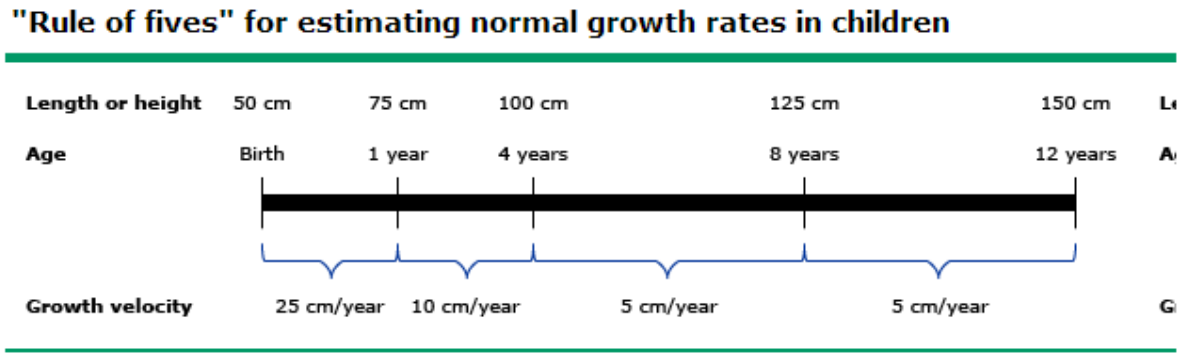
Height



At **birth** 50 cm, **0-1 yr** grow 25 cm, **1-2 yr** grow 10 cm, **2-4 yr** grow 7.5 cm/yr, **4 yr-puberty** 5 cm/yr.

Birth height increased by half at 1 yr, doubled by 4 yr. Children reach one-half of their adult height by 24 to 30 months. There is a normal deceleration of height velocity before the pubertal growth spurt.

Tall stature

Infancy
Maternal diabetes mellitus
Cerebral gigantism (Sotos syndrome)
Beckwith-Wiedemann syndrome
In childhood and adolescence
Endocrine disorders
Precocious puberty
Central precocious puberty
Peripheral precocious puberty (congenital adrenal hyperplasia and others)
Growth hormone excess
Thyrotoxicosis
Sex hormone deficiency or insensitivity
Familial glucocorticoid deficiency (FGD)
Congenital total lipodystrophy
Non-endocrine disorders
Familial (Constitutional) tall stature
Exogenous obesity
Klinefelter syndrome
XYY syndrome
Marfan syndrome
Homocystinuria
Neurofibromatosis Type I

Short stature

Classification of short stature based upon the relationship between chronologic age, height age, weight age, bone age, and growth rate:

- Intrinsic shortness – Intrinsic shortness is characterized by inherent limitations of bone growth and predicts adult short stature.
- Delayed growth – Delayed growth is defined as a bone age closer to height age than chronologic age and predicts "normal" adult stature.
- Attenuated growth – Attenuated growth is characterized by a growth rate that is so slow that the child progressively deviates from a previously defined growth channel (or percentile). Because the height age approximates the bone age, adult height potential is often normal, but only after remedial action is taken for one of the many possible causes.
- Accelerated early growth but early epiphyseal maturation – Certain conditions are associated with rapid childhood growth but more rapid advancement of bone age, resulting in short stature as an adult.

Intrinsic shortness
Familial (genetic) short stature
Turner's syndrome
Delayed growth*
Subtle undernutrition
Underlying disease of mild to moderate severity
Attenuated growth •
Malnutrition
Chronic renal failure
Metabolic acidosis
Cancer - includes chemotherapy and cranial radiotherapy
Glucocorticoid excess
Pulmonary disease
Asthma
Cystic fibrosis
Cardiac disease
Gastrointestinal disease Δ
Inflammatory bowel disease
Celiac disease
Immunologic disease
Human immunodeficiency virus (HIV) infection
Severe combined immunodeficiency
Metabolic and endocrine disease
Vitamin D deficiency or resistance
Growth hormone deficiency
Growth hormone insensitivity
Hypothyroidism
Accelerated early growth but more accelerated epiphyseal closure ◇
Central precocious puberty
Pseudoprecocious puberty
Virilizing forms of congenital adrenal hyperplasia
Longstanding hyperthyroidism

* Delayed growth is characterized by bone age that is closer to height age than to chronologic age; adult height is often normal.
• Attenuated growth is characterized by progressive deviation from previously defined growth channel or percentile.
Δ Patients with underlying gastrointestinal diseases are often underweight for height.
◇ If untreated, these tall children become short adults.

Head circumference

At **birth** 35 cm, **0-1 yr** grows 12 cm (2 cm/mo for first 3 mo), **1-4 yr** 10 cm.

