongoing substance misuse will interfere with evaluation of ADHD treatment response – interactions will emerge and side effects can be intensified. While all substance use should be minimised before the start of pharmacological treatment, it should be recognised that the persistence of ADHD symptoms may maintain substance misuse in order to supplement medication to treat symptoms. Self-treatment with stimulants is however infrequent, while use of alcohol and cannabis to dampen down symptoms associated with adult ADHD is far more common.

The concerns of some professionals that the use of stimulants in ADHD may lead to drug misuse either by sensitisation or as gateway to other drugs is not supported by available evidence. Although there may be a risk that some individuals with drug misuse problems may self-medicate with stimulants, it is important to note that when stimulants are used appropriately by adults they are not habit forming or addictive, and they do not cause euphoria. Furthermore, there is evidence from follow-up studies that the

appropriate treatment of ADHD with stimulants is associated with a reduction in substance abuse disorders (Wilens *et al.*, 2008).

Association with crime

Early onset and persistent antisocial behaviour is commonly associated with ADHD. Longitudinal studies have shown that ADHD independently predicts the development of antisocial behaviour, a developmental trajectory thought to be mediated by familial environmental influences (Bambinski *et al.*, 1999; Taylor *et al.*, 1996).

The association between ADHD and crime is becoming increasingly recognised and regarded with concern. Studies conducted in the US, Canada, Sweden, Germany, Finland and Norway suggest that around two-thirds of young offender institutions and up to half of the adult prison population screened positively for ADHD in childhood and many continued to be symptomatic (for review see Young, 2007b). A sizeable number of individuals may have mild symptoms, and are in partial remission from their ADHD symptoms. All these studies have limitations in their methodologies, nevertheless it seems that the rate of young people and adults with ADHD in the prison population far exceeds that reported in the general population (that is, 3–4% of children and 1% of adults).

ADHD has been associated with early onset of criminal behaviour, even before the age of 11, and high rates of recidivism have been found in studies of young people with ADHD detained in institutions (Rosler *et al.*, 2004). Young people are likely to have more severe and pervasive symptoms than older offenders detained in adult prisons, and this most likely accounts for the much higher prevalence of ADHD reported in young offender institutions. For such young people the ‘revolving door’ between prison and probation and the community is most likely strongly associated with the severity of their ADHD symptoms.

A meta-analysis of 20 ADHD studies reported a strong association between measures of ADHD and criminal/delinquent behaviour (Pratt *et al.*, 2002) and concluded that ADHD is a factor that should be considered in the delivery of treatment services for offenders, starting with early intervention programmes and going on to rehabilitation and supervision of adult offenders.

Differential diagnosis and mistaken diagnosis

In adulthood, coexisting conditions include personality disorder (particularly antisocial and borderline), bipolar disorder, obsessive-compulsive disorder and, to a lesser extent, psychotic disorders. Adults with severe mental illness, such as schizophrenia, or severe learning disability often have problems with attention and activity levels yet these disorders do not occur any more frequently in people with ADHD than in the normal population (Mannuzza *et al.*, 1998).

However, there is a difficulty in that attentional problems are common to many psychiatric disorders; thus adults with other psychiatric problems may appear to have symptoms of ADHD. On the other hand this also means that there is a pool of adult psychiatric patients in whom the diagnosis of ADHD has been unidentified and where ineffective treatments have been put in place for alternative diagnoses such as anxiety, depression, cyclothymia and personality disorder. This may account for the

high rates of contact reported with mental health services for adults with ADHD (Dalsgaard *et al.*, 2002), which in turn has associated cost implications.

ADHD in adults is frequently misdiagnosed because there are potential ‘traps’ for the inexperienced ADHD diagnostician. ADHD in adulthood does not present in the same way as ADHD in children who, for example, have more symptoms of hyperactivity. The age criterion is crucial to distinguish ADHD from later onset conditions and, unless care is taken to rule out the existence of the other conditions, there may be a high rate of falsely identified cases.

Psychopathology overlaps with other psychiatric conditions in two main ways. First, the chronic trait-like characteristics of ADHD symptoms that start in early childhood and persist into adulthood are frequently mistaken for traits of a personality disorder. This occurs, in particular, for cluster B personality disorders (that is, anti-social, borderline and emotionally unstable personality disorders) as these include symptoms that are commonly associated with adult ADHD such as mood instability, impulsivity and anger outbursts. Second, the volatile and irritable mood frequently reported by adults with ADHD is a symptom that overlaps with that seen in major affective disorders. Both bipolar disorder and ADHD are characterised by hyperactivity, distractibility, inattentiveness and mood changes. The distinction, however, is that the mood state of ADHD is irritable and volatile, rather than containing elements of euphoria and grandiosity. More recently, it has been argued that ‘juvenile mania’ of very early onset is characterised by a mood of irritability rather than euphoria, and by chronicity rather than fluctuation. If this change of definition is accepted, then this distinction from ADHD in young people will become highly problematic.

2.8 THE ECONOMIC COST OF ADHD

The current estimated prevalence of children and young people with ADHD in the UK is 3.62% in boys and 0.85% in girls (Ford *et al.*, 2003). Based on these figures and national population statistics (Office for National Statistics, 2007) it can be estimated that about 210,000 children aged 5 to 18 years are affected by ADHD in England and Wales, although only a minority of them will seek or receive medical treatment (Sayal *et al.*, 2002, 2006a). It has been estimated that in England and Wales, children with ADHD place a significant cost on health, social and education services, reaching £23 million for initial specialist assessment, and £14 million annually for follow-up care, excluding medication (King *et al.*, 2006). These figures do not include costs incurred by adults with ADHD to health and social services.

