Introduction to Maternal Infant Young Children Nutrition
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Indian Institute of Technology, Bombay

Lecture - 57
Session - 12

Health Spoken Tutorials
WHO Weight for Age and Length for Age Percentile Growth Charts

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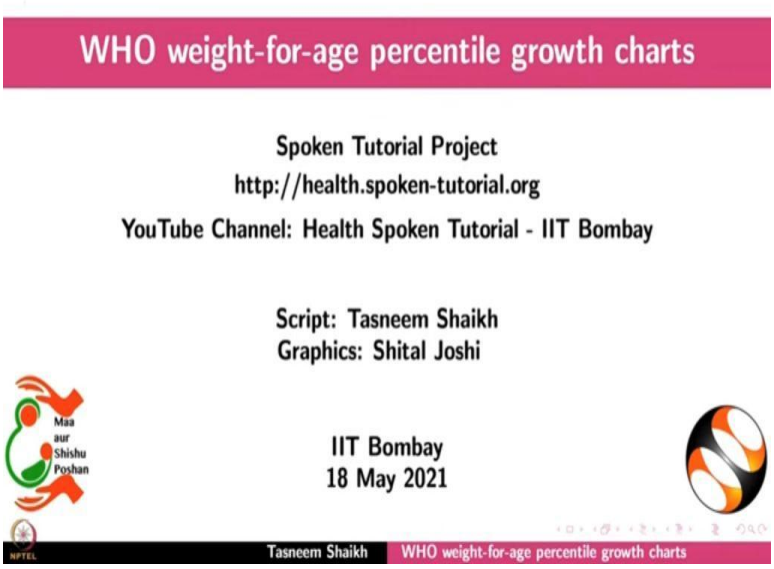

