

## **CRITERIA FOR THE DIAGNOSIS AND MANAGEMENT OF ATTENTION DEFICIT HYPERACTIVITY DISORDER IN CHILDREN AND ADOLESCENTS**

This document replaces TG181/9. This document draws on various reputable guidelines and research papers that have been published on ADHD and its management (see References at the end of Part A).

The document consists of two parts:

**PART A** deals with 'Clinical Issues Relating to the Diagnosis and Management of Attention Deficit Hyperactivity Disorder in Children and Adolescents'.

**PART B** deals with 'Legal, Policy and Procedural Issues Relating to the Prescribing of Dexamfetamine, Methylphenidate and Lisdexamfetamine for Attention Deficit Hyperactivity Disorder in Children and Adolescents'.

**It is important that the management of patients is in accordance with Part A.**

This document can be obtained at

<http://www.health.nsw.gov.au/pharmaceutical/doctors/pages/prescribe-psychostimulant.aspx>  
or by contacting the Pharmaceutical Regulatory Unit on (02) 9391 9944.

For general information on ADHD, visit the Ministry of Health's website on ADHD at <http://www.health.nsw.gov.au/pharmaceutical/doctors/Pages/ADHD-medical-practitioners.aspx>

## PART A

### Clinical Issues Relating to the Diagnosis and Management of Attention Deficit Hyperactivity Disorder (ADHD) in Children and Adolescents

#### 1. CRITERIA FOR DIAGNOSIS

As a minimum, the criteria set down in DSM-IV should be fulfilled before a diagnosis of ADHD is made.

#### 2. AETIOLOGY

The aetiology of ADHD is essentially unknown. Evidence suggests that many factors, including genetic, neurophysiologic, cognitive, familial and environmental factors are involved. It is likely that a combination of these factors contributes to the symptoms of ADHD.

#### 3. PREVALENCE

Reported estimates of the community prevalence of ADHD vary widely depending on the method of ascertainment, the diagnostic criteria used, and the population sampled. Australian studies have generally found prevalence rates of ADHD between 2.4% and 7.5%. Most studies have found a higher prevalence of ADHD in boys than girls, with boys scoring higher particularly on measures of hyperactivity and disruptive behaviour scales.

#### 4. ASSESSMENT

A comprehensive assessment of a child with suspected ADHD should include the following elements:

- 4.1 **History:** Family, past and current medical, psychosocial and developmental.
- 4.2 **Medical:** Physical and neurological examination and any appropriate investigations.
- 4.3 **Developmental:** To exclude significant specific and/or global problems, hearing and vision difficulties, and provide further referral as appropriate.
- 4.4 **Behavioural:** Description of behaviour in various settings, especially home and school.
- 4.5 **Family and Relationship Function:** An assessment of the child's relationship with family members, the overall functioning of the family and the child's relationships with peers.
- 4.6 **Educational:** A review of classroom observations and prior testing, including estimates of intellectual capabilities (incorporating intellectual/cognitive assessment), strengths and weaknesses and measure of academic achievement, including language development.

Multiple sources of information should be utilised during assessment, such as parents, caregivers and relevant professionals, especially teachers.

Appropriate rating scales should be used as part of the assessment for obtaining systematic information from different settings and to gauge treatment response.

## 5. TREATMENT APPROACH

It is important to treat ADHD because of its disruptive symptoms, associated learning, behavioural and emotional problems, family stress, and possible persistence into adolescence and adulthood.

ADHD is a chronic condition that requires ongoing management and monitoring. The choice of treatment strategies is influenced by the child's specific target symptoms, comorbidity, and the strengths and weaknesses of the child as well as the child's parents and caregivers.

Multimodal therapy is widely advocated for the management of ADHD. Strategies may include medication, behaviour therapy, family support, and developmental therapies such as language therapy. A management plan for a child with ADHD should be individualised to the needs of the child and his/her family, as determined by a comprehensive assessment. It should take account of associated problems such as peer relationships, low self-esteem, family dysfunction, and comorbid conditions such as learning difficulties, anxiety and depression. It should also be developed in accordance with the family's resources and capacity to adhere to the plan.

Educating parents and the child about the disorder and how it may affect learning, behaviour, self-esteem, social skills and functioning within the family, as well as providing information on the advantages and disadvantages of potential treatment strategies, will enable the most effective management plan to be developed for the child.

Many agencies and professionals may be involved in multimodal management. It is particularly important to establish a therapeutic alliance with the child's parents and other significant caregivers (e.g. day care providers, school teachers) to enable specific treatment interventions to be implemented consistently.

Over time a number of factors can affect a child's target symptoms, such as normal developmental changes, greater academic demands and educational expectations with increasing grade, and changes in the home environment and availability of resources. Regular review is important to ensure that the management strategies remain appropriate and effective.

Frequency of review will depend on age, stage and complexity of treatment, educational and family factors, and should involve three to six monthly review. At a minimum, a review should occur once a year covering medication, educational progress and behaviour in home and other settings. Such a review should include information from multiple sources (e.g. parents, other significant caregivers, teachers) and include an evaluation of any reported deterioration in target symptoms or other behaviours.

## 6. THE ROLE OF PSYCHOSTIMULANT MEDICATION IN THE MANAGEMENT OF ADHD

The need for medication and its effectiveness is relative to the nature and severity of problems and the use of other interventions. Although medication is the most effective short-term treatment for the core symptoms of ADHD, other approaches may add to the success of medication and may be essential if medication is ineffective.

