

# THE UNOFFICIAL GUIDE TO BLOOM SYNDROME

First Edition  
July 9, 2018

A Handbook for Families and Persons with Bloom Syndrome,  
Written by Families and Persons with Bloom Syndrome

*Disclaimer: Information provided in this handbook about medications, treatments or products should not be construed as medical instruction or endorsement. Always consult your physician before taking any action based on this information.*

## Welcome!

Whether you or a loved one has just received a diagnosis of Bloom syndrome, or whether you've known about Bloom syndrome for many years, you likely have a lot of questions. This handbook was developed out of a meeting<sup>1</sup> of families just like you – it is intended to summarize the current state of understanding of Bloom syndrome in plain language, to highlight what is known and what is not known, and also provide some "insider" information based on our experiences and those of others.

This handbook is designed to be a "living document." In order to keep it alive, we seek your input in the form of comments, additions, personal anecdotes, and corrections that can be emailed to the handbook editor, through a [contact form](#) on the Bloom's Syndrome Association website.

Bloom syndrome is a rare condition and trying to find the information you need to best care for yourself or your loved ones can be a challenge, and quite honestly, quite frightening and overwhelming to absorb. We hope that this handbook helps you on your journey.

**As stated in the disclaimer above, always talk with your doctor before taking any action based on anything written in this handbook.**

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<sup>1</sup> The 2017 Bloom Syndrome Nanocourse held at the Children's Cancer Therapy Development Institute in Beaverton, OR, August 14-18, 2017

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# I - Introduction

## What is Bloom syndrome?

Bloom syndrome (BS) is a genetic condition that has the following features:

- Small size (both before birth and after) - more in [Chapters II](#) and [III](#)
- (Often) A skin rash that develops in the sun – more in [Chapter IV](#)
- Immunodeficiency, meaning that the immune system does not function properly, potentially leading to more infections or illnesses - more in [Chapter V](#)
- A greater risk of developing diabetes or other related endocrine issues – more in [Chapter VII](#)
- A greatly increased risk of cancer – more in [Chapter X](#)

All that sounds really scary, but you should also realize that persons with Bloom syndrome, while living with a chronic condition, are for the most part happy, healthy individuals who live productive lives. The authors of this handbook are probably not so different from you, and certainly do not spend all their time worried about this diagnosis and its consequences. Healthy people with Bloom syndrome are healthy!

## How is Bloom syndrome caused?

Bloom syndrome is a recessive genetic condition, which means that every person with Bloom syndrome has two non-functioning copies of their Bloom gene (*BLM*).

Genes are passed down from parent to child. In the vast majority of cases, a person with Bloom syndrome inherited one mutated gene from their mother and one mutated gene from their father, who were both "carriers" of Bloom syndrome. (In other, much more rare cases, a mutation may have arisen spontaneously very early on in utero.) Carriers do not show any obvious signs of Bloom syndrome (more on that in [Chapter XII](#)), so they often do not know they are carriers until after having had a child who is diagnosed with Bloom syndrome.

If you and/or your child have had your *BLM* gene sequenced, please share that information with the Bloom Syndrome Registry (see [Appendix A](#)). The Registry can tell you whether it is a known mutation or whether you're the first known person to have it!

## How is Bloom syndrome diagnosed?

Bloom syndrome is diagnosed either clinically (through observable features) or through laboratory testing. Historically, diagnoses were made through clinical observations of short stature, potentially a facial rash, and/or other features consistent with Bloom syndrome. These days, the diagnosis is typically first suspected through clinical observation and fully confirmed through genetic testing.

## I've heard 23andMe tests for Bloom syndrome. Can I or my child be tested to confirm our diagnosis of Bloom syndrome?

23andMe is a direct-to-consumer genetic testing company that does offer a Food and Drug Administration (FDA)-approved test for Bloom syndrome. However, this test will ONLY detect the known mutation that is common in Ashkenazi Jewish population, sometimes referred to as *BLM<sub>Ash</sub>*. If your mutation is one of the many others that can cause Bloom syndrome, the 23andMe test will not reveal your mutation. If you suspect your child has Bloom syndrome, or if you are curious about which mutation(s) have caused your or your child's Bloom syndrome, talk with your doctor about ordering a more comprehensive genetic test that will test for all known mutations that cause Bloom syndrome.

## Who discovered Bloom syndrome?

Bloom syndrome was discovered by Dr. David Bloom in New York City in 1954, where he noticed 3 children who were short and had rashes on their faces. He suggested that this was a genetic syndrome, which was later confirmed through the mapping of the *BLM* gene in the 1990s.

## How many people have Bloom syndrome?

The Bloom's Syndrome Registry has documented 287 cases of Bloom syndrome. There are likely others with Bloom syndrome, as not all cases have been reported to the Registry, and it may be that the condition is underdiagnosed in many countries. With genetic sequencing becoming more common, and the internet allowing people from across the world to connect more easily, it is likely that more cases will be seen in the coming years.

## What is the prognosis of Bloom Syndrome?

One of the first (and probably very scary) things that people faced with a new diagnosis find online is that the median life span of persons with Bloom syndrome is 27 years old.<sup>2</sup> *This does not mean that the life expectancy of a child who was just diagnosed with BS is 27 years!* This number is a figure that is based on *all* of the records in the registry, going back to the 1960s, and our understanding on how to screen for and treat cancers has advanced immensely over the past half century! According to the Registry, at least one individual lived to be 60 years old, which appears to be an outlier. Nevertheless, some other persons with Bloom Syndrome have lived to be 50, and more and more are living into their 40s.

That said, there are many complications that can be caused by Bloom syndrome, affecting many different systems of the body. Make sure your doctor understands Bloom syndrome and if he or she doesn't, share this document with them and refer them to the resources listed. Your health may depend on it!

## What organizations exist to support persons and families with Bloom Syndrome?

There are several groups and organizations that focus on research, support, and community for persons with Bloom syndrome and their families.

- The Bloom Syndrome Registry (“BSR”):
  - The BSR is the home for information on persons with Bloom syndrome. Their work helps drive research on Bloom syndrome, and it is critical that we help the Registry by providing information (given that Bloom syndrome is such a rare condition, every case matters!).
  - See: <http://weill.cornell.edu/bsr/>
  - You may contact Dr. Chris Cunliff, the current head of the BSR at: [cmc9039@med.cornell.edu](mailto:cmc9039@med.cornell.edu).
  - See more about the BSR in [Appendix A](#).
- Bloom’s Syndrome Association (“BSA”):
  - The BSA is an international family support and patient advocacy organization for persons affected by Bloom syndrome. The mission of the BSA is “to foster interactions among its members, so that they might learn from and support one another; to raise funds for research to advance treatments and a cure for Bloom’s syndrome; and to raise public

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<sup>2</sup> See, for example: <http://www.bloomssyndromeassociation.org/page/aboutbloomssyndrome>

awareness about the syndrome and its importance to worldwide cancer research.”

- See: <http://www.bloomssyndromeassociation.org/>
- Bloom’s Syndrome Foundation, USA (“BSF-USA”):
  - The BSF-USA was founded in 2004 to “fund research aiming at the development of a therapy for Bloom's Syndrome and the prevention of its complications, primarily the significant risk of developing cancers at early ages.”
  - See: <http://www.bloomssyndrome.org/>
- Bloom Syndrome Foundation, Europe (“BSF-Europe”):
  - The BSF-Europe also funds research on BS, primarily in Europe.
  - See: <http://www.bloomsyndrome.eu/>
- Bloom's Connect:
  - Largely operated through Facebook, Bloom's Connect is a place for persons with Bloom syndrome and their families to connect with one another.
  - See: <https://www.facebook.com/groups/130771598288/>
  - An older site has additional information:  
<https://sites.google.com/a/bloomsconnect.org/www/>
- Bloom Syndrome Nanocourse 2017 Facebook Page:
  - This page grew out of the 2017 Nanocourse held at the CC-TDI and is intended to be a place where Registry news and other updates can be shared.
  - See: <https://www.facebook.com/groups/468812696835205/>

There are two recent scientific publications on Bloom Syndrome that are extremely useful to read and share with your doctor(s). We heavily reference these papers in this handbook -- we do not seek to reiterate what they share, but have instead tried to summarize key points in easy-to-understand language, as well as supplement with experiences from BS persons and families.

**Bloom's Syndrome: Clinical Spectrum, Molecular Pathogenesis, and Cancer Predisposition** by Christopher Cunniff, Jennifer A. Bassetti, and Nathan A. Ellis. Molecular Syndromology 2017

**Health Supervision for People with Bloom Syndrome\*** by Christopher Cunniff et al.

\* available on the Bloom Syndrome Association website via member access.

What other organizations and resources exist?

A broader list of organizations, websites, and resources are listed in [Appendix B](#).

Read More:

- Help Me Understand Genetics: <https://ghr.nlm.nih.gov/primer>
- Scientific Overview of Bloom Syndrome, from GeneReviews: <https://www.ncbi.nlm.nih.gov/books/NBK1398/>

*Do you have a question you'd like to see answered, or do you have an experience that differs from what is listed here?  
Contact the editor – we'd love to have your input!*

## II - Growth

### How is growth affected in Bloom Syndrome?

Small size is one of the hallmark characteristics of Bloom syndrome. This growth restriction starts before birth and adults with Bloom syndrome are frequently less than 5 feet (1.5 m) tall. Growth curves have not been systematically studied or updated in the Bloom Syndrome Registry since 1999, but according to the data there, typically men with Bloom syndrome grow to a final height of 1.49 m (4 ft, 10 in) and women grow to 1.38 m (4 ft, 6 in).

These days, the amount of monitoring available for pregnant mothers and infants means that small stature is often how Bloom syndrome is first suspected in an individual. Terms such as "IUGR" (intrauterine growth restriction) and "failure to thrive" are often familiar to parents of children with Bloom syndrome, both during pregnancy and after. These can be very scary sounding terms to hear, but for people with Bloom syndrome, once the syndrome has been recognized and diagnosed, many other concerns that you and your doctor may have had about growth can be ruled out.

### Why are persons with Bloom Syndrome small?

At a most fundamental level, scientists still don't know what causes persons with Bloom syndrome to be below "normal" size. They hypothesize that it may be due to either one or more of the following:

- Slower cell proliferation, due to the fact that it takes longer for DNA replication to happen in cells lacking the BLM protein.
- Endocrine issues, as the endocrine system does seem affected in other ways (see [Chapter VII](#)).
- More cell death due to mutations caused by the lack of the BLM protein.

Further research is needed to uncover the reason(s) for small size. This is an example of why it is important to keep your records up to date in the Bloom Syndrome Registry – this is one of the ways that we can stimulate research!

## How does my child's height/weight/etc. compare to others with Bloom Syndrome?

Before diagnosis, many parents of infants and toddlers may be concerned that they are not feeding their child enough or that reflux or other conditions are causing their child to be malnourished. Even after diagnosis, many people (including doctors!) still struggle to know how small is “too” small.