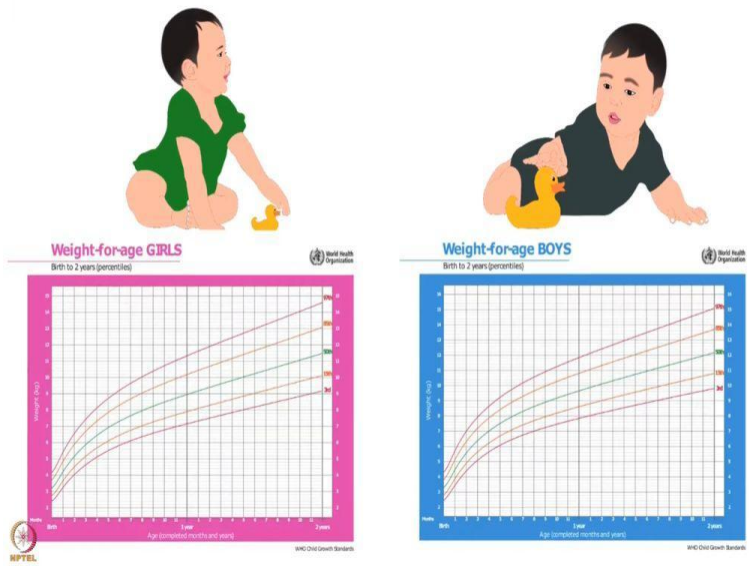

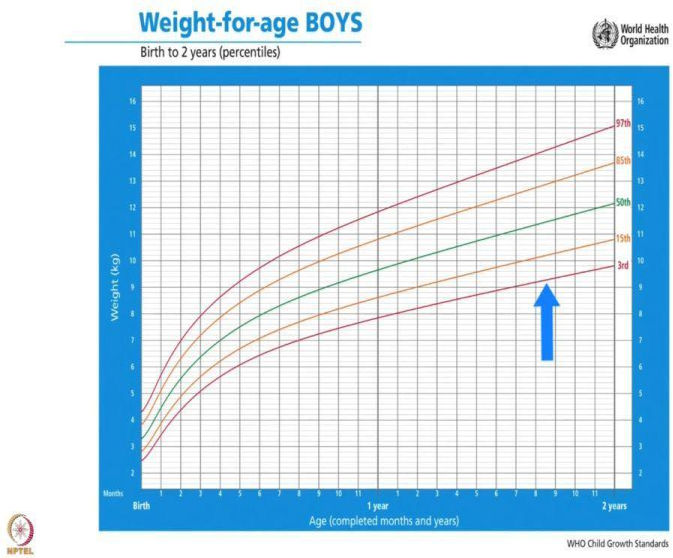

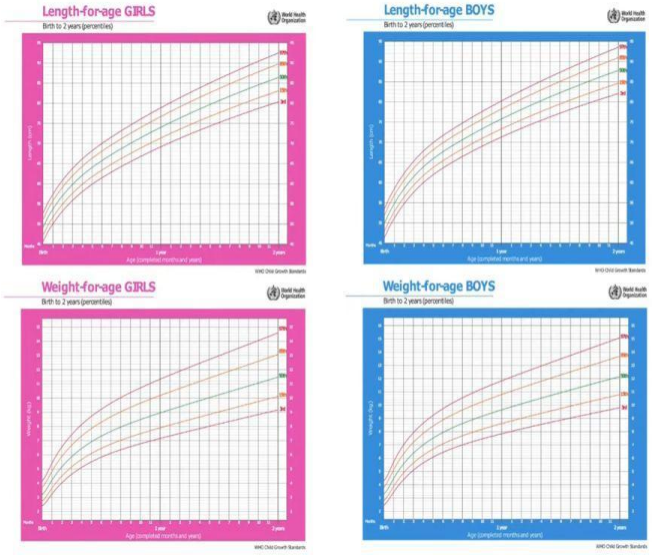

Welcome to the Spoken Tutorial on WHO Weight for Age Percentile Growth Charts. In this tutorial, we will learn about plotting on weight for age percentile growth charts. Interpreting plotted points for growth indicators, identifying problems on growth charts. percentile growth charts are discussed in another tutorial of the same series. Basics of growth charts and plotting are explained in that tutorial.