Despite widespread clinical and scientific support for the use of psychostimulants in the management of ADHD, the popular media continues to portray psychostimulant treatment as controversial. Consequently, parents of children presenting with ADHD may be fearful or suspicious about psychostimulant treatment. Prescribers should be mindful of this and inquire into any concerns a parent or a child may have about psychostimulant medication. Appropriate written information is useful. The benefits of psychostimulant therapy and the possible side effects should be comprehensively discussed before a child is commenced on psychostimulant medication.

## 7. PSYCHOSTIMULANT MEDICATION

*Note: Prescribers should be familiar with the current product information regarding the use of methylphenidate, dexamfetamine and lisdexamfetamine before prescribing these medications.*

Dexamfetamine, lisdexamfetamine and methylphenidate act on dopaminergic and noradrenergic neurotransmitter pathways and appear to influence mainly prefrontal, frontal and limbic systems with benefits on disruptive behavioural inhibition, impulse control, selective attention, active working memory and executive functioning. There is no 'paradoxical effect' of psychostimulants appearing to 'sedate' disruptive behaviour. There are no direct effects on consciousness or moral judgment.

Though similar in clinical effects, the psychostimulants differ in how they increase neurotransmitter concentrations in the synapse. There is wide individual variation in metabolism and effect. The duration of action varies according to the format of the medication and the individual patient's rate of metabolic breakdown. The short-acting form usually has an effect after 30 minutes and lasts three to four hours. In contrast, the long-acting form lasts six to 10 hours, depending on the drug delivery system.

While the response of most children is similar for both methylphenidate and dexamfetamine, the efficacy and side-effects are not identical. Some children may respond better to one than the other. Consideration should be given to trialling both medications, particularly when it seems that high doses are necessary.

For further information about lisdexamfetamine please refer to the published product information.

Dosage should be individually titrated. There is no evidence that an approach based on weight leads to improved response, but weight can be used to judge the relative amount a child is receiving. The best dose of medication for a given child is that which leads to optimal effects with minimal side effects. Start with a small dose and titrate upward until a satisfactory response is obtained or side effects intrude. The first dose that a child's symptoms respond to may not be the best dose to improve function. All symptoms do not respond equally to each dose of medication so it is

important that the target symptoms are defined before initiating medication. Standard rating scales are useful for measuring and monitoring responses and side effects.

Following initiation of psychostimulant treatment, the prescriber and the family should be in frequent contact about the child's status. Once the treatment regimen has been stabilised, ongoing contact should be maintained to monitor for new side effects and obtain measurements of height, weight and blood pressure. In the absence of intruding side effects, it is not necessary for a child to have regular periods off medication. To confirm the need for continuation of medication, occasional times to reduce or discontinue the medication can be planned with families and are best avoided at the beginning of the school year or other important times of the year.

## **8. ADVERSE EFFECTS OF PSYCHOSTIMULANTS**

Adverse effects vary among individuals. Interpretation and identification of adverse effects require careful observation. Is the possible symptom present before, unchanged by or begun with medication? Does it relate to a dose wearing off, to a dose increase or is it less if psychostimulant treatment is interrupted? Does it occur with either psychostimulant or only one, and at what dose? Is it present in particular situations? Is it affected by other variables - for example, an unreasonable demand on learning disability, change in others' behavioural responses (e.g. relief teachers) or any other disruptive event (e.g. family sickness, disruption or loss)?

Symptoms commonly attributed to psychostimulant side effects can be confused with symptoms of nonresponse, or with symptoms which occur as a dose wears off, or with use of inadequate dosage. By assessing side effects before commencing treatment a clearer picture of what is a medication-induced side effect can be obtained. Different doses used, their times of administration, and their effects on target symptoms and side effects should be documented. Parents and significant caregivers should be appropriately instructed on how to do this.

Common side effects include insomnia, reduced appetite, nervousness, irritability, headache and abdominal pain.

Psychostimulant medication is associated with slower growth than normal in height and weight. Most individuals lose weight for the first few months of treatment, regaining the lost weight after around 12 months. The growth in height is typically 1cm per year less than expected for the first three years of treatment. Catch up growth normally follows cessation of treatment, with individuals' height and weight returning to their original percentiles after 12 to 18 months off treatment. A comprehensive set of growth charts, including weight-for-age, stature-for-age and body mass index-for-age, can be accessed at the U.S. National Center for Health Statistics of the Centers for Disease Control and Prevention website (<http://www.cdc.gov/growthcharts/>). Copies of these charts are provided in the Appendix, along with information on measuring the weight and stature of children and the use and interpretation of the CDC Growth Charts.

In some children, psychostimulant treatment may be accompanied by the onset of tics or the worsening of pre-existing tics. The relationship between the onset of tics and psychostimulant medication is not clear but research suggests it may be

coincidental. The nature, severity and frequency of tics should be monitored and documented and the medication adjusted (or discontinued) accordingly.

Psychostimulants can cause a modest increase in blood pressure and heart rate. Before commencing psychostimulant medication, a child's cardiovascular status should be examined. If there are any abnormal symptoms or findings, or if there is a family history of early cardiac death or arrhythmia, a cardiac consultation should be organised. Blood pressure and heart rate should be regularly measured while a child is on psychostimulant medication. Recommendations concerning the diagnosis, evaluation, and treatment of hypertension in children based on recent scientific evidence have been published by the U.S. National Heart, Lung, and Blood Institute (see References).

The likelihood of minor and serious side effects should be discussed with parents and, where appropriate, the child being treated. Parents should also be informed about what to do when they are concerned that something is wrong with the treatment. Clear lines of contact between the family and the prescriber will facilitate timely changes in medication treatment and minimise the impact of adverse side effects, which is particularly important in the initial phase of treatment.