An analysis of the data in the Bloom Syndrome registry from the 1990s (Keller 1999) found that growth rates for persons with Bloom syndrome are different than those of the general population. The authors of this handbook have used the data to produce growth charts for people with Bloom syndrome, which can be found in Appendix C of this Handbook. Our hope is that these can be used by yourself and your doctors to get a sense as to how your or your child's growth compares to others with Bloom syndrome.<sup>c</sup>

Parents of children with Bloom syndrome share stories with one another about trying to estimate the number of calories lost to a puddle of baby vomit on the floor. Many of the authors of this Handbook have been there, and we are here to tell you that *your child's slow growth is almost certainly not caused by your inability to feed them -- it is caused by Bloom syndrome*. Stressing out about that puddle isn't going to help anything. The best thing you can do for your child is to make sure you and your child's doctors are as well informed as possible about Bloom syndrome and how to care for children with this complication.

## Will putting my child on a feeding tube increase their growth?

The Registry has reported that Bloom syndrome children who were given supplemental feeding (through an NG- or G-tube) did see results in increased fat, but not height. Anecdotally, some families who did put their child on feeding tubes have said that it did not increase intake, as the child refused to take food orally and/or had increased vomiting.

*Do you have a question you'd like to see answered, or do you have an experience that differs from what is listed here?  
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<sup>c</sup> Contact the editor if you'd like to get a copy of the growth charts as an Excel spreadsheet.

### III – Nutrition

How do I know whether my child is properly nourished when s/he seems so small?

As discussed in [Chapter II](#), it can be challenging to know what is typical for a child with Bloom syndrome, and the lack of (or low level of) fat in children with Bloom syndrome can make them appear to be undernourished. Young individuals with Bloom syndrome typically have very little subcutaneous fat, which contributes to the malnourished look. It can be helpful to work with a nutritionist, especially one trained to work with children or adults with genetic disorders that may have needs that differ from someone who may be just a “picky eater.” As a start, tracking your child’s growth on the growth charts in Appendix C should give you a sense as to whether your child is following his or her own growth curve.

Aside from that, while it may be tempting to feed your child high calorie, low nutritional value foods, it’s important to remember that diabetes can be common in Bloom syndrome and it’s likely better to offer a wide range of healthy options and to let your child grow at their own pace. It could be more important for your child to develop a healthy relationship with food than to force extra calories in the hopes of having them gain a few ounces.

I am/my child is anemic – is that normal in Bloom syndrome?

Several persons with Bloom syndrome have reported being anemic. To the best of our knowledge, it is not something that the Registry or other researchers have studied to understand the prevalence or underlying cause. It is worth having bloodwork done to check for anemia or other deficiencies, and taking appropriate vitamins to supplement any deficiencies.

My baby/child with Bloom Syndrome has severe reflux and vomits after bottles/meals. What should I do?

Reflux (often referred to as Gastroesophageal reflux disease or GERD) is one of the more common symptoms of Bloom syndrome in infants and young children. Consult with a GI specialist, and they may recommend medications. However, many families have noted that the common medications do not help, or help only mildly. Small, frequent meals seem to be better than larger feeds, and having your baby or child sleep on a small incline may help.

Most children grow out of the reflux by age 2-3, but some of the GI issues such as nausea or a feeling of fullness persist even into adulthood.

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## IV – Skin

### What do we know about the facial rash commonly seen in persons with Bloom Syndrome?

One of the first features noticed by Dr. Bloom that led to his concluding that Bloom syndrome was in fact a syndrome was a facial rash, in a “butterfly” shape across the nose and cheeks. This rash appears to be due to a reaction of the skin to ultraviolet radiation (UV rays) – mostly commonly from the sun, but also from halogen lamps or lightbulbs.

While described as a facial rash, this rash can also appear on the neck, shoulders, hands, chin, and may cause a blistering of lips. It is not always in a “butterfly” pattern, either.

It is not known exactly what causes this rash, nor why it only appears where it does and not on other parts of the body. Some have said the rash seems to be made worse by heat, but the cause of this relationship has not been established.

### Does everyone with Bloom Syndrome have the facial rash?

It does not seem that everyone with Bloom syndrome has experienced the rash. This is true anecdotally and also has been reported in the literature (see Appendix D: References). It is not known whether there is any underlying relationship between which specific genetic mutation(s) led to Bloom syndrome and the presence or absence of a facial rash.

### Do persons with Bloom Syndrome “grow out” of the rash?

It is reported that the facial rash is more common in children under the age of 3, but others have reported that their rash did not first appear until a later age. Most parents of children with Bloom syndrome become vigilant with sunscreen and children get better at applying and re-applying sunscreen and wearing hats as they get older, so it is challenging to know whether the rash gets better over time or is just less likely to appear due to sun protection. That said, most persons say that it does get less frequent and severe with age.

## Is there a treatment for the facial rash?

According to most, the rash or blisters are not painful, but may be itchy, and do not necessarily need to be treated unless it becomes infected. For a severe rash, some dermatologists have prescribed a cortisone cream or recommended over-the-counter zinc oxide, but most persons report these are not effective. Some dermatologists may prescribe steroid cream, but long-term use of steroids can have complications, in that they weaken the immune system.

If the rash becomes infected, it should be seen by a doctor who may prescribe antibiotics.

## How can I avoid the facial rash?

Always use a high sun protection factor (SPF) sunscreen on exposed body parts, including face and hands. Wearing a hat or baseball cap can also minimize direct sun exposure. Try to avoid direct sun exposure during high UV hours (i.e. 10am – 2pm).

If you have a child in school, work with your school system to make sure that sunscreen is being reapplied to your child once or twice during the day.

## Are there other skin issues associated with Bloom syndrome?

Birthmarks known as “café-au-lait” spots are common in persons with Bloom syndrome, as are some areas that are darker or lighter than the surrounding skin. These are not known to cause any problems by themselves, but may be a cosmetic issue for some.

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## V – Immune System & Vaccines

### How is the immune system affected in Bloom syndrome?

It is common in persons with Bloom syndrome to have a slight or moderate immunodeficiency, even if they show no other signs of being sick.

Children with Bloom syndrome in particular are reported to get frequent ear infections, stomach upsets, colds and/or lung infections, especially in their younger years. Some children with Bloom syndrome do not get sick any more frequently than other children. If you think your child may have an infection, it is important to consult with your pediatrician to properly diagnose and treat. If you are unsure if your child needs to be seen, call your doctor's office and let them guide you until you get a feel for your child's regular "patterns."

At a fundamental level, scientists still do not understand how exactly the BLM protein affects the immune system. It is hypothesized that perhaps: (1) lymphocytes (white blood cells that are part of the immune system) do not proliferate as well in persons with Bloom syndrome; and/or (2) there's a defect in something called "class switching" as immune cells try to change between one type and another.

### How do I know if my or my child's immune numbers are low?

Current guidelines (see the [Health Supervision](#) paper) recommend only testing immunoglobulin (antibody) levels if there is a sign of immunodeficiency. That said, there may be value in knowing your or your child's immunoglobulin levels to have a baseline in case anything develops in the future.

A lab test for immunoglobulins will report on the three major immunoglobulins: IgG, IgA, and IgM. Most commonly reported in Bloom syndrome is that IgG is low normal, and especially IgG2 is low.

### What can I do if my or my child's immune levels are low?

Even if your child seems perfectly healthy, persons with Bloom syndrome often show low immunities. This can mean that an infection can progress quickly.

If IgG/IgM levels are very low, your doctor may recommend IVIG therapy as your child gets older. Some persons report that IVIG is very helpful in making them feel better and fight off infections, while others have had mildly negative responses to the IVIG infusion itself. Taking an anti-histamine before the IVIG infusion has helped some with the irritation caused by the infusion.

## What should I do about childhood vaccines?

Given that your child may be immune-deficient, keeping them on the prescribed schedule for childhood vaccines is critically important. It is important to note that some have reported that certain childhood immunizations were not successful in producing antibodies – i.e. they didn't work. Your child's doctor should be made aware of this and may want to test your child's antibody response to vaccinations and, if they do not show the normal response, may recommend receiving a "booster" vaccine.

You may also want to keep your child away from children who have not been immunized. Although we are not aware of documented cases of a child with Bloom syndrome getting measles or mumps, it could be a concern as fewer people get vaccinations. Whooping cough is on the rise in the United States, and could be a particular concern given that people with Bloom syndrome are at increased risk for lung infections.

## I keep hearing about harnessing the immune system to fight cancer – is that something I or my child would be eligible to use if/when cancer strikes?

Immuno-oncology is one of the hottest areas of research in the cancer world today and is increasingly being used as a frontline in certain types of cancers. At present, not enough is known about the immune system in Bloom syndrome to know whether current emerging therapies (checkpoint inhibitors and CAR-T, among others) would be effective in treating Bloom syndrome cancers, as the immune system is affected in Bloom syndrome in a way that is not completely understood. That said, there is much hope for these therapies given they are much less toxic than chemotherapy or radiation.

Ask your oncologist about these therapies and, if you do end up prescribed one of them, talk with the Bloom Syndrome Registry so that others can learn from your experience!

*Do you have a question you'd like to see answered, or do you have an experience that differs from what is listed here?  
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## VI – Dental

Are persons with Bloom syndrome more susceptible to dental problems?

There are some reports of low or no natural enamel coating on some of the teeth, making them prone to cavities. There has also been reports of weakened teeth that may chip or crack easily.

It's not known what causes the above, and whether there may be a connection to the reflux commonly seen in younger years, or whether it is a part of the syndrome that is not fully understood.

What can I do to protect my or my child's teeth and mouth?

Early and regular dental exams are key. It is also important that your dentist understands that people with Bloom syndrome are far more susceptible to cancer than the general population.

Strive for regular dental check-ups and cleanings every 6 months, as called for in the Bloom Syndrome Health Supervision paper. You may also want to discuss with your dentist about having sealants placed on your child's primary and/or secondary teeth.

There have been reported cases of oral cancer with Bloom Syndrome. Typically, dentists do head and neck exams and oral cancer screenings on adult patients.

What should I do if my dentist wants to do x-rays of my or my child's teeth?

First and foremost, make sure your dentist understands Bloom syndrome and the possible risks associated with radiation. (If you don't think he or she understands, do not hesitate to change dentists!)

Most dentists follow the ALARA (As Low as Reasonably Achievable) principle of radiation exposure. This means a dentist will take as few x-rays as possible in order to evaluate a patient and make a diagnosis. As Bloom patients typically have smaller mouths than the general population, it is reasonable to expect that less x-rays will be taken than an average patient. (2 bitewing radiographs for a Bloom patient vs 4 for a typical patient, for example).

As the thyroid is the most susceptible area of the head and neck region to absorb radiation, the neck region should be shielded with a lead apron for any x-ray exposures.

X-rays have been used by persons with Bloom Syndrome for dental care. Some have had braces, and others have needed x-rays for other purposes.

CBCT (Cone Beam Computed Tomography) scanners are a new technology being utilized more in dentistry. The routine use of a CBCT scan for evaluation is controversial due to its higher level of ionizing radiation. Using a CBCT scan for routine evaluation for a Bloom patient should be avoided. If a CBCT needs to be done for a specific reason or diagnosis (ie: the surgical placement of an implant), the dentist should use the smallest field size possible. In addition, some newer CBCT models have an ultra-low radiation dose mode. (Planmeca scanners utilize this technology). This mode should be utilized for Bloom patients whenever possible.

You may wish to discuss with your dentist whether any alternative diagnostics are available.

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## VII – Diabetes & Endocrine System

Are persons with Bloom syndrome predisposed to diabetes?

Diabetes does appear more frequently in the Bloom syndrome community than in the general population, and it develops at an earlier age than in the general population. It has been diagnosed in children as young as age 4, but on average appears around age 26.