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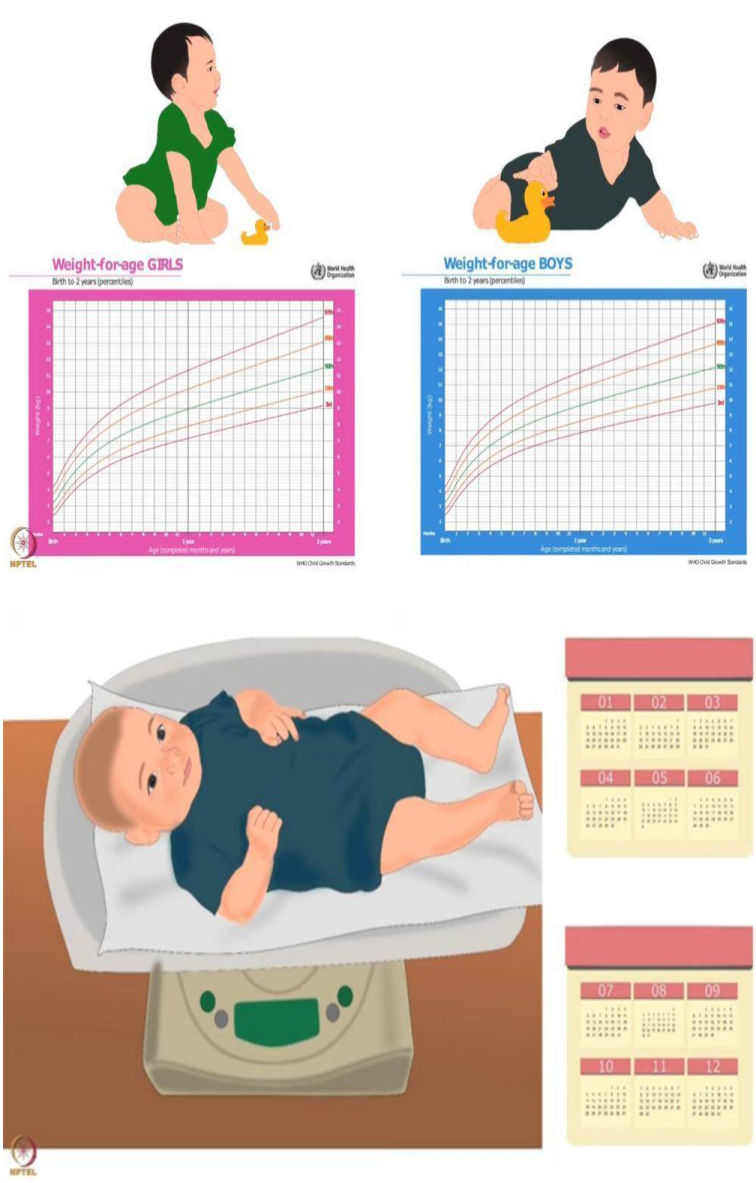
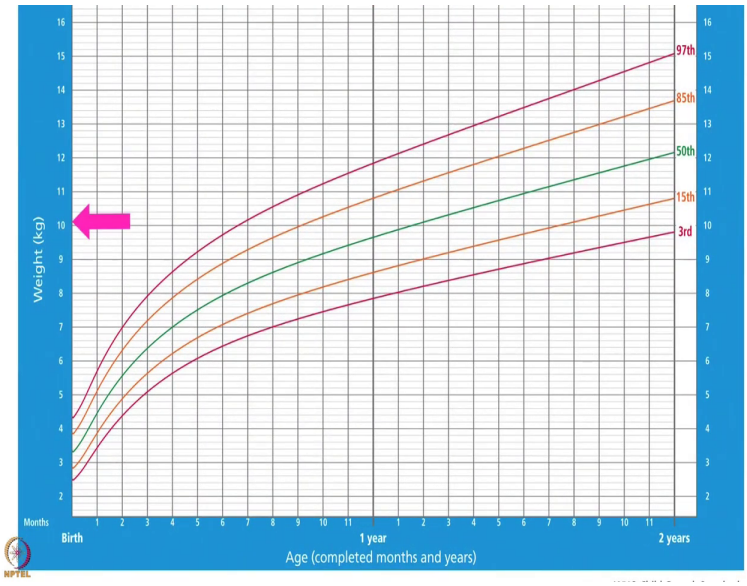