## **9. NON-PSYCHOSTIMULANT MEDICATION**

While psychostimulants are widely advocated as first-line pharmacological treatment for ADHD, there are other medications that may be used. Atomoxetine (Strattera®), a selective norepinephrine reuptake inhibitor, is the only non-psychostimulant drug specifically indicated for the treatment of ADHD in Australia. Whereas psychostimulants have a relatively quick effect, atomoxetine takes time to reach a steady state. It needs to be taken every day and it may take a week before improvements in symptoms are observed. The full effect may not be seen until after four weeks of treatment.

## **10. POLYPHARMACY**

Associated problems, such as learning difficulties, low self-esteem and co-morbid conditions, need to be addressed. If treatment of ADHD and/or co-morbid conditions results in polypharmacy, the likelihood of side effects increases and careful monitoring becomes even more essential. There are limited controlled scientific studies supporting the efficacy and safety of most non-psychostimulant medications in ADHD. These medications are subject to fewer regulatory prescribing controls than psychostimulant medication. Expert opinion is recommended in these circumstances.

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## **PART B**

### **Legal, Policy and Procedural Issues Relating to the Prescribing of Dexamfetamine, Methylphenidate and Lisdexamfetamine for Attention Deficit Hyperactivity Disorder in Children and Adolescents**

*For the purposes of this document, children and adolescents refer to persons under the age of 18 years.*

#### **1. THE POISONS AND THERAPEUTIC GOODS ACT**

The prescription of dexamfetamine, methylphenidate and lisdexamfetamine (central nervous psychostimulants) is subject to the Poisons and Therapeutic Goods Act, 1966, and its regulations.

This document (Part B) outlines the procedures necessary to ensure compliance with the legislation.

These procedures are monitored by the Stimulants Subcommittee of the Medical Committee constituted under Section 30A of the Poisons and Therapeutic Goods Act 1966. The Subcommittee is constituted to advise the Secretary of the Ministry of Health on the prescription of psychostimulants for children and adolescents.

#### **2. PRESCRIBERS**

##### **2.1. Consultant Paediatricians & Child Psychiatrists**

Child Psychiatrists are Consultant Psychiatrists who are members (or eligible for membership) of the NSW Faculty of Child and Adolescent Psychiatry.

Paediatricians and Child Psychiatrists may apply to the Ministry for a general authority number (CNS Number) to prescribe psychostimulants for patients, without the need for an individual application, provided that:

- Patient management is in accordance with Part A;
- The prescribing is in accordance with the routine prescribing criteria (see over page);
- All prescriptions issued using the CNS number are notified (using the Notification form) to the Ministry each month;
- The prescriber participates in clinical audits concerning the prescription of psychostimulant medications as requested by the Ministry of Health.

An application form for a general authority to prescribe psychostimulants can be obtained at

<http://www.health.nsw.gov.au/pharmaceutical/doctors/Pages/prescribe-psychostimulant.aspx> or by contacting the Pharmaceutical Regulatory Unit.

## 2.2. Other Designated Prescribers (ODPs)

Medical practitioners other than Paediatricians and Child Psychiatrists may apply to prescribe psychostimulants but generally only if approved as an '**Other Designated Prescriber**' (ODP). Generally ODPs are:

- Adult psychiatrists
- Advanced trainees in community paediatrics or child psychiatry
- General practitioners, with paediatric training, working in rural or remote areas
- General practitioners in a predominantly paediatrically orientated practice

Application to be an ODP is made by forwarding to the Stimulants Subcommittee a full resumé including a rationale for the application.

ODPs must obtain an authority for each individual patient (see 'Individual Patient Applications'). Applications which fall outside the routine prescribing criteria (see below) will not be approved. These patients should be referred to a Paediatrician or Child Psychiatrist.

## 3. ROUTINE PRESCRIBING CRITERIA

### 3.1. Age

For prescribing of dexamfetamine and methylphenidate patients must be aged **4** to **17** years (inclusive).

For prescribing of lisdexamfetamine patients must be aged **6** to **17** years (inclusive).

### 3.2. Dosage

Prescribed doses must not exceed:

- **1mg/kg/day** for **dexamfetamine**, up to a maximum of **50mg per day**
- **2mg/kg/day** for **methylphenidate**, up to a maximum of **108mg per day**
- a maximum of **70mg lisdexamfetamine** per day

### 3.3. Absence of exclusionary factors (see below)

## 4. EXCLUSIONARY FACTORS

Routine prescribing is not available for patients in whom:

- the age is under 4 years when prescribed methylphenidate or dexamfetamine,
- the age is under 6 years when prescribed lisdexamfetamine,
- the dosage is higher than the range specified above,
- the DSM-IV criteria for ADHD are not fulfilled,
- there are significant side effects,
- there is severe psychiatric co-morbidity, or

- there exists a severe tic causing significant impairment and distress or requiring treatment in its own right.

**Paediatricians and Child Psychiatrists must make individual patient applications for patients outside the routine prescribing criteria.**

**NB 1** - Psychosis is an absolute contraindication to psychostimulant therapy.

**NB 2** - Concerns about, or evidence of, the misuse of appropriately prescribed psychostimulant medication should be discussed with the patient and his/her parents and the appropriate measures taken to address the misuse. These concerns should be notified in writing to the Stimulants Subcommittee.

The Subcommittee can request reports and/or other opinions on any patient within or outside routine criteria.