How should I be monitored for endocrine issues?

The Bloom Syndrome [Health Supervision Guidelines](#) recommends that fasting blood sugar measurements and lipid profiles begin annually at age 10. Talk to your doctor about seeing an endocrinologist earlier if your child has any symptoms before age 10.

If you have any symptoms of hypothyroidism, such as fatigue, constipation, cold sensitivity and weight gain, talk to your doctor about testing your thyroid function.

My doctor has told me I'm "pre-diabetic." What does that mean?

Pre-diabetes can be considered a "warning sign" – it's when your blood glucose level is higher than the healthy range, but is not high enough to be considered diabetic.

Talk with your doctor about what he or she recommends.

What do we know about growth hormone therapy in persons with Bloom syndrome?

There have only been a few reported cases of growth hormone therapy used for persons with Bloom syndrome. In cases published in the literature (Reyes 2013, Brock 1991, and Stahnke 1992), four out of five children developed cancer, most commonly B-cell Non-Hodgkin's Lymphoma. What we don't know is whether these cancers were related to the growth hormone treatment or whether they would have developed otherwise.

There are other, unpublished, reports of Bloom syndrome children having been on growth hormone therapy with seemingly no cancers developing as a result. These children anecdotally did show increased growth as a result of GH treatment.

According to the Gene Reviews entry authored by the Registry ([link below](#)), growth hormone administration to children with Bloom syndrome has not led to increased growth rate or adult height in most persons, but some have experienced improved linear growth. Use of growth hormone has been approached cautiously in this

population, because of the theoretic increase in their risk to develop tumors as a result of their treatment.

The Bloom Syndrome [Health Supervision](#) paper recommends that great caution should be used if growth hormone is prescribed and that monitoring for cancers will be of utmost importance. Specifically, the paper states that growth response, serum IGF1, and IGFBP3 levels should be monitored during growth hormone therapy; and therapy should be discontinued if there is no response.

## What do we know about delaying puberty in persons with Bloom syndrome?

Some families have hormonally delayed puberty in their children to allow the bones a few more years to grow. This has, anecdotally, resulted in increased height compared to what would have been expected from earlier growth charts.

It is also important to note that some groups feel that medically (hormonally) intervening is considered unethical as it changes the natural course of growth.

These questions are undeniably complex and should be done in close consultation with medical professionals (endocrinologist, oncologist, possibly psychologist and/or psychiatrist), but ultimately each person and family will have to carefully make their own decision as to which course to take.

## Read more:

- Bloom Syndrome Association's page on the Digestive System (including metabolism):  
<http://www.bloomssyndromeassociation.org/?page=thedigestivesystem>
- GeneReviews article on Bloom's syndrome:  
<https://www.ncbi.nlm.nih.gov/books/NBK1398/>

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## VIII – Fertility

### Can persons with Bloom Syndrome have children?

Women with Bloom Syndrome have had children, but do experience difficulty in getting pregnant and many go through menopause much earlier than the general population.

It is less clear how many men with Bloom syndrome are fertile. Not many have been studied, but, of those that have, most have been azospermic (meaning they do not have viable sperm in the semen), while one was severely oligospermic (meaning a low sperm count). Interestingly, a recent paper of a case in Tunisia seemed to show that a man with Bloom syndrome had successfully fathered a child (see Appendix D: References). Clearly more research is needed in this area.

### Who should I talk with about fertility issues?

Talk with your general practitioner about getting a referral to a fertility specialist. Make sure to share information about Bloom syndrome with him/her, and discuss your options. While the road may be challenging, it may not be impossible.

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## IX – Intellectual

### Are persons with Bloom syndrome at risk of having intellectual disabilities or learning difficulties?

This is not a well-documented area for Bloom syndrome. Anecdotally, there have been reports of learning disabilities and/or Attention Deficit Hyperactivity Disorder (ADHD) being more common in the Bloom syndrome-affected children than those not affected. That said, it is known that ADHD and related conditions are more common in children born premature, so untangling the ultimate cause or true relation to Bloom syndrome is difficult. The Registry has reported in the past that participants were of normal intelligence, with some participants having achieved higher levels of education.

Anecdotally, some persons with Bloom syndrome and their families say they have experienced learning difficulties and differences including dyslexia. If this is the case for you or your child, talk with your local school district. In the United States, by law, they are required to assess your child if you request an evaluation and, if found eligible for services, they will work with you to come up with an Individualized Education Plan (IEP).

### Read more:

- U.S. Department of Education Guide to the Individualized Education Program: <https://www2.ed.gov/parents/needs/speced/iepguide/index.html>

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## X – Cancer

### Why do persons with Bloom syndrome have a higher risk of cancer?

Cancer arises when cells begin to divide without stopping and spread into surrounding tissues. Cancer is caused by mutations in genes that control the ways our cells grow and divide. Each time a cell divides, it must copy over its DNA; this process is error-prone, leading to mutations. Mutations also accumulate in response to external exposures such as tobacco smoke and radiation (see [Chapter XV](#) for more on Environmental Exposures). The BLM protein helps to fix those errors, so persons with Bloom syndrome, lacking the BLM protein, are more likely to have mutations that were unable to be fixed, and thus are more likely to develop cancers.

### What is the risk of developing cancer?

According to the Registry, at least 33.4% of individuals with Bloom syndrome develop cancer by age 25, and at least almost 80.9% of individuals with Bloom syndrome develop cancer by age 40.

As of 2018, the Registry is currently performing a more thorough analysis to understand the frequency of cancer by type of cancer. In the meantime, a table describing the cancers reported to the Registry can be found in the [Health Supervision Guidelines](#) paper.

### Does Bloom syndrome make cancer more likely / faster to spread?

This is currently unknown and more research is needed. In any case, for most cancers, earlier detection and treatment leads to better outcomes. Following the recommended [health supervision guidelines](#), and talking with your doctor as soon as possible if something seems “off”, is advised.

Whom should I contact (and have my doctors contact) if cancer is diagnosed? Who are the world's experts on treating cancer in persons with Bloom syndrome?

The Registry can put your oncologist in touch with other oncologists who have treated cancer in persons with Bloom syndrome. Certain oncologists have treated multiple cancers in multiple persons with Bloom syndrome.

As a community, it is important that we share information on our cancers and protocols used to treat them. Please share with the Registry, which can serve as a clearinghouse for this information, and help others!

What types of cancer have persons with Bloom syndrome had?

Persons with Bloom syndrome may develop many different cancer types. Leukemia (particularly Acute Myeloid Leukemia) and lymphoma (particularly non-Hodgkin) are the most common cancer types. Colorectal cancer, breast cancer, skin cancer, and Wilms tumor, are also more common than in the general population.

How should I be monitored for cancer?

The [Health Supervision Guidelines](#) paper recommends the following surveillance schedule:

Clinical Condition	Screening/Prevention Recommendations
<b>Leukemia</b>	<ul style="list-style-type: none"><li>• Awareness of symptoms of leukemia, such as pallor, abnormal bleeding, petechiae, fatigue, and unintentional weight loss</li></ul>
<b>Lymphoma</b>	<ul style="list-style-type: none"><li>• Awareness of symptoms, such as enlarged lymph nodes, unexplained fevers, night sweats, fatigue, unintentional weight loss</li><li>• Whole body MRI scanning every 1-2 years, starting at age 12-13</li></ul>
<b>Colorectal Cancer</b>	<ul style="list-style-type: none"><li>• Annual colonoscopy and fecal immunochemical testing every 6 months, starting at age 10-12 years</li></ul>
<b>Breast Cancer</b>	<ul style="list-style-type: none"><li>• Annual breast MRI scans, starting at age 18</li></ul>
<b>Skin Cancer</b>	<ul style="list-style-type: none"><li>• Reduce excessive exposure to sunlight</li><li>• Cover exposed skin</li><li>• Use a broad spectrum sunscreen with SPF of 30 with application twice daily and every 2-3 hours if outdoors</li></ul>
<b>Wilms Tumor</b>	<ul style="list-style-type: none"><li>• Awareness of symptoms, such as hematuria and a painless abdominal mass</li><li>• Abdominal ultrasound every 3 months, starting at diagnosis to age 8</li></ul>

If I develop cancer, does it need to be treated differently?

YES! It is important that your oncologist understand Bloom syndrome and that you are at an increased risk for secondary cancers if treated with chemotherapy and/or radiation.

Chemotherapy regimens should be adapted; patients have typically tolerated 50% or below the normal regimen dosage. Ionizing radiation or alkylating agents are not recommended, due to their risk of potential additional damage.

We hope to compile more cancer protocols that have been used in the past. In the meantime, contact the Registry if you are diagnosed and you can be put in touch with others who have successfully beat cancer to learn more about their experiences.

Read more:

- National Cancer Institute's "What is Cancer?": <https://www.cancer.gov/about-cancer/understanding/what-is-cancer>

*Do you have a question you'd like to see answered, or do you have an experience that differs from what is listed here?  
Contact the editor – we'd love to have your input*

## XI – Pulmonary/Lungs

What pulmonary issues are associated with Bloom syndrome?

Several individuals in the BSR died due to Chronic Obstructive Pulmonary Disease (COPD), and others have had recurrent bronchitis. If bronchitis is common, consult with your immunologist about testing for an immunodeficiency.

What can I use to help with my bronchiectasis?

The [Health Supervision Guidelines](#) paper recommends cough assist devices, vibration vests, and daily nasal lavage may be helpful in clearing mucus out of the chest and sinuses.

*Do you have a question you'd like to see answered, or do you have an experience that differs from what is listed here?*

*Contact the editor – we'd love to have your input*

## **XII – Eye/Vision**

What eye/vision issues are associated with Bloom syndrome?

None have been documented in the literature, but some have anecdotally said they've had issues including astigmatism (some have had while younger and have grown out of it) or poor vision in general. If you have experience with this, contact the editor!

*Do you have a question you'd like to see answered, or do you have an experience that differs from what is listed here?  
Contact the editor – we'd love to have your input*

## XIII – Hearing

### Does Bloom syndrome affect hearing?

Several persons with Bloom syndrome have reported hearing difficulties, some of which were present from birth, or developed a young age (perhaps due to multiple ear infections, caused by reflux) and others that developed over time with the use of antibiotics that have hearing loss as a side effect. There's no evidence (to the best of our knowledge) that Bloom syndrome in and of itself causes hearing difficulties, although at least one individual has reported having moderate hearing loss from birth.

*Do you have a question you'd like to see answered, or do you have an experience that differs from what is listed here?  
Contact the editor – we'd love to have your input*

## XIV – Social/Emotional

At what age should I tell my child he/she has Bloom syndrome?

This is a difficult question with no single right answer. Families with children with other genetic conditions face the same question. Some useful points from a page on Autism Spectrum Disorder:<sup>3</sup>

“A child’s personality, abilities and social awareness are all factors to consider in determining when a child is ready for information about their diagnosis.”

“Many families have found that setting a positive tone about each family member’s uniqueness is a wonderful starting place. A positive attitude about differences can be established if you start as early as possible, and before the diagnosis is mentioned. Everyone is in fact unique with their own likes and dislikes, strengths and weaknesses, and physical characteristics. Differences are discussed in a matter of fact manner as soon as the child or others their age understand simple concrete examples of differences. With this approach, it is more likely that differences, whatever they are, can be a neutral or even fun concept. Matter of fact statements such as “Mommy has glasses and Daddy does not have glasses” or “Bobby likes to play ball and you like to read books” are examples. The ongoing use of positive concrete examples of contrasts among familiar people can make it easier to talk about other differences related to your child’s diagnosis with him or her.”