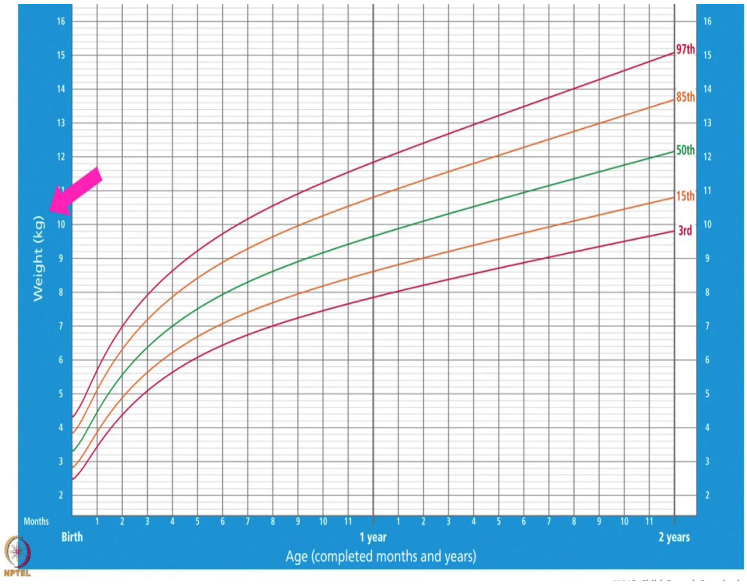
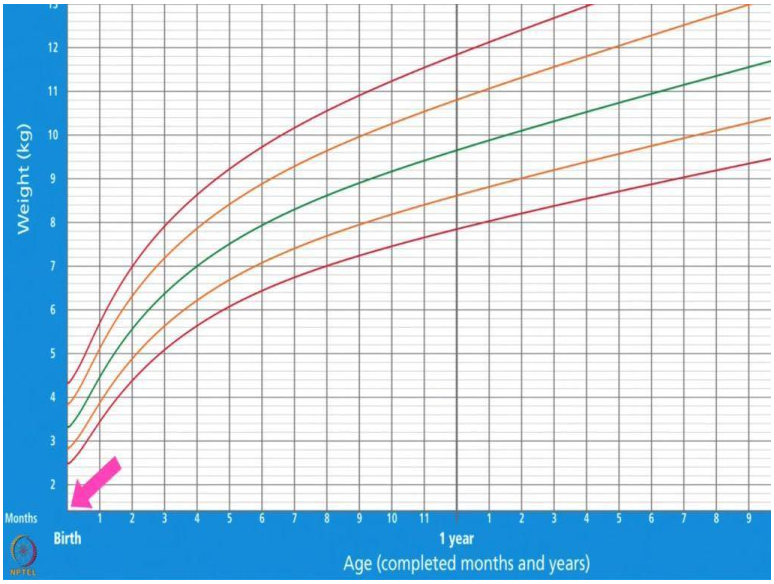
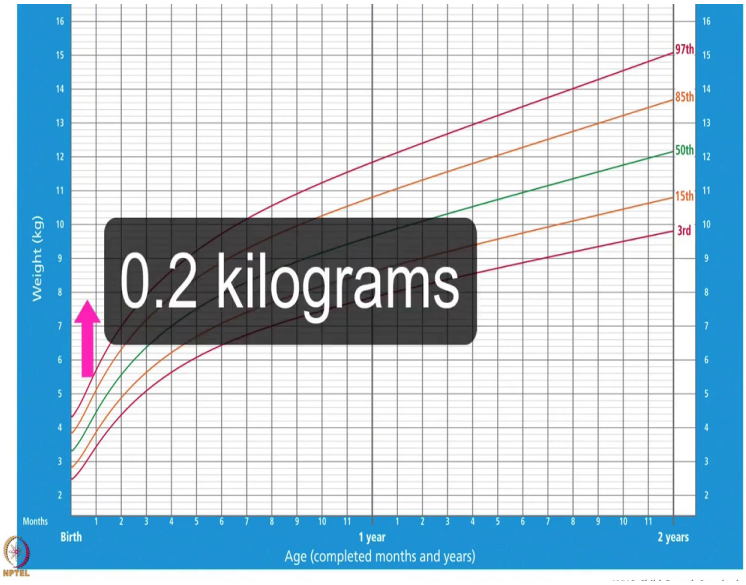
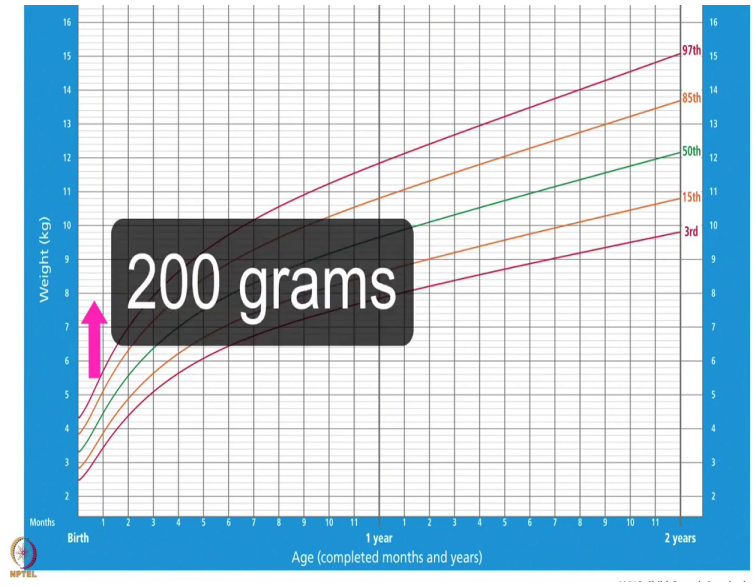