## **5. PROCEDURES FOR APPLICATION FOR AUTHORITY TO PRESCRIBE FOR CASES OUTSIDE THE CRITERIA**

### 5.1. Age

#### 5.1.1. Children under two years of age

Authorities will not be granted.

#### 5.1.2. Children aged two

Before the initiation of psychostimulant therapy, an application accompanied by a second opinion must be forwarded and approved.

Three months is the maximum length of authority for children aged two.

Within three months, the original prescriber, **and** the specialist giving the second opinion, must provide reports indicating that psychostimulant therapy is appropriate.

Applications for authority **renewals** for children aged two must be accompanied by a report from the initial prescriber **and** from the specialist giving the second opinion, **until age three**.

Second opinions must come from a practitioner experienced in the area and where possible from a different specialty to the prescriber. Reports from other observers (e.g. parents, caregivers, teachers) on medication effects are essential with subsequent applications.

The clinical reports for all applications for this age group will be considered by the Stimulants Subcommittee.

#### 5.1.3 Children aged three

A generally authorised prescriber may initiate a trial of dexamfetamine and/or methylphenidate using the prescriber's CNS number. A full clinical report must be forwarded within three months of the onset of the trial so that authorisation of further prescription can be considered.

#### 5.1.4 Children aged four

A progress report is required at age four years for all patients commenced on dexamfetamine and/or methylphenidate prior to age four years and where psychostimulant treatment is continuing.

#### 5.2 High dosage

For children who otherwise meet the routine prescribing criteria, a dose higher than the routine prescribing criteria dose may be trialled. An individual patient application must be submitted **within one month** of commencing the trial. All applications to prescribe for a dose higher than that specified in the routine prescribing criteria must be submitted with the following documentation:

- current clinical summary including the reasons for not using the alternate psychostimulant medication within the criteria (e.g. if applying for dexamfetamine, reasons must be provided as to why a dose of methylphenidate of 2mg/kg/day or less is not being used),
- growth charts or height/weight percentiles for the period from the commencement of psychostimulant treatment to the present (NB: where available, growth details obtained prior to the commencement of treatment should be provided), and
- reports from relevant observers (e.g. parents, teachers) documenting the advantages of using a dose higher than that specified in the routine prescribing criteria.

An application form for approval to prescribe a dose higher than that specified in the routine prescribing criteria can be obtained at

<http://www.health.nsw.gov.au/pharmaceutical/doctors/Pages/prescribe-psychostimulant.aspx> or by contacting the Pharmaceutical Regulatory Unit.

### 6. INDIVIDUAL PATIENT APPLICATIONS

Authorisation for **Other Designated Prescribers** to prescribe psychostimulants can only be granted following individual patient application. **All applications must fall within the routine prescribing criteria.**

Individual patient applications by generally authorised prescribers (**Paediatricians and Child Psychiatrists**) for cases which fall **outside** the routine prescribing criteria, need to be accompanied by a thorough clinical report. The report, as appropriate, should outline the clinical history, the patient's height and weight (with measurements plotted on CDC Growth Charts), the differential diagnoses, assessments made or planned, the presence or absence of co-morbid conditions, the family circumstances, and all other treatments instituted or planned.

An application form for an individual patient authority can be obtained at <http://www.health.nsw.gov.au/pharmaceutical/doctors/Pages/prescribe-psychostimulant.aspx> or by contacting the Pharmaceutical Regulatory Unit.

Individual patient applications by generally authorised prescribers for cases falling outside the routine prescribing criteria will be referred to the Stimulants

Subcommittee which meets four times per year. An interim authority will often be granted pending subsequent consideration by the Subcommittee.

Prescriptions written following **individual patient authorisations** should not be included in the monthly summary (Notification form).

## **7. TREATMENT OF OLDER ADOLESCENTS AND YOUNG ADULTS**

### **7.1. Adult Psychiatrists**

Adult Psychiatrists may initiate treatment in patients who are aged 16 to 17 years (inclusive).

### **7.2. Paediatricians**

Treatment cannot be initiated by a Paediatrician in a patient who is 18 years of age or older.

A Paediatrician who has diagnosed and treated a patient for ADHD prior to their 18<sup>th</sup> birthday may, in extenuating circumstances including an ongoing therapeutic relationship, continue treatment with psychostimulants until age 25. Prescribing for persons aged 18 years or over must be in accordance with the latest version of TG190 'Criteria for the Diagnosis and Management of Attention Deficit Hyperactivity Disorder in Adults' available at

<http://www.health.nsw.gov.au/pharmaceutical/doctors/Pages/prescribe-psychostimulant.aspx> or by contacting the Pharmaceutical Regulatory Unit.

Provided that management is in accordance with the criteria and conditions outlined in TG190, prescriptions may be endorsed with a Paediatrician's CNS number and notified to the Ministry on a monthly basis using the latest version of the notification form provided for this purpose.

Under TG190, the maximum daily dose that may be prescribed to a person aged 18 years or over without an individual patient authority is:

**30mg dexamfetamine**

**60mg methylphenidate**

**70mg lisdexamfetamine**

Therefore, where a patient is continuing on a dose higher than those specified in TG190, an application for approval to continue prescribing should be submitted as soon as practicable after the patient turns 18 years of age, unless a valid authority already exists.

An application form to prescribe psychostimulants for a patient aged 18 year or over (as required under TG190) can be obtained at

<http://www.health.nsw.gov.au/pharmaceutical/doctors/Pages/prescribe-psychostimulant.aspx> or by contacting the Pharmaceutical Regulatory Unit.

By age 25 years the patient must be referred to a Psychiatrist or Neurologist if further psychostimulant prescribing is required.