Talk with your child’s pediatrician about what concepts might be age-appropriate to share.

How can I connect with others with Bloom syndrome?

The Bloom’s Connect Facebook page, the Bloom’s Syndrome Association members-only site, and conferences are great places to meet others with Bloom syndrome.

*Do you have a question you’d like to see answered, or do you have an experience that differs from what is listed here?  
Contact the editor – we’d love to have your input*

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<sup>3</sup> <https://www.iidc.indiana.edu/pages/Getting-Started-Introducing-Your-Child-to-His-or-Her-Diagnosis-of-Autism-or-Asperger-Syndrome>

## XV – Environmental Factors

What environmental factors may impact Bloom syndrome?

As described above, persons with Bloom syndrome should avoid direct sun exposure because of increased risk of both cancer and facial rash. In addition to UV exposure, persons with Bloom syndrome should avoid or limit exposure to known or likely carcinogens, mutagens, and reprotoxins (CMRs).

- **Carcinogens (C):** substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may induce cancer or increase its incidence.
- **Mutagens (M):** substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may induce heritable genetic defects or increase their incidence.
- **Reprotoxins (R):** substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may produce or increase the incidence of non-heritable adverse effects in the progeny and/or an impairment of male or female reproductive functions or capacity.

More information on this topic is available via the resources listed below.

Read more:

- [Cancer-Causing Substances in the Environment](#). National Cancer Institute
- [Risk Factors for Cancer](#). National Cancer Institute
- [Known and Probable Human Carcinogens](#). American Cancer Society
- [10 Household Tips for Cancer Prevention](#). Environmental Working Group

*Do you have a question you'd like to see answered, or do you have an experience that differs from what is listed here?  
Contact the editor – we'd love to have your input*

## XVI – Carriers

### What should I know about being a carrier of Bloom syndrome?

If you are a carrier of Bloom syndrome, you have only one functioning copy of the *BLM* gene. If your partner also is a carrier of Bloom syndrome, it means any offspring have a 25% chance of having Bloom syndrome, a 50% chance of being a carrier, and a 25% chance of having two functioning copies of *BLM* and not being a carrier.

Depending on how your child was diagnosed with Bloom syndrome, you may have had your *BLM* gene sequenced and know your mutation. It may be a mutation already known to the BSR, or a completely novel (new) mutation. Either way, please share this information with the BSR so that more can be learned about Bloom syndrome.

### Are carriers at an increased risk of cancer?

It's currently unknown whether carriers are at an increased risk of developing cancers; if they are, the risk is only slightly higher than the general population. In animal tests used in research, carriers have been found to be at an increased risk. Population studies of humans have found conflicting results. Nevertheless, you should discuss with your doctor the fact that you are carrier of Bloom syndrome and discuss whether he or she recommends any cancer surveillance differing from guidelines for the general population.

*Do you have a question you'd like to see answered, or do you have an experience that differs from what is listed here?  
Contact the editor – we'd love to have your input*

## **XV – Conclusion**

We hope that this document will grow over time to include other perspectives and, that by posing questions, we may be able to drive research and inquiry into those areas most pressing to affected individuals and their families. As stressed at the end of each chapter, please do share your thoughts on your experiences, or suggest additional questions you'd like to see answered!

## Appendix A: Bloom Syndrome Registry

### Overview and History of Registry

The Bloom's Syndrome Registry at the Weill Cornell School of Medicine was established in 1960 to collect information on affected individuals and their families. Dr. James German was head of the registry for many years and personally collected information and biological samples from individuals with Bloom syndrome and their families.

In 2012, Chris Cunniff became the new registrar. He has been working to update the registry's information and to move older, paper files into a digital repository.

### Importance of keeping information up-to-date with Registry

Registries in rare diseases are incredibly important. Because of the difficulty in doing clinical trials in populations with such few numbers, information in a registry can be used as a "natural history" to which a potential treatment might be compared.

Sharing any updates to your health, or anything else that you or your child experience with Bloom syndrome, is an important part of building that natural history for Bloom syndrome. The Registry also hopes to build on the momentum of the past few years to have more regular conferences and other activities and making sure your information is up to date is the best way to be a part of that momentum!

### Contact the Registry:

Chris Cunniff, MD  
Chief, Division of Medical Genetics  
646-962-2205

### Mailing address:

Chris Cunniff, MD  
Division of Medical Genetics  
Weill Cornell Medicine  
525 East 68th Street, Box 128  
New York, NY 10021

### Read More:

- The Bloom Syndrome Registry website: <http://weill.cornell.edu/bsr/>
- NIH information about patient registries: <https://www.nih.gov/health-information/nih-clinical-research-trials-you/list-registries>

## Appendix B: Online Resources

### Bloom Syndrome Organizations

- Bloom Syndrome Association: <http://www.bloomssyndromeassociation.org/>
- Bloom Syndrome Foundation (Europe): <http://www.bloomsyndrome.eu/>
- Bloom Syndrome Foundation (USA): <http://www.bloomssyndrome.org/>
- Bloom's Connect Facebook page:  
<https://www.facebook.com/groups/130771598288/>
- Bloom Syndrome Nanocourse 2017 Facebook page:  
<https://www.facebook.com/groups/468812696835205/>

### Cancer Research and Information

- American Association for Cancer Research (AACR): <http://www.aacr.org>
  - AACR Recommendations for Childhood Cancer Screening and Surveillance in DNA Repair Disorders (including Bloom syndrome):  
<http://clincancerres.aacrjournals.org/content/23/11/e23>
- American Society for Clinical Oncology (ASCO): <https://www.asco.org/>
- National Institutes of Health: <https://www.nih.gov/>
  - National Cancer Institute: <https://www.cancer.gov/>
- American Cancer Society: <https://www.cancer.org/>

### Rare Diseases

- National Organization for Rare Disorders (NORD): <https://rarediseases.org/>
- Global Genes: <https://globalgenes.org/>

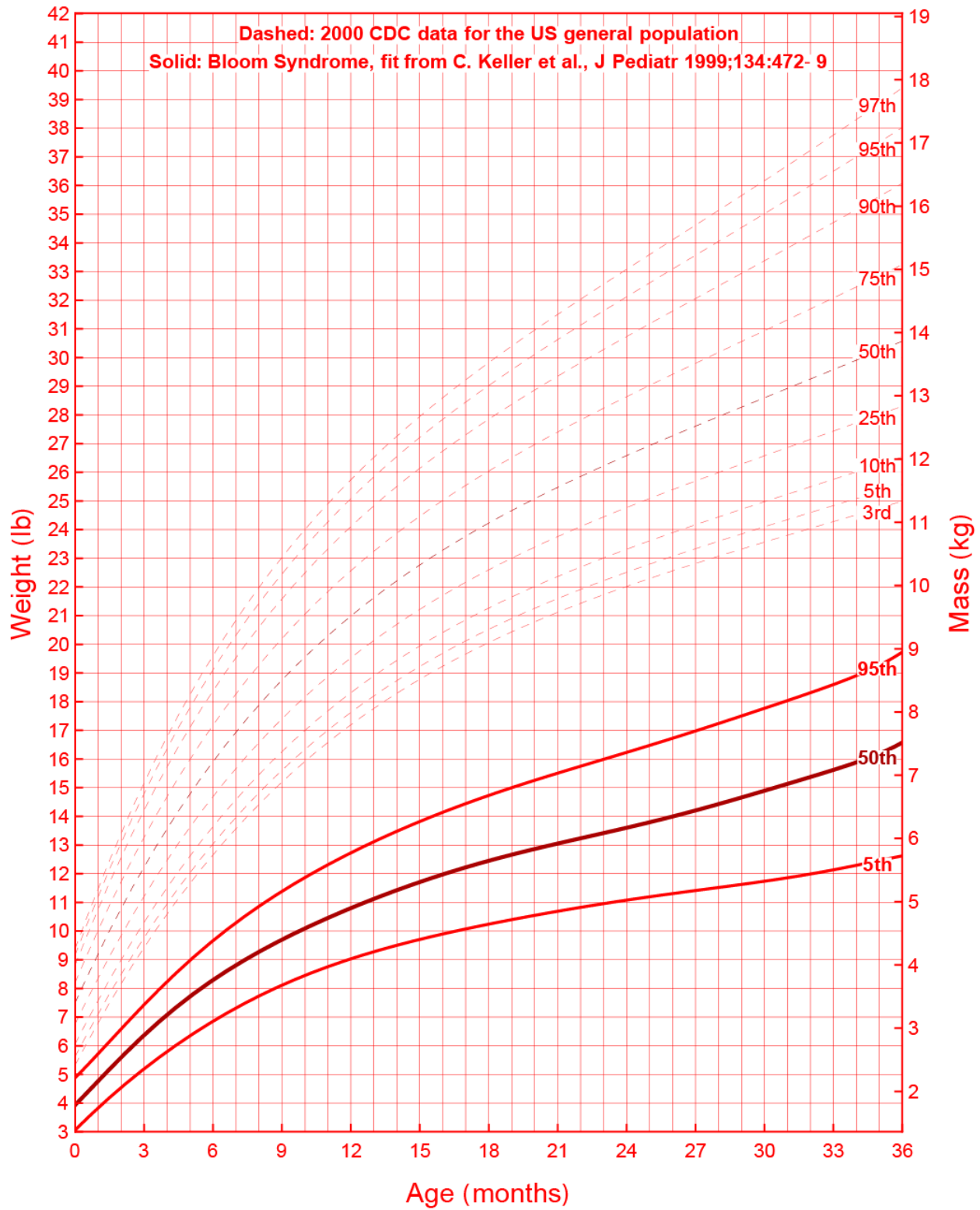
## Appendix C: Growth Charts

The growth charts here have curves for persons with Bloom Syndrome that are taken from a paper published in 1999. These charts are designed to be printed out on a full page so that you can take them to your doctors and chart progress on them by hand if you wish.