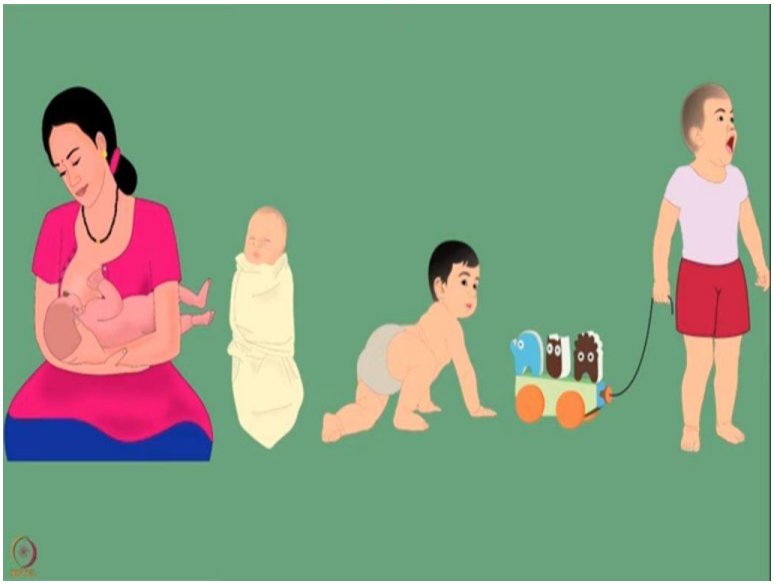

Weight (kg)
97th
85th
50th
15th
3rd
Months
Birth
1 year
2 years
Age (completed months and years)


Weight (kg)
97th
85th
50th
15th
3rd
Months
Birth
1 year
2 years
Age (completed months and years)


Weight (kg)
Months
Birth
1 year
Age (completed months and years)


97th
85th
50th
15th
3rd
0.2 kilograms
Weight (kg)
Months
Birth
1 year
2 years
Age (completed months and years)





The first type of percentile growth chart length for age is also explained. It is important that you watch it before watching this tutorial. Please visit our website for more details. Now, let us learn more about the second type of percentile growth chart, it is the weight for age growth chart. Weight for age reflects body weight according to the child's age, on weight for age charts, the y-axis shows weight in kgs. The horizontal lines mean an increase in weight by 0.2 kgs or 200 grams. The x-axis shows age, it starts with 0 which is at birth. Age is plotted in completed months and years from 0 to 2 years of age.