In 2006, the total annual cost of prescribed stimulants and other drugs for ADHD in England was roughly £29 million, comprising a 20% increase from the previous year (NHS Health and Social Care Information Centre, 2006; NHS Information Centre, 2007). This increase in cost is attributed in part to the increased numbers of individuals being treated, and in part to a shift in prescribing towards more expensive MR formulations. Schlander (2007) estimated that, in 2012, the ADHD pharmacotherapy expenditures for children and young people may exceed £78 million in England, owing to an increase in the number of diagnosed cases, growing acceptance

and intensity of pharmacotherapy, and higher unit costs of novel medications. Nevertheless, the current £29 million annual cost of prescribed drugs for ADHD in England is rather low compared with annual costs of drugs prescribed for other chronic conditions such as depression (£292 million) and diabetes (£562 million) (The Information Centre, 2006).

UK data on the economic cost of ADHD are limited; since figures from the US relate to a very different pattern of service provision they cannot be generalised to the UK. Costs in the US have increased over the years due to a constantly increasing rate of identification by clinicians, with identification by paediatricians from 1.4% of children in 1979 to 9.2% in 1996 (Kelleher *et al.*, 2000). Birnbaum and colleagues (2005) estimated that the total cost of ADHD in the US was \$31.6 billion in 2000 prices, using a prevalence of 8% for boys, 4% for girls, 5% for male adults and 3.5% for female adults. Of this cost, only 5% (\$1.6 billion) related directly to treatment of the condition; the rest constituted other healthcare costs of children and adults with ADHD (\$12.1 billion or 38%), healthcare costs of family members of individuals with ADHD (a striking \$14.2 billion or 45%), and productivity losses of adults with ADHD and adult family members of persons with ADHD (\$3.7 billion or 12%). These figures express excess costs, that is, additional costs of people with ADHD and their families, over and above respective costs of comparable control individuals. Pelham and colleagues (2007) reported an estimated annual cost of ADHD in children and young people approximately \$14,600 per individual in 2005 prices (range from \$12,000 to \$17,500), consisting of healthcare costs (18%), costs to the education system (34%), as well as costs associated with crime and delinquency (48%). Using a prevalence rate of 5%, the authors estimated a total cost of children and people with ADHD in the US reaching \$42.5 billion (range from \$36 to \$52.5 billion).

Children with ADHD have been found to incur similar healthcare costs in the US to children with asthma (Chan *et al.*, 2002; Kelleher *et al.*, 2001) and significantly higher than those of children without ADHD (Chan *et al.*, 2002; Burd *et al.*, 2003a; DeBar *et al.*, 2004; de Ridder & de Graeve, 2006; Leibson *et al.*, 2001; Swensen *et al.*, 2003; Hakkaart-van Roijen *et al.*, 2007; Guevara *et al.*, 2001). This difference in costs was found to be related to a higher frequency in contacts with general practitioners (GPs) and outpatient mental health services, visits to emergency departments and hospitalisations (DeBar *et al.*, 2004; de Ridder & de Graeve, 2006; Leibson *et al.*, 2001; Guevara *et al.*, 2001). Moreover, children with ADHD are more likely to have other psychiatric coexisting conditions such as conduct disorder, oppositional defiant disorder, depression and so on, compared with children without ADHD (Burd *et al.*, 2003b), which significantly increase use of healthcare services and associated costs (Burd *et al.*, 2003b; Hakkaart-van Roijen *et al.*, 2007; Guevara *et al.*, 2001; DeBar *et al.*, 2004). Children with ADHD are also much more likely to have learning difficulties and to incur higher educational costs than children without ADHD; these costs may include costs of special education and the cost of either a school nurse or office staff administering medication to children with ADHD (Guevara & Mandell, 2003).

Adults with ADHD also incur high healthcare costs relative to matched adults without ADHD (Secnik *et al.*, 2005a), despite the relatively low treatment rates of ADHD in this age cohort, estimated roughly at 25% in the US (Birnbaum *et al.*, 2005).

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Adults with ADHD are more likely to have a comorbid diagnosis of asthma, depression, anxiety, bipolar disorder, antisocial personality disorder and alcohol or drug misuse, which contributes further to the magnitude of medical expenses (Secnik *et al.*, 2005a). However, even after controlling for the impact of coexisting conditions, adults with ADHD have been found to have higher inpatient and outpatient costs, as well as prescription drug costs. The annual estimated cost of an adult with ADHD in the US was \$5,600 in 2001 prices, versus \$2,700 for a matched adult without ADHD (Secnik *et al.*, 2005a). It must be noted, however, that adult ADHD incurs lower healthcare costs per person compared with other chronic conditions, such as depression or diabetes (Hinnenthal *et al.*, 2005). Further to the increase in healthcare costs, the presence of ADHD in adults is associated with increased productivity losses because of absenteeism (Kessler *et al.*, 2005; Secnik *et al.*, 2005a) and decrements in work performance (Kessler *et al.*, 2005).

Apart from affected individuals, the carers and families of people with ADHD also bear substantial costs in terms of out-of-pocket expenses as well as productivity losses related to reduced ability to work and absenteeism (de Ridder & de Graeve, 2006; Hakkaart-van Roijen *et al.*, 2007; Swensen *et al.*, 2003). In addition, families of children with ADHD suffer a significant emotional burden, comprising strained family relationships (parent-child or sibling interactions), parenting distress and worry, and marital discord (Hankin *et al.*, 2001). Additional costs are related to increased accident rates (Jerome *et al.*, 2006).

It is evident, from the above review, that ADHD is associated with a significant financial and emotional costs to the healthcare system, education services, carers and families and society as a whole. Providing effective treatment will improve the quality of life of individuals with ADHD, their carers and their families, and at the same time will reduce the financial implications and psychological burden of ADHD to society.