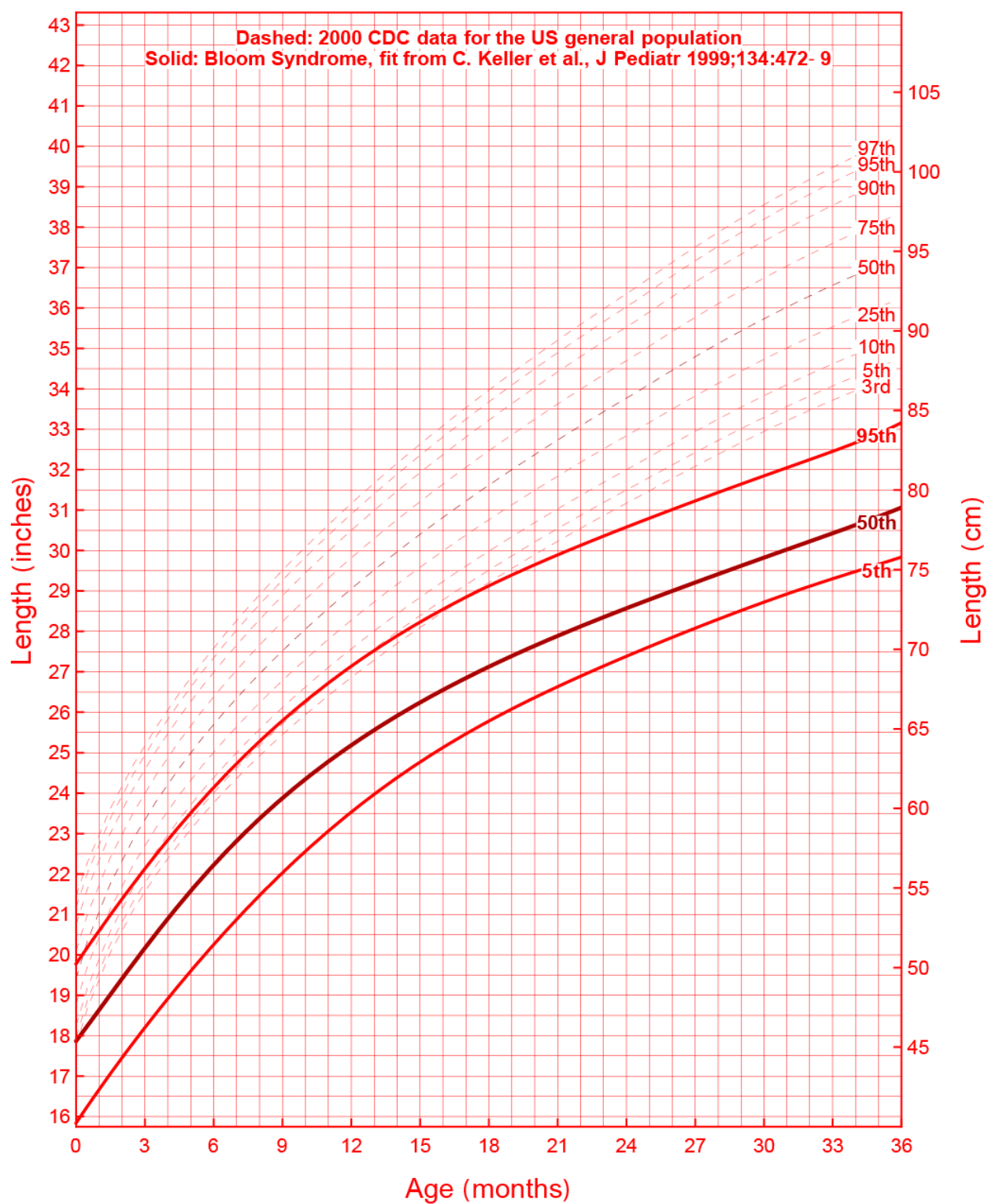
The data used to make those curves were limited, so they should not be taken too literally, particularly near their endpoints. Wes Campbell keeps these curves and updates them, so feel free to contact him ([wes@physics.ucla.edu](mailto:wes@physics.ucla.edu)) if you have any questions or requests.

*Note: we need additional information to make sure these growth charts are as accurate as can be! Please provide your/your child's charts to the Registry, if possible.*

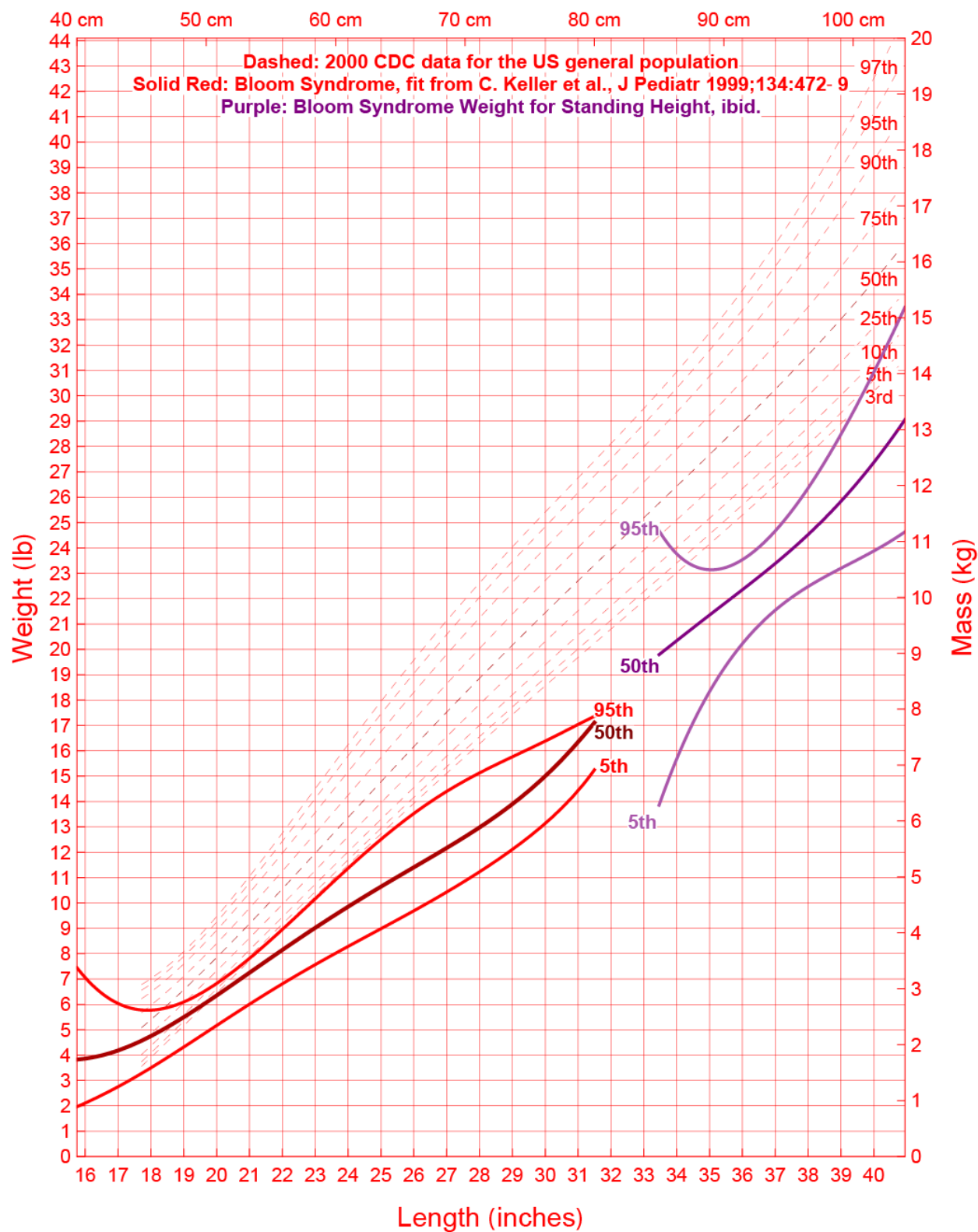
## Weight for Age 0- 36 months, Females with Bloom Syndrome



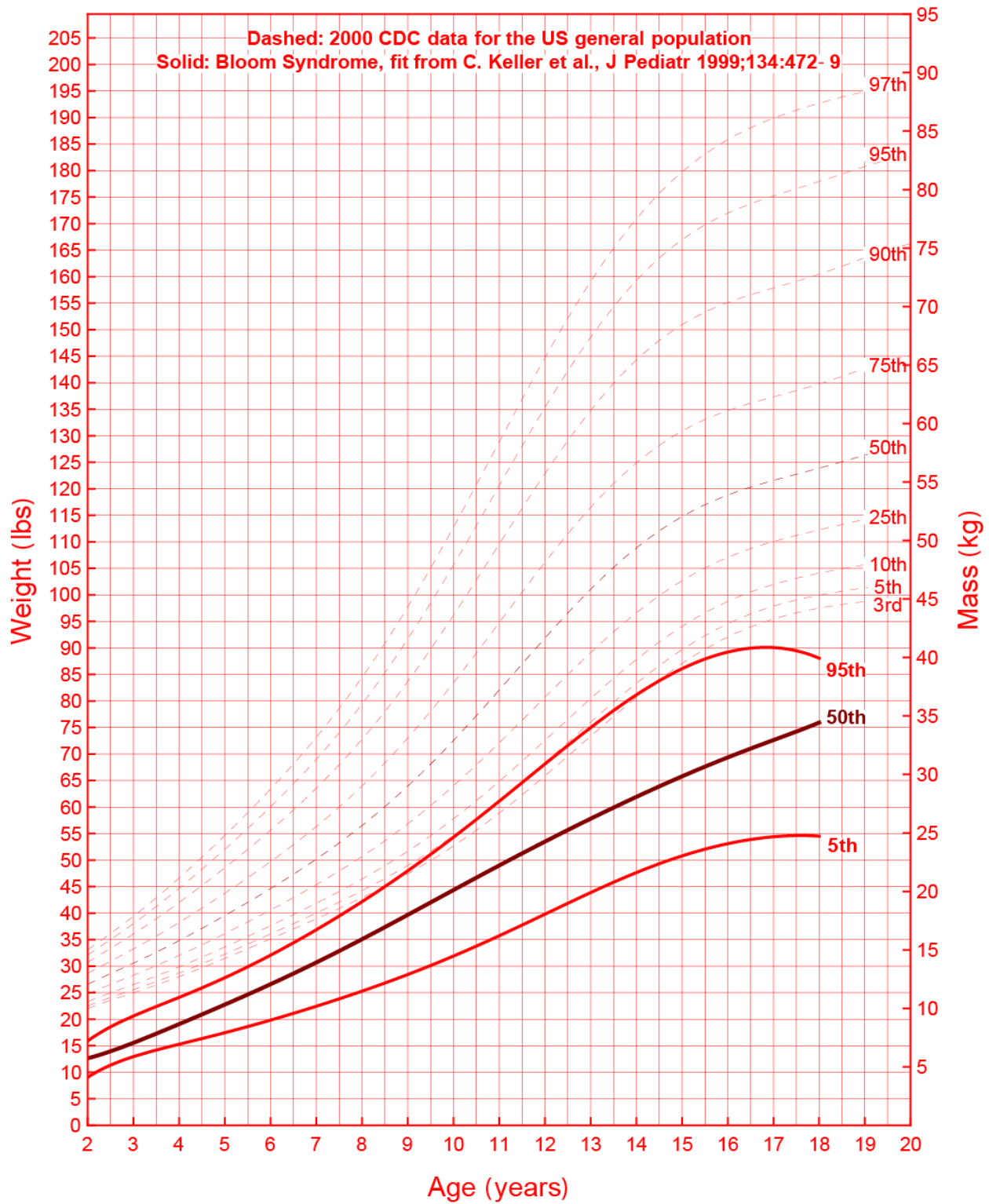
## Length for Age 0- 36 months, Females with Bloom Syndrome