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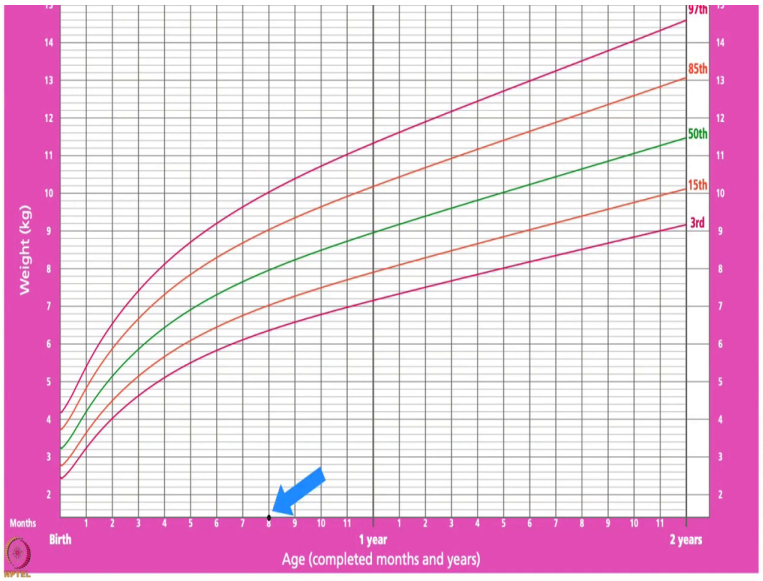
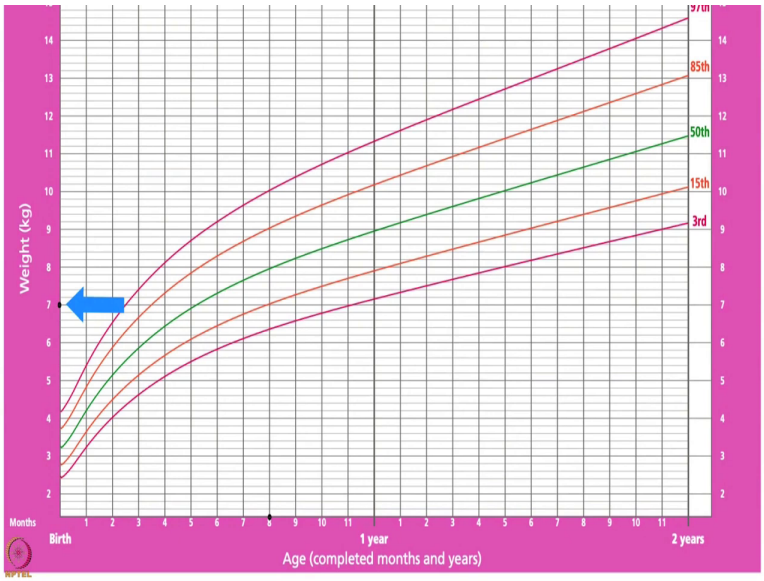
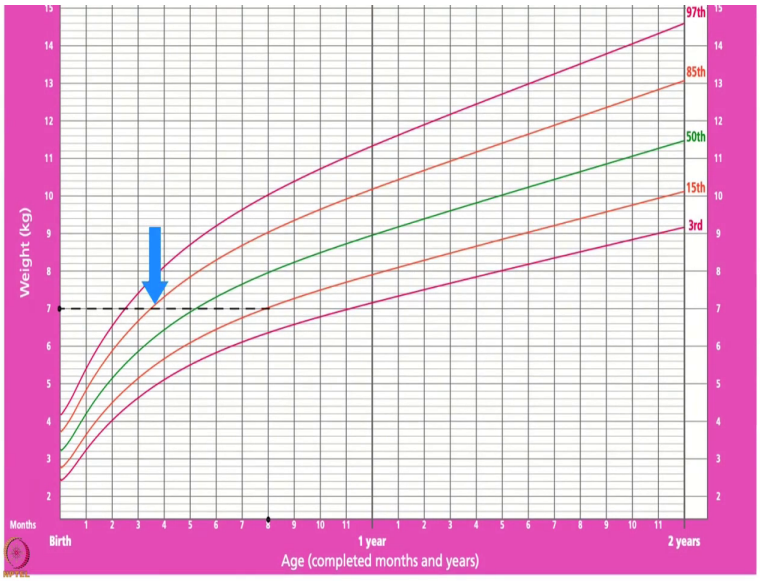
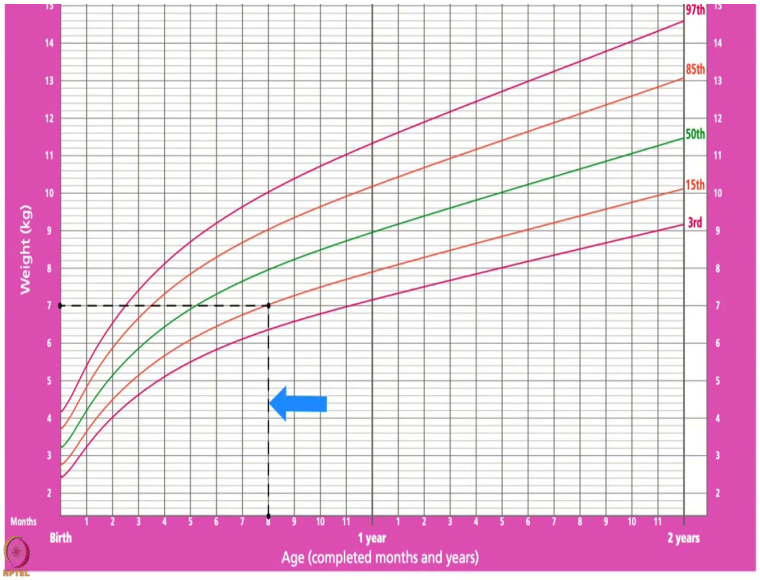
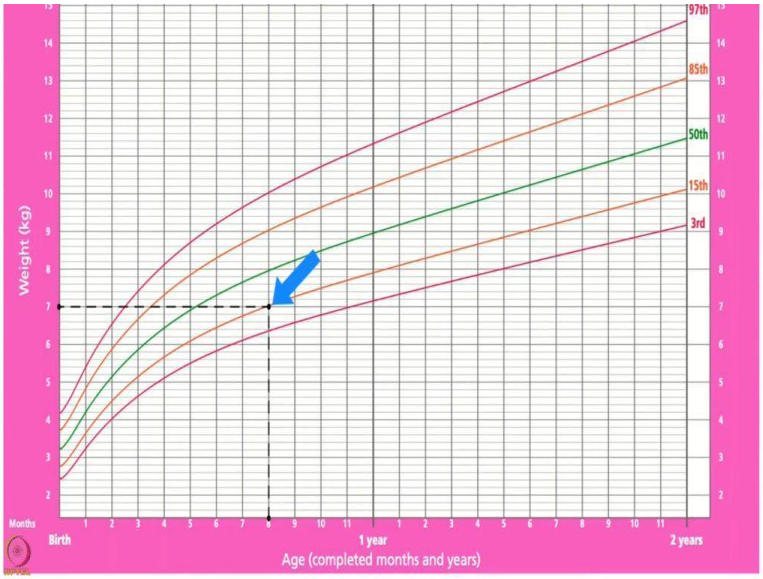