## 8. NOTES ON PRESCRIPTIONS FOR PSYCHOSTIMULANTS

All prescriptions for dexamfetamine, lisdexamfetamine and methylphenidate must be endorsed, in the prescriber's handwriting, with either the CNS authority number issued (**CNS** .....) or the state authority number (**Ref No** .....) where an individual authority has been obtained.

Prescriptions for Schedule 8 drugs are only valid for 6 months and must specify repeat intervals if repeats are ordered. Prescriptions may be issued for a shorter period than 6 months if considered appropriate. Further information about prescribing Schedule 8 drugs can be found in TG12 'Guide to the Poisons and Therapeutic Goods Legislation for Medical, Nurse and Midwife Practitioners and Dentists' available at:

<http://www.health.nsw.gov.au/pharmaceutical/doctors/Pages/guides-legislation-medical-practitioners.aspx>

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## APPENDIX

- Measuring Weight and Stature of Children
- CDC Growth Charts
- Use and Interpretation of the CDC Growth Charts

## MEASURING WEIGHT AND STATURE OF CHILDREN

*Note: This document should be read in conjunction with the Centers for Disease Control and Prevention Use and Interpretation of the WHO and CDC Growth Charts for Children from Birth to 20 years in the United States (Accessed on April 12, 2016, at*

<http://www.cdc.gov/nccdphp/dnpa/growthcharts/resources/growthchart.pdf>)

Children undergoing treatment with psychostimulant medication should be monitored for potential effects on their rate of growth. Effective growth monitoring needs precise measurement, accurate plotting on appropriate charts and correct interpretation.

### 1. Measuring Child and Adolescent Weight

- A child older than 36 months is weighed standing on a scale.
- A calibrated beam balance or electronic scale should be used.
- The child must stand without assistance.
- The child should wear lightweight undergarments, a gown, or negligible outer clothing.
- The child should stand on the centre of the scale platform.
- Read the measurement to the nearest 0.01 kg or ½ oz. And write it down.
- Reposition the child on the scale and repeat the measurement.
- The measures should agree within 0.1 kg or ¼ lb. If they do not, the child should be repositioned and remeasured a third time. The average of the two measures in closest agreement is recorded on the chart.
- Plot the weight measurement on the growth chart appropriate for age and sex.
- Calculate age by subtracting the birth date from the date of the measurement. It may be necessary to convert months to days and years to months to calculate the exact age.

### 2. Measuring Child and Adolescent Stature

- Stature (rather than length) should be measured for children over age three years.
- A calibrated vertical stadiometer with a right-angle headpiece should be used.
- The child is measured standing with heels, buttocks, and shoulders touching a flat upright surface.
- Hair ornaments, buns, braids etc are to be removed.
- The child should stand on the stadiometer footplate without shoes. Heels should be together, legs straight, arms at sides, and shoulders relaxed.
- Ask the child to stand fully erect without altering the position of the heels. Make sure the heels do not rise off the foot plate.
- The child should look straight ahead.
- Lower the perpendicular headpiece snugly to the crown of the head with sufficient pressure to compress the hair.
- The measurer's eyes should be parallel with the headboard.
- Read the measurement to the nearest 0.1 cm or 1/8 inch and write it down.
- Reposition the child and repeat the measurement.
- The measures should agree within 1 cm or ¼ inch. If they do not, the child should be repositioned and remeasured a third time. The average of the two measures in closest agreement is recorded on the chart.
- Plot the stature measurement on the growth chart appropriate for age and sex.
- Calculate age by subtracting the birth date from the date of the measurement. It may be necessary to convert months to days and years to months to calculate the exact age.

Reference: U.S. Department of Health and Human Services, Health Resources and Services Administration, Maternal and Child Health Bureau. *Accurately Weighing and Measuring: Technique* (Accessed on April 12, 2016 at <http://depts.washington.edu/growth/module4/text/intro.htm>)