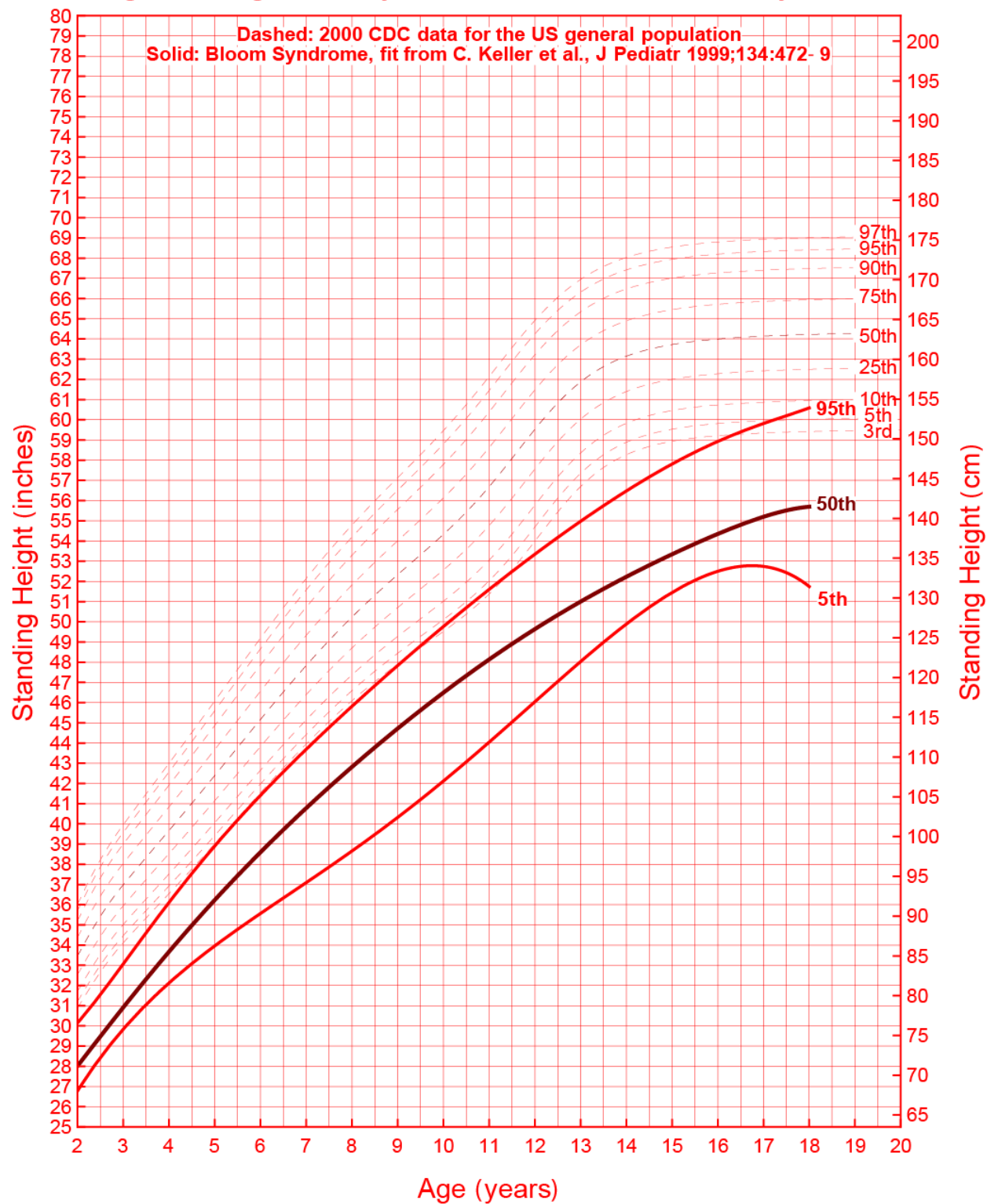
## Weight for Length 0- 36 months, Females with Bloom Syndrome



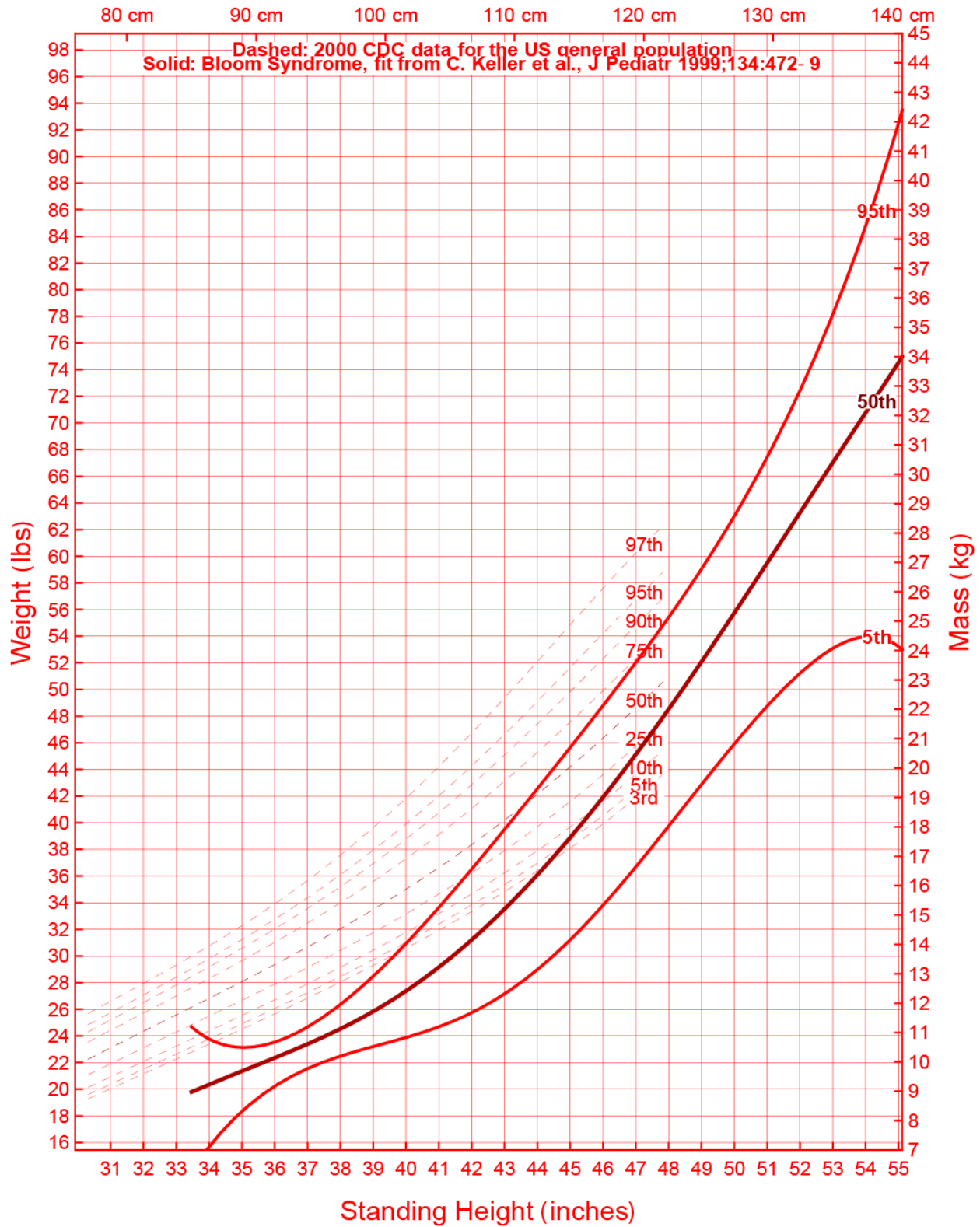
## Weight for Age 2- 18 yrs, Females with Bloom Syndrome



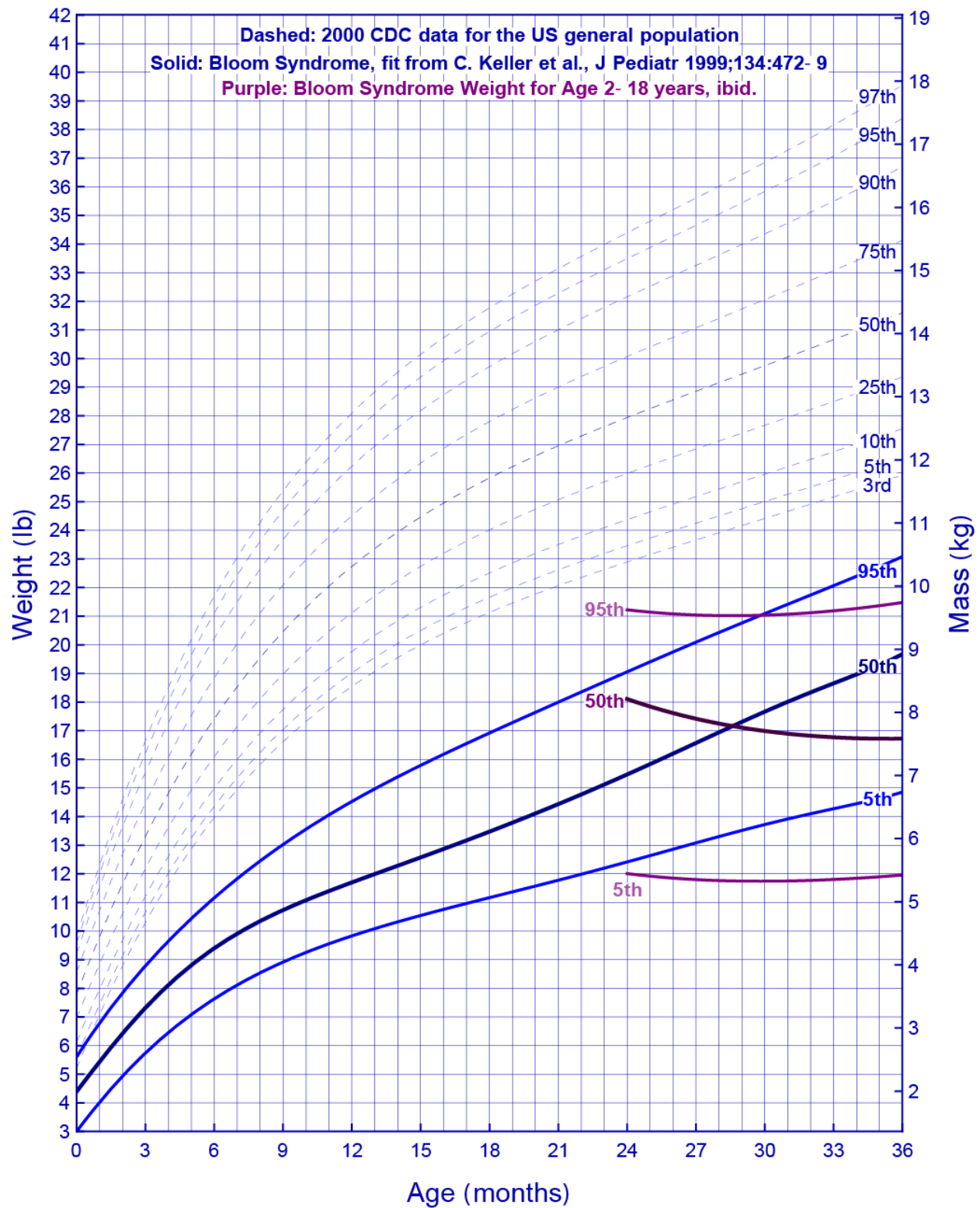
## Height for Age 2- 18 yrs, Females with Bloom Syndrome