Weight (kg)
97th
85th
50th
15th
3rd
Months
Birth
1 year
2 years
Age (completed months and years)


Weight (kg)
97th
85th
50th
15th
3rd
Months
Birth
1 year
2 years
Age (completed months and years)



Let us go through the steps to plot weight for age in this chart. First, mark the exact age that is months and years on the x-axis. Then mark the weight on the y-axis with a point. Extend it over the connected horizontal line till the marked point for age. Extend the marked point for age over the connected vertical line. The point where the two extended lines intersect is called a plotted point.

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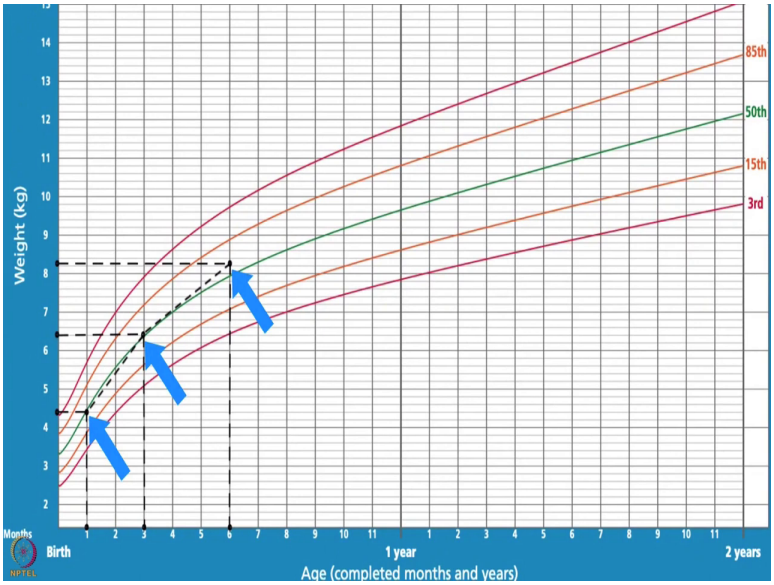
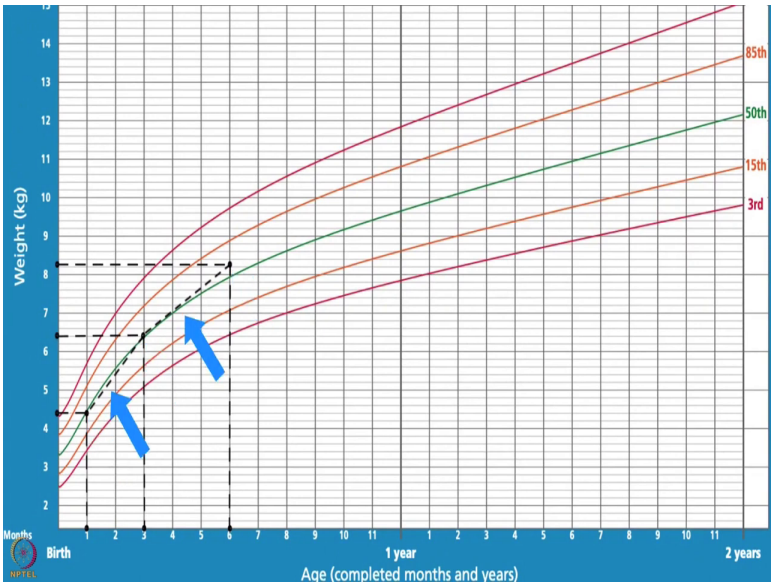
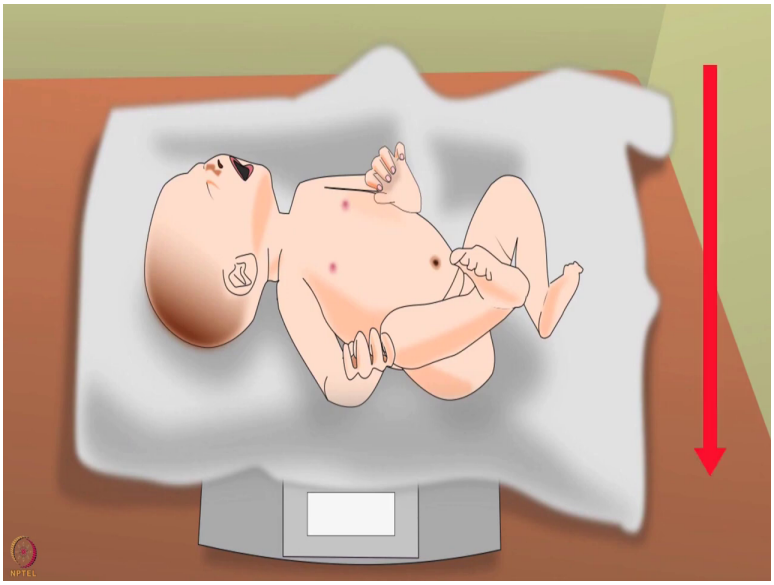
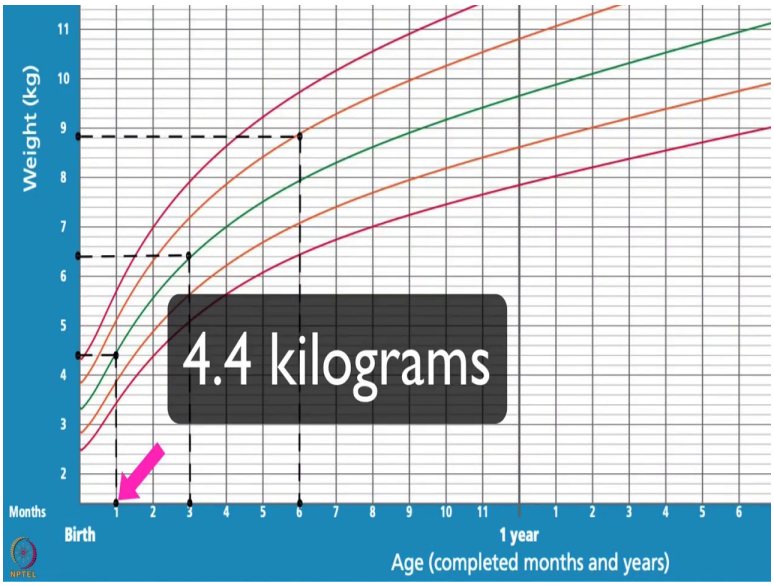
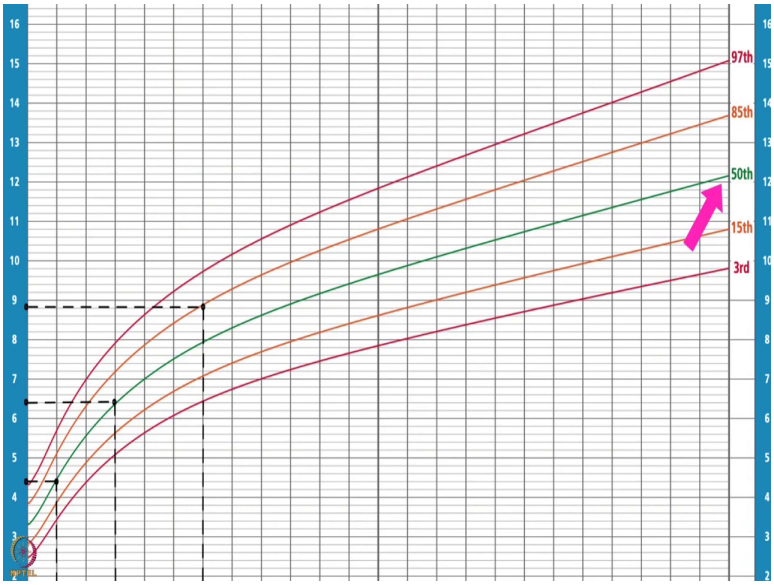
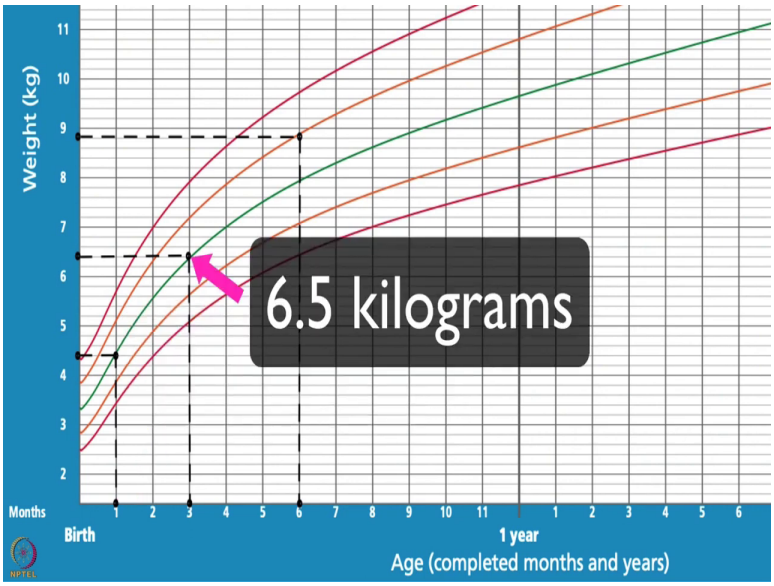