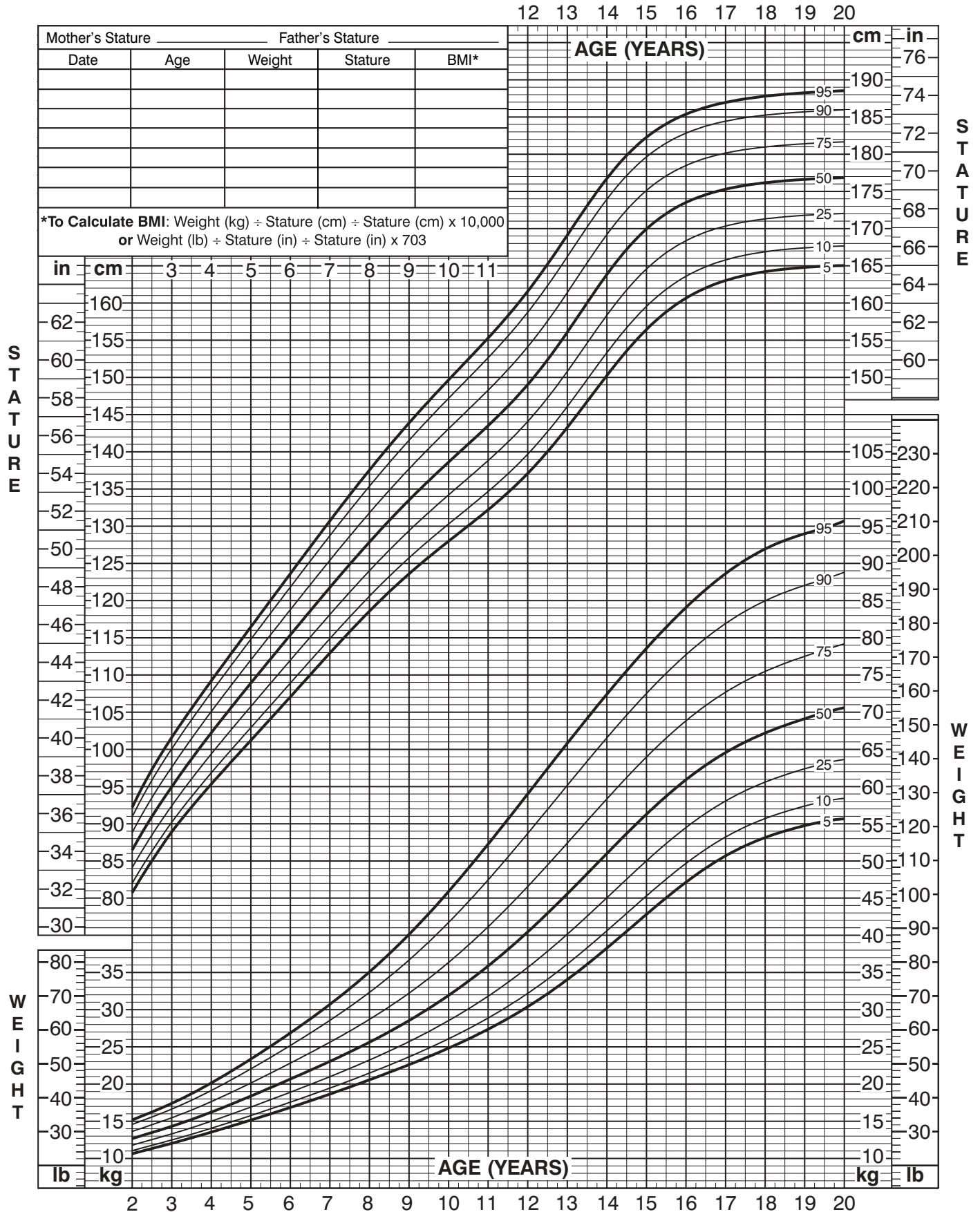


# 2 to 20 years: Boys

## Stature-for-age and Weight-for-age percentiles

NAME \_\_\_\_\_

RECORD # \_\_\_\_\_



Published May 30, 2000 (modified 11/21/00).

SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).  
<http://www.cdc.gov/growthcharts>