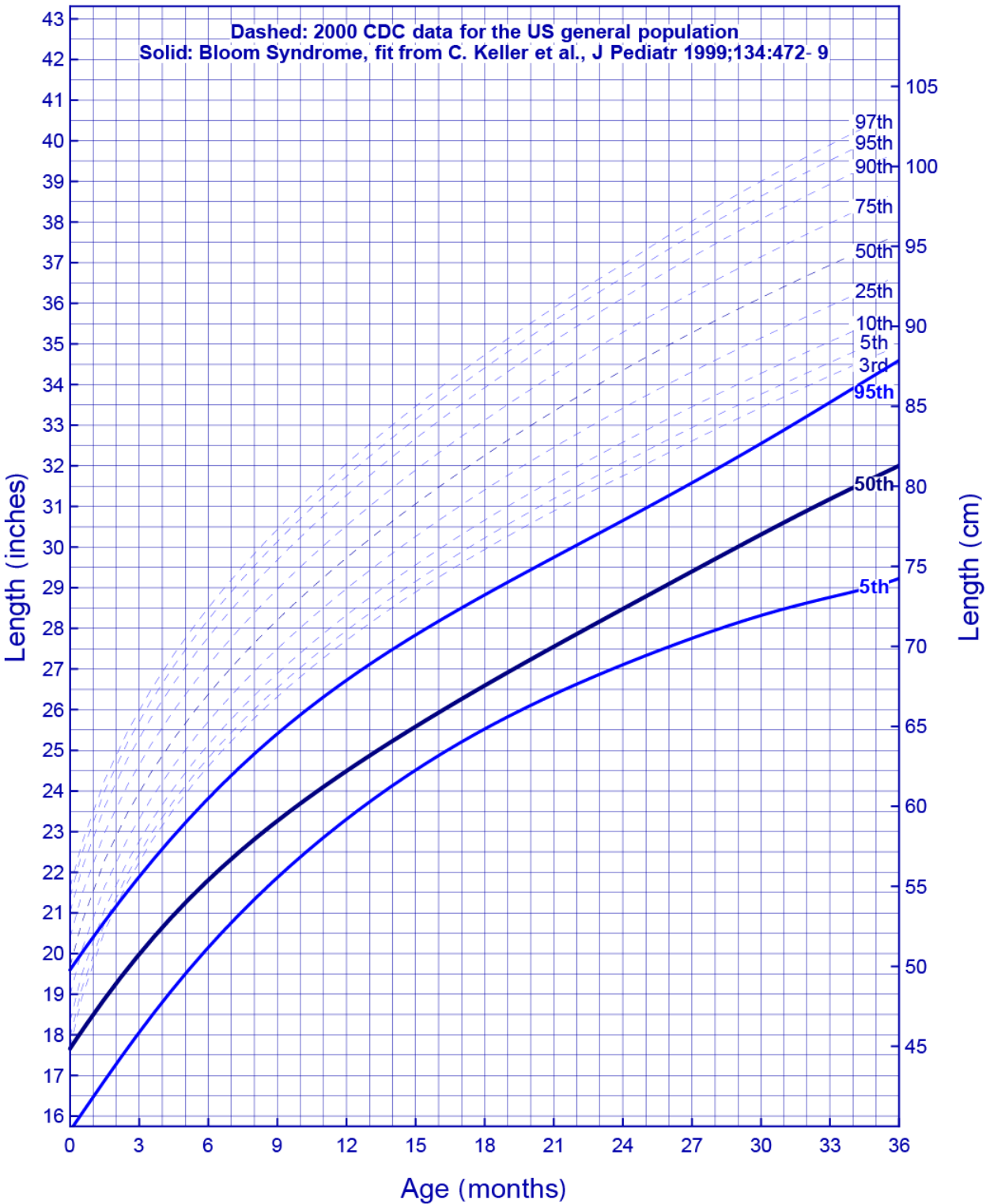
# Weight for Height 2- 18 yrs, Females with Bloom Syndrome



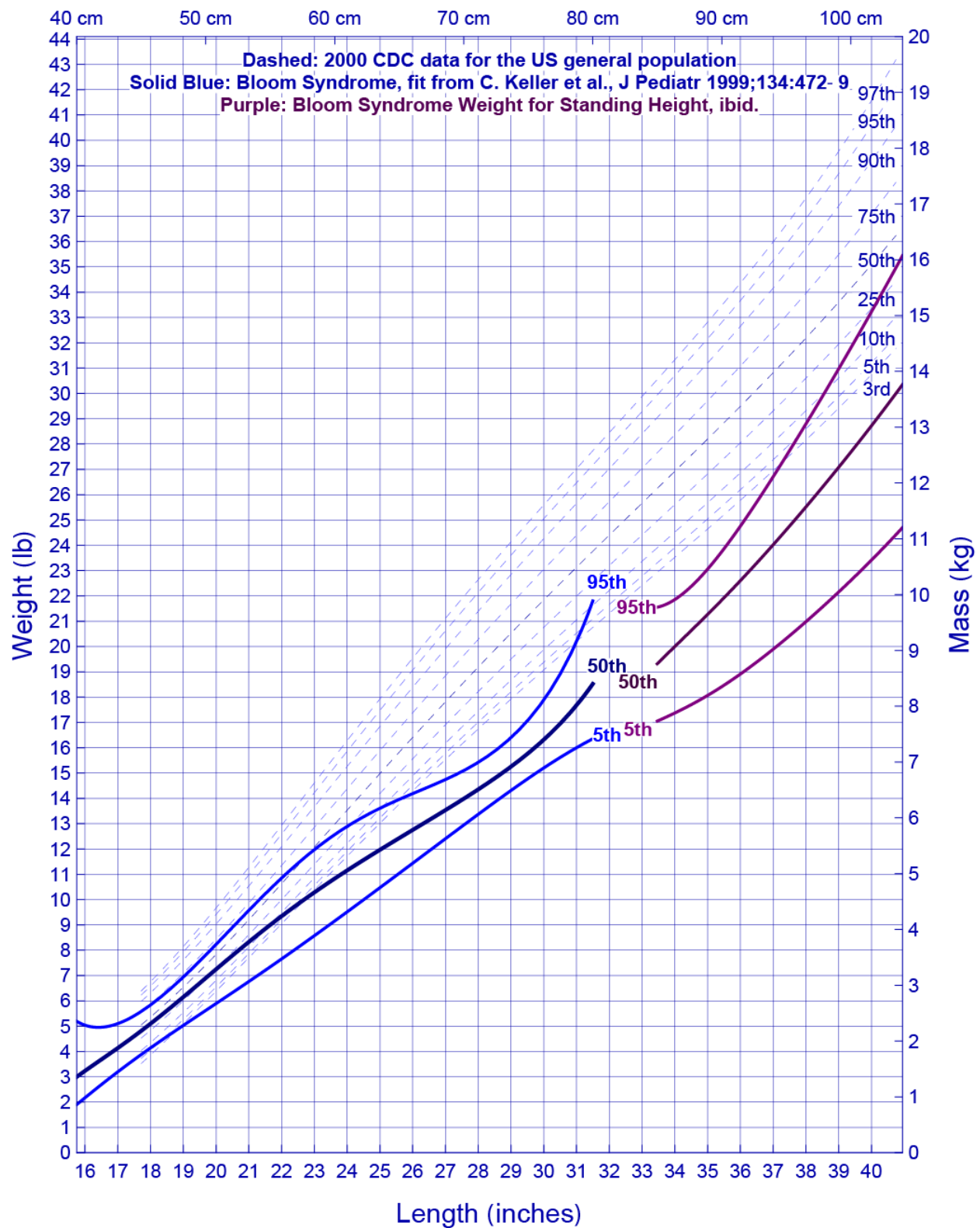
## Weight for Age 0- 36 months, Males with Bloom Syndrome



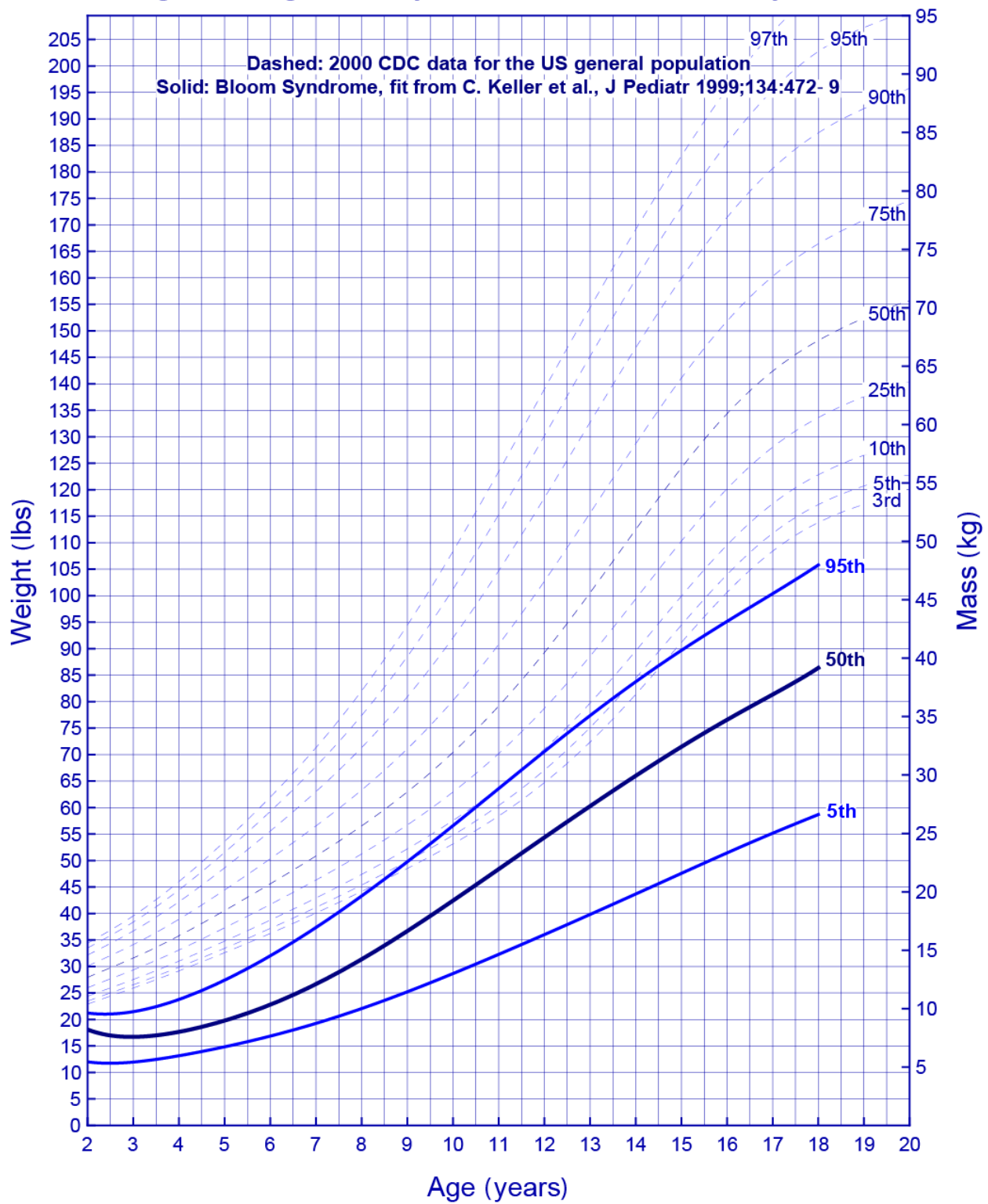
Length for Age 0- 36 months, Males with Bloom Syndrome