Microcephaly

Isolated microcephaly (true microcephaly, microcephaly vera)
Autosomal recessive (eg, autosomal recessive primary microcephaly types 1 through 6, Amish lethal microcephaly
Autosomal dominant
X-linked microcephaly
Chromosomal abnormalities and syndromes
Trisomies (eg, 21, 18, 13)
Monosomy 1p36 deletion
Seckel syndrome
Smith-Lemli-Opitz syndrome
Williams syndrome (7q11.23 deletion)
Cornelia de Lange syndrome
Miller-Dieker syndrome (17p13.3 deletion)
Wolf-Hirschhorn syndrome (4p deletion)
Cri-du-chat syndrome (5p15.2 deletion)
Mowat-Wilson syndrome
Rubinstein-Taybi syndrome
Pseudo-TORCH syndrome
Cockayne syndrome
Bloom syndrome
Angelman syndrome
Neuroanatomic abnormalities
Neural tube defects (eg, anencephaly, hydranencephaly, encephalocele)
Holoprosencephaly
Atelencephaly (aprosencephaly)
Lissencephaly
Schizencephaly
Polymicrogyria
Pachygyria (macrogyria)
Fetal brain disruption sequence
Metabolic disorders
Maternal diabetes mellitus
Untreated maternal phenylketonuria
Phenylketonuria
Methylmalonic aciduria
Citrullinemia
Neuronal ceroid lipofuscinosis
Environmental causes
Congenital infection (eg, cytomegalovirus, herpes simplex virus, rubella, varicella, toxoplasmosis, human immunodeficiency virus, syphilis, enterovirus)
Meningitis
In utero drug or toxin exposure (eg, alcohol, tobacco, marijuana, cocaine, heroin, antineoplastic agents, antiepileptic agents, radiation, toluene)
Perinatal insult (eg, hypogycemia, hypothyroidims, hypopituitarism, hypoadrenocorticism)
Anoxia/ischemia

Macrocephaly

Increased brain (megalencephaly)
Anatomic
Familial megalencephaly
Neurocutaneous disorders (eg, neurofibromatosis, tuberous scleorsis, linear sebaceous nevus syndrome, Sturge-Weber syndrome, Klippel-Trenaunay-Weber syndrome, nevoid basal call carcinoma syndrome [Gorlin syndrome])
Autism spectrum disorder
Achondroplasia
Cerebral gigantism (Sotos syndrome)
Fragile X syndrome
PTEN hamartoma syndromes (eg, Cowden syndrome, Bannayan-Riley-Ruvalcaba)
Metabolic
Leukodystrophies (eg, Alexander, Canavan, megalencephalic leukoencephalopathy)
Lysosomal storage disorders (eg, Tay-Sachs, mucopolysaccharidosis, gangliosidosis)
Increased cerebrospinal fluid
Hydrocephalus*
Benign enlargement of the subarachnoid space
Hydranencephaly
Choroid plexus papilloma
Increased blood
Hemorrhage (intraventricular, subdural, epidural, subarachnoid)
Arteriovenous malformation
Increased bone
Bone marrow expansion (eg, thalassemia major)
Primary bone disorders (eg, skeletal and cranial dysplasias such as achondroplasia, osteogenesis imperfecta, cleidocranial dysostosis, metaphyseal dysplasia, osteopetrosis, hyperphosphatasia)
Increased intracranial pressure
Idiopathic (pseudotumor cerebri)
Infection or inflammation (eg, meningitis)
Toxins (eg, lead)
Metabolic abnormalities (eg, vitamin A deficiency or excess, galactosemia)
Mass lesions
Intracranial cyst
Intracranial tumor
Intracranial abscess

Weight

Term neonates may lose 5-10% of their birth weight in the first few days of life and typically regain their birth weight by 10 to 14 days.

At **birth** 3.5 kg, **0-3 mo** gain ~30 g/day, **3-6 mo** gain ~20 g/day, **6-12 mo** gain ~10 g/day, **2 yr - puberty** gain ~2 kg/year.

Birth weight doubled by 4 mo, tripled by 1 yr, quadrupled by 2 yr.

Obesity

Dietary and sedentary lifestyle
Endocrine
Drugs (e.g. anticonvulsants, antidiabetic drugs, beta blockers)
Hypothyroidism
Cortisol excess (corticosteroid medication, Cushing syndrome)
Growth hormone deficiency
Pseudohypoparathyroidism
ROHHADNET syndrome (rapid onset obesity, hypothalamic dysfunction, hypoventilation, autonomic dysregulation, neural crest tumors)

Acquired hypothalamic lesions
After surgery for craniopharyngioma
Diencephalic tumor
Congenital or acquired hypoventilation syndromes
Genetic syndromes
Albright hereditary osteodystrophy (Pseudohypoparathyroidism type 1a)
Beckwith-Wiedemann, Prader-Willi
Carpenter, Cohen
Laurence-Moon, Bardet-Biedl, Alström

Failure to thrive