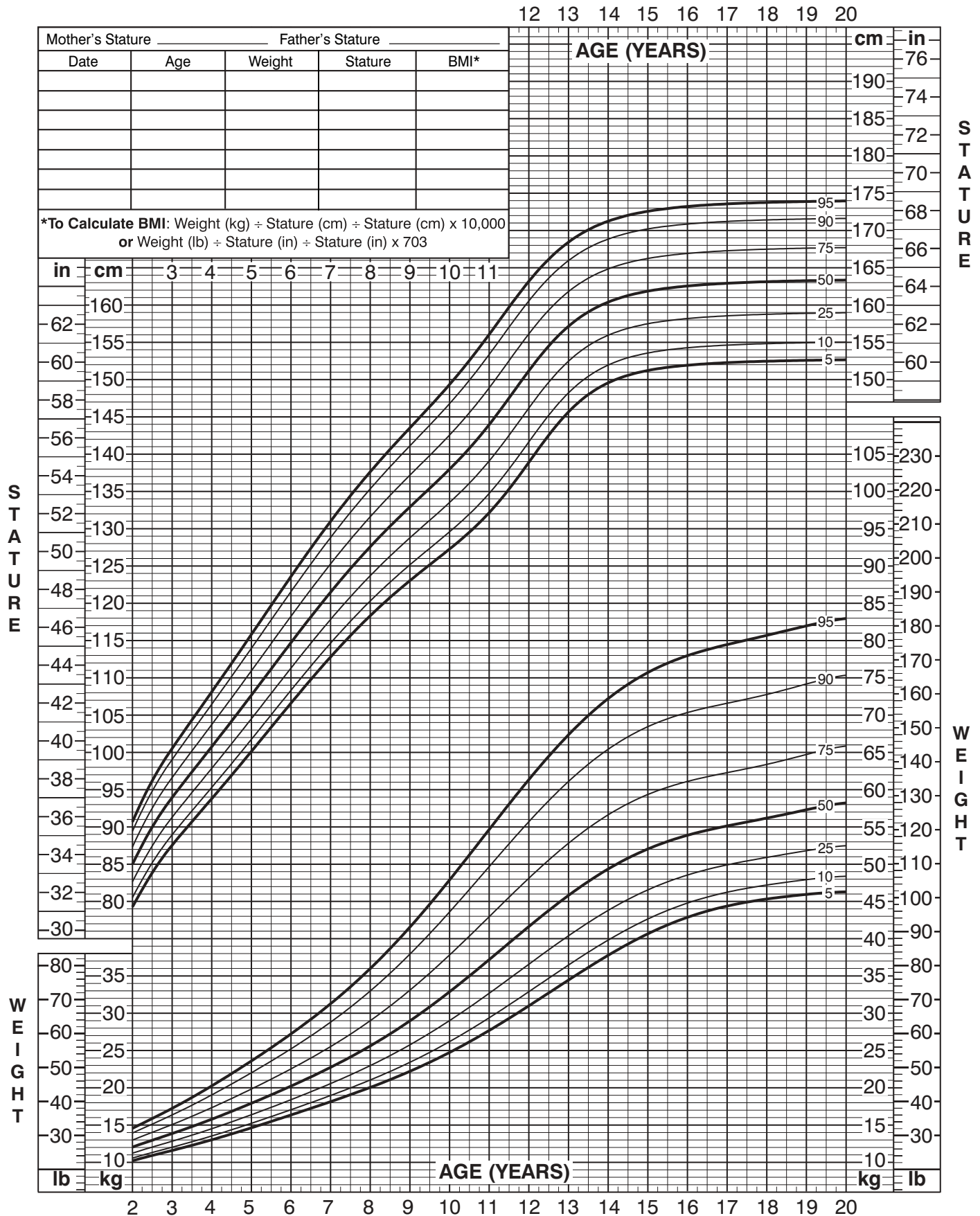
SAFER • HEALTHIER • PEOPLE™



# 2 to 20 years: Girls Stature-for-age and Weight-for-age percentiles

NAME \_\_\_\_\_

RECORD # \_\_\_\_\_



Published May 30, 2000 (modified 11/21/00).

SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).  
<http://www.cdc.gov/growthcharts>





# Use and Interpretation of the WHO and CDC Growth Charts for Children from Birth to 20 Years in the United States

## CDC Recommendation

- Use the WHO growth charts for all children from birth up to 2 years of age to monitor growth in the United States. The WHO growth standards for children younger than 2 years have been adapted for use in the United States.\*
- Use the CDC growth charts for children and teens aged 2 through 19 years to monitor growth in the United States.\*

## Background

- The WHO growth charts are international standards that show how healthy children should grow. The standards describe the growth of children living in six countries (including the United States) in environments believed to support optimal growth. One of the several criteria defined for optimal growth is breastfeeding. The WHO growth charts use the growth of breastfed infants as the norm for growth. This is in agreement with national guidelines that recommend breastfeeding as the optimal infant feeding method. The WHO growth charts should be used with all children up to aged 2 years, regardless of type of feeding.
- The CDC growth charts are a national reference that represent how US children and teens grew primarily during the 1970s, 1980s and 1990s. The CDC recommends using the references from ages 2 through 19 years so health care providers can track weight, stature, and body mass index (BMI) from childhood through age 19 years.

## Purpose

- This guide instructs health care providers on how to use and interpret the WHO and CDC growth charts to assess physical growth among children and teens. Comparing body measurements with the appropriate age- and sex-specific growth chart enables health care providers to monitor growth and identify potential health- or nutrition-related problems.
- During routine screening, health care providers assess physical growth using the head circumference, weight and length of infants and children up to 2 years of age and the weight, stature (also referred to as height), and BMI of children and teens from aged 2 through 19 years. Although one measurement plotted on a growth chart can be used to screen children for nutritional risk, it does not provide adequate information to determine the child's growth pattern. When plotted correctly, a series of accurate measurements offer important information about a child's growth pattern. Gestational age, birth weight, and parental stature should be considered since they may influence a child's growth pattern. Parental stature, for example, should be considered before assuming there is a health or nutrition concern. Other factors, such as the presence of a chronic illness or special health care need, must be considered, and further evaluation may be necessary.

## STEP

# 1

**Obtain accurate measurements** When weighing and measuring children, follow procedures that yield accurate measurements and use equipment that is well maintained. For information about accurate weighing and measuring procedures, see *Accurately Weighing and Measuring Infants, Children and Adolescents: Technique* at <http://depts.washington.edu/growth/module5/text/page1a.htm>

# 2

**Select the appropriate growth chart** Select the growth chart to use based on the age and sex of the child being weighed and measured.

*Enter the child's name and the record number, if appropriate.*

Use the charts listed below when measuring weight and length of children from **birth up to 2 years of age:**

- WHO Weight-for-age
- WHO Length-for-age
- WHO Weight-for-length

Use the charts listed below when measuring weight and stature in children and teens aged **2 through 19 years:**

- CDC Weight-for-age
- CDC Stature-for-age
- CDC BMI-for-age

# 3

**Record data** After selecting the appropriate chart and entering the patient’s name and record number, if appropriate, complete the data entry table.

First, record information about factors obtained at the initial visit that influence growth.

- Enter mother’s and father’s stature as reported.
- Enter the gestational age in weeks. (Omit this step when using the CDC growth charts for children and teens aged 2 to 20 years.)

The next line is reserved for recording the child’s birth data. (Omit this step when using the CDC growth charts for children and teens aged 2 to 20 years.)

- Enter the date of birth.
- Enter birth weight and length.
- Add notable comments (e.g., breastfeeding).

Record information obtained during the current visit.

- Enter today’s date.

Determine age to the nearest month for infants and children up to 2 years and to the nearest 1/4-year for children aged 2 to 20 years.

- Enter the child’s age.
- Enter weight, and length or stature, immediately after taking the measurement.
- Add any notable comments (e.g., was not cooperative).

**Example of how to calculate the child’s age:** To calculate Sam’s age, subtract his birth date from the date of the visit or measurement. To subtract, it will be necessary to convert months to days and years to months if either the month or day in the birth data is larger than in the date of measurements. When converting one month to days, subtract 1 from the number of months in the date of measurement, then add 28, 30, or 31, as appropriate, to the number of days. When converting one year to months, subtract 1 from the number of years in the date of measurement, then add 12 to the number of months.