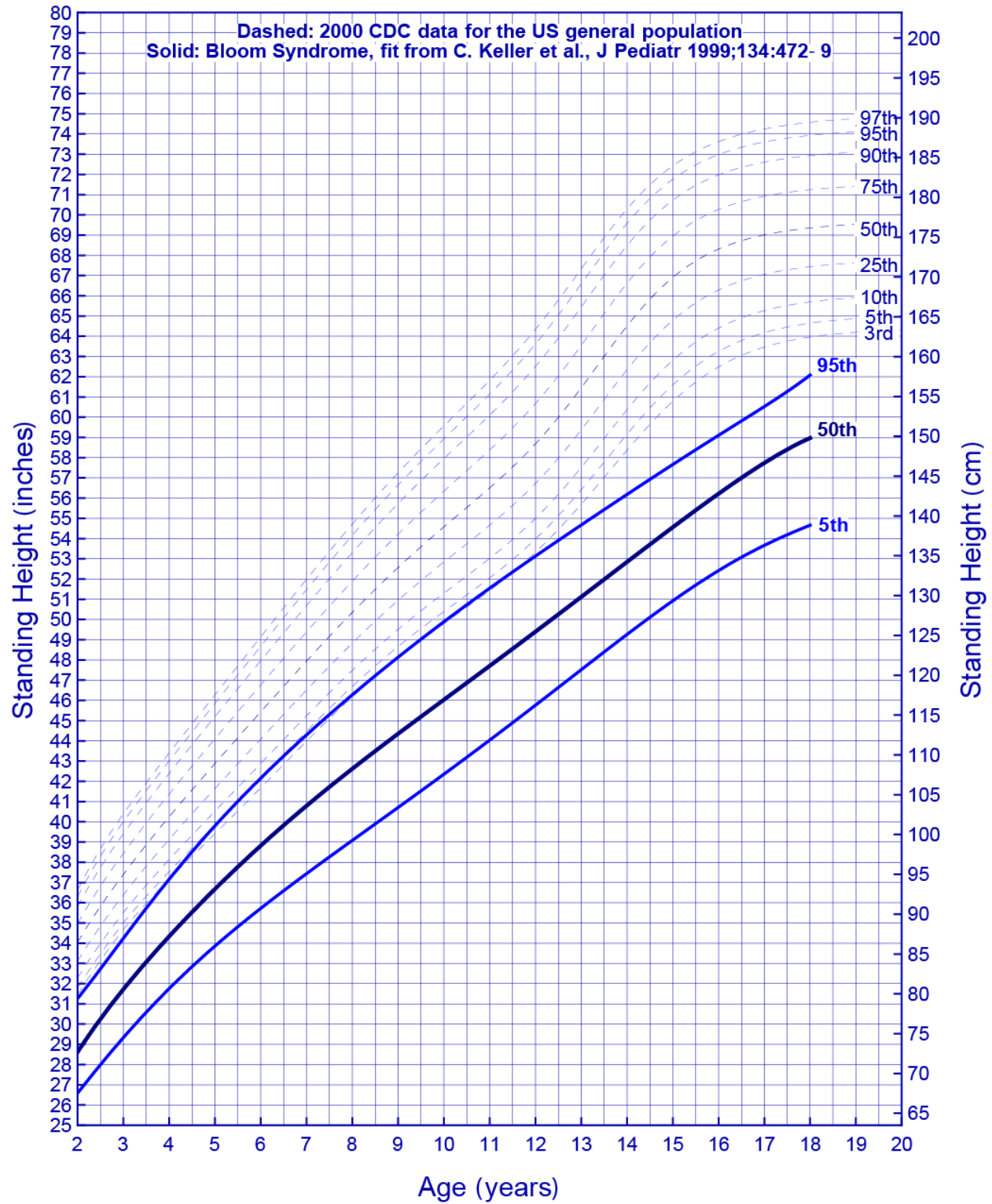
## Weight for Length 0- 36 months, Males with Bloom Syndrome



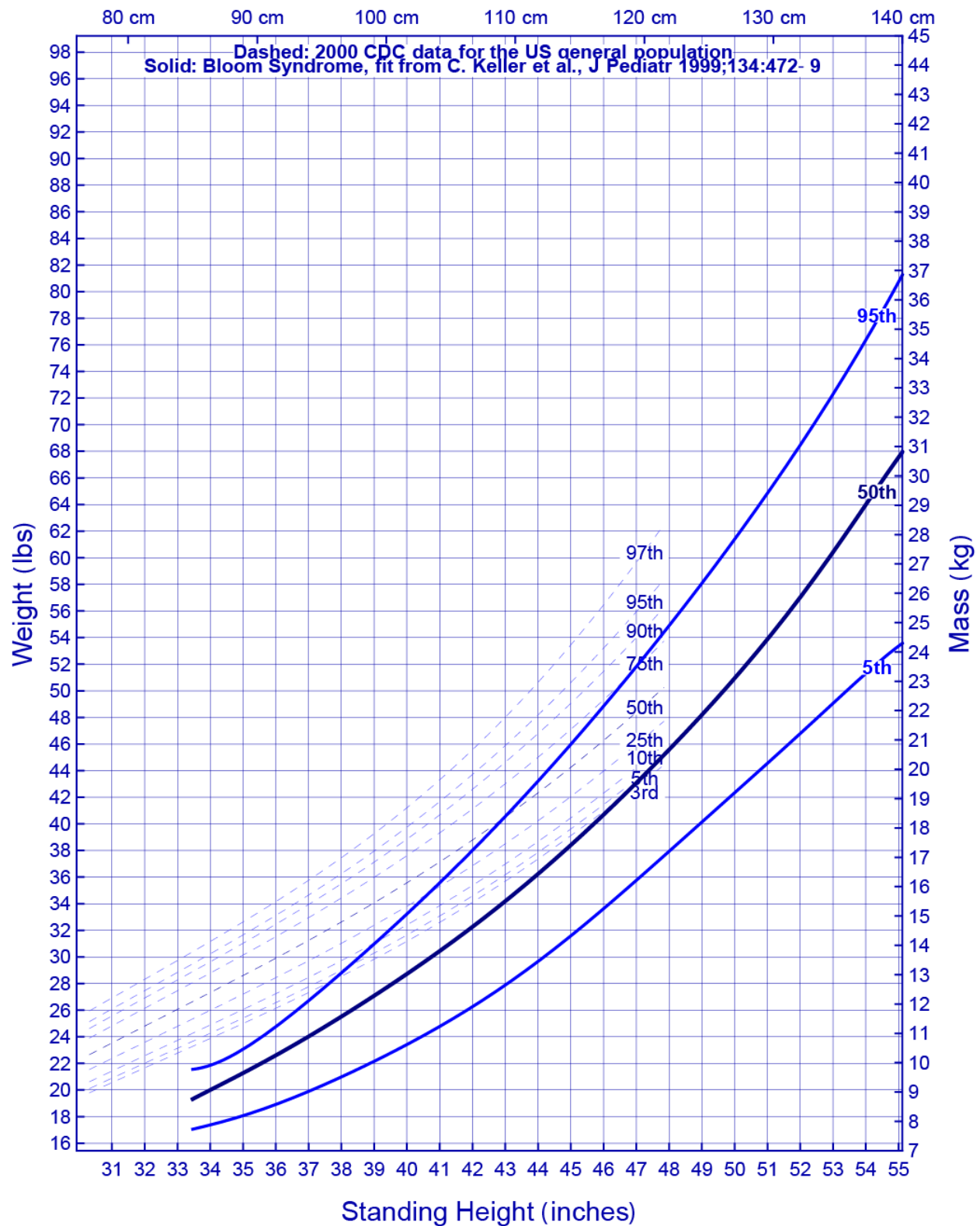
## Weight for Age 2- 18 yrs, Males with Bloom Syndrome



# Height for Age 2- 18 yrs, Males with Bloom Syndrome



# Weight for Height 2- 18 yrs, Males with Bloom Syndrome



## Appendix D: References

To find any of the below references, you may copy and paste the Digital Object Identifier (DOI) (the weird number following each reference's title) into your internet search engine or the search box at <https://dx.doi.org/>

### Overview/Review Articles

- Bloom's Syndrome: Clinical Spectrum, Molecular Pathogenesis, and Cancer Predisposition (2016): 10.1159/000452082
- [Health Supervision](#) paper

### Summaries of Bloom Syndrome Workshops/Events

- Bloom syndrome: research and data priorities for the development of precision medicine as identified by some affected families (2018): 10.1101/mcs.a002816
- Bloom's syndrome workshop focuses on the functional specificities of RecQ helicases (2008): 10.1016/j.mad.2008.09.005

### Growth

- Growth deficiency and malnutrition in Bloom syndrome (1999): 10.1016/S0022-3476(99)70206-4

### Facial Rash/Dermatology

- First Two Cases of Bloom Syndrome in Russia: Lack of Skin Manifestations in a BLM c.1642C>T (p.Q548X) Homozygote as a Likely Cause of Underdiagnosis (2017): 10.1159/000454820

### Immunology

- The Bloom's Syndrome Helicase Is Critical for Development and Function of the alpha-beta T-Cell Lineage (2007): 10.1128/MCB.01402-06
- Immunodeficiency in Bloom's Syndrome (2018): 10.1007/s10875-017-0454-y

### Cancer Screening

- Recommendations for Childhood Cancer Screening and Surveillance in DNA Repair Disorders (2017): 10.1158/1078-0432.CCR-17-0465
- [Health Supervision](#) paper

## Cancer Treatment

- Toxicity of Chemotherapy in a Patient with Bloom Syndrome's Diagnosis (2017): 10.17265/2328-2150/2017.07.006
  - Unsuccessful treatment of 21 year old in Brazil
- Successful treatment of mature B-cell lymphoma with rituximab-based chemotherapy in a patient with Bloom syndrome (2017): 10.1002/pbc.26385
  - Successful treatment of 11 year old in Saudi Arabia
- Adenocarcinoma of the Right Colon in a Patient with Bloom Syndrome (2016): 10.1155/2016/3176842
  - Successful treatment of 40 year old in Brazil
- Burkitt lymphoma in a child with Bloom syndrome: Burkitt's lymphoma and Bloom syndrome: about a pediatric observation (2016): 10.1016/j.arcped.2015.12.004
  - Unsuccessful treatment of 5 year old in Tunisia
- Acute myeloid leukaemia after treatment for acute lymphoblastic leukaemia in girl with Bloom syndrome (2014): 10.4172/2157-7412.1000177
  - Unsuccessful treatment of 9 year old in UK
- Proton beam therapy for malignancy in Bloom syndrome (2013):
  - Unsuccessful treatment of 32 year old in Japan
- Discrepant outcomes in two Brazilian patients with Bloom syndrome and Wilms' tumor: two case reports (2013): 10.1186/1752-1947-7-284
  - Successful treatment of 3.5 year old in Brazil; Unsuccessful treatment of 4 year old in Brazil
- Bloom syndrome complicated by colonic cancer in a young Tunisian woman (2011): 10.1016/j.clinre.2011.06.001
  - Unsuccessful treatment of 19 year old woman in Tunisia
- Combined modality treatment for locally advanced squamous-cell carcinoma of the oropharynx in a woman with Bloom's syndrome: A case report and review of the literature (2001): 10.1023/A:1011106202939
  - Unsuccessful treatment of patient in Australia

## Cancer Risks for Carriers

- Deleterious Germline BLM Mutations and the Risk for Early onset Colorectal Cancer (2015): 10.1038/srep14060