	Year	Month	Day
Date of Measurement	1998	4	4
Convert one month to days		(-1)	(+30)
	1998	3	34
Convert one year to months	(-1)	(+12)	
	<b>1997</b>	<b>15</b>	<b>34</b>
Birth Date	1994	9	15
Child’s Age	3	6	19

**Sam is aged 3 years, 6 months, and 19 days.**

Days → Months		Months → Year	
0-15	0	0-1	40
16-31	1	2-4	1/4
		5-7	1/2
		8-10	3/4
		11-12	1

**Using the guide above, 3 years, 6 months, and 19 days is rounded to 3 years and 7 months. Because age for children over 2 is rounded to the nearest ¼ year, Sam’s age is rounded to 3 ½ years.**

# 4

**Calculate BMI when a child is aged 2 to 20 years** BMI is calculated using weight and stature measurements, then used to compare a child's weight relative to stature with other children of the same age and sex in the reference population.

- Using a calculator, hand-held device or software, determine BMI using the calculation below.

$$\text{BMI} = \text{Weight (kg)} \div \text{Stature (cm)} \div \text{Stature (cm)} \times 10,000$$

Or

$$\text{BMI} = \text{Weight (lb)} \div \text{Stature (in)} \div \text{Stature (in)} \times 703$$

It is necessary to convert the weight and stature measurements to the appropriate decimal value shown in Table 1.

Example: 37 lbs. 4 oz. = 37.25 lbs., 41-1/2 inches = 41.5 in.

**Table 1. Decimal Conversions**

Fraction	Ounces	Decimal
1/8	2	.125
1/4	4	.25
3/8	6	.375
1/2	8	.5
5/8	10	.625
3/4	12	.75
7/8	14	.875

- Enter BMI to one place after the decimal point (Example: 15.204 = 15.2).

For more information and additional resources on calculating BMI, see *Using the CDC BMI-for-age Growth Charts for Children and Teens Aged 2 to 20 Years* at

<http://www.cdc.gov/nccdphp/dnpa/growthcharts/training/modules/module1/text/page1a.htm>

# 5

**Plot measurements** On the appropriate WHO or CDC growth chart, plot the measurements recorded in the data entry table for the current visit.

- Find the child's age on the horizontal axis. When plotting weight-for-length, find the length on the horizontal axis. Use a straight edge or right-angle ruler to draw a vertical line up from that point.
- Find the appropriate measurement (weight, length, stature, or BMI) on the vertical axis. Use a straight edge or right-angle ruler to draw a horizontal line across from that point until it intersects the vertical line.
- Make a small dot where the two lines intersect.

# 6

**Interpret the plotted measurements** The curved lines on the growth chart show selected percentiles that indicate the rank of the child’s measurement. For example, when the dot is plotted on the 95th percentile line on the CDC BMI-for-age growth chart, it means that 5 of 100 children (5%) of the same age and sex in the reference population have a higher BMI-for-age.

**The WHO growth standard charts use the 2nd and the 98th percentiles** as the outer most percentile cutoff values indicating abnormal growth.

**The CDC growth reference charts use the 5th and the 95th percentiles** as the outermost percentile cutoff values indicating abnormal growth.

Interpret the plotted measurements based on the percentile ranking on the WHO or the CDC growth charts and the percentile cutoff value corresponding to the nutrition indicator shown in the table below. If the percentile rank indicates a nutrition-related health concern, additional monitoring and assessment are recommended.

- Determine the percentile rank.
- Determine if the percentile rank suggests that the anthropometric index is indicative of nutritional risk based on the percentile cutoff value.
- Compare today’s percentile rank with the rank from previous visits to identify any major shifts in the child’s growth pattern and the need for further assessment.

When transitioning from the WHO growth charts to the CDC growth charts at aged 2 years, a change in growth classification may occur. During this transition, caution should be used in interpreting any changes in classification.

Anthropometric Index	Percentile Cut-off Values	Nutritional Status Indicato
<b>WHO Growth Charts 2nd and 98th percentiles</b>		
Length-for-age	< 2nd	Short stature
Weight-for-length	< 2nd	Low weight-for-length
Weight-for-length	> 98th	High weight-for-length
<b>CDC Growth Charts 5th and 95th percentile</b>		
BMI-for-age	≥ 95th	Obesity
BMI-for-age	≥ 85th and < 95th	Overweight
BMI-for-age	< 5th	Underweight
Stature-for-age	< 5th	Short Stature

## References and Resources

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2. Barlow SE; and the Expert Committee. Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: summary report. *Pediatrics*. 2007;120(suppl 4):S164-S192. [http://pediatrics.aappublications.org/cgi/content/abstract/120/Supplement\\_4/S164](http://pediatrics.aappublications.org/cgi/content/abstract/120/Supplement_4/S164)
3. Grummer-Strawn LM, Reinold C, Krebs NF; Centers for Disease Control and Prevention (CDC). Use of the World Health Organization and CDC growth charts for children aged 0-59 months in the United States. Recommendations and Reports. *MMWR Recomm Rep* 2010; 59(RR-9);1-15. <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5909a1.htm>
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5. World Health Organization. *Physical Status: The Use and Interpretation of Anthropometry*. Geneva: World Health Organization, 1995. WHO Technical Report Series 854.
6. World Health Organization. *WHO Child Growth Standards: Length/Height-for-Age, Weight-for-Age, Weight-for-Length, Weight-for-Height and Body Mass Index-for-Age: Methods and Development*. Geneva: World Health Organization; 2006.

\*The WHO and CDC growth charts are available at [http://www.cdc.gov/growthcharts/who\\_charts.htm](http://www.cdc.gov/growthcharts/who_charts.htm) and [http://www.cdc.gov/growthcharts/clinical\\_charts.htm](http://www.cdc.gov/growthcharts/clinical_charts.htm)