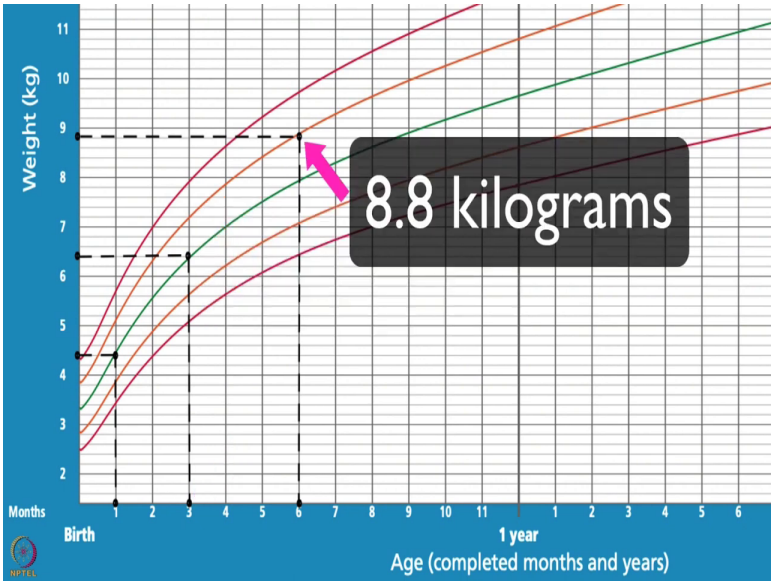

Weight (kg)
85th
50th
15th
3rd
Months
Birth
1 year
2 years
Age (completed months and years)

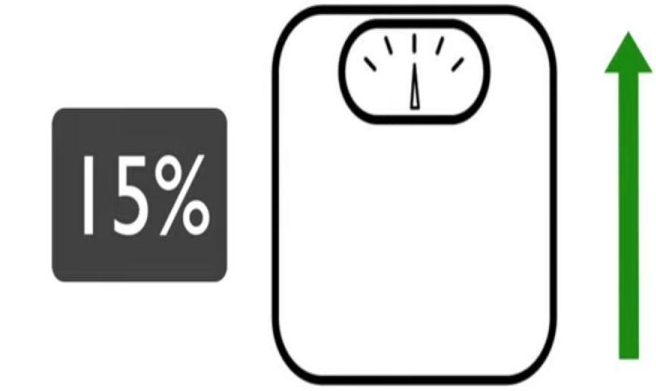


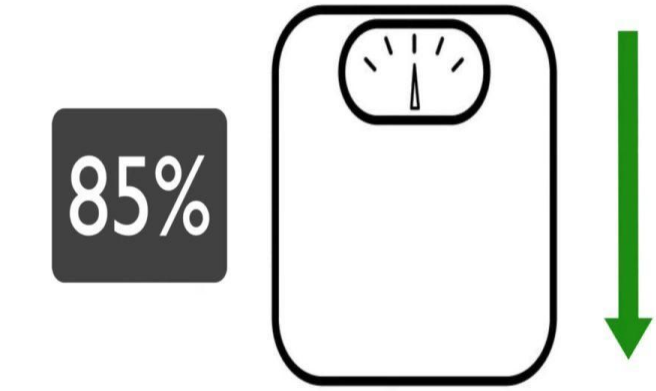

Weight (kg)
11
10
9
8
7
6
5
4
3
2
4.4 kilograms
Months
1 2 3 4 5 6 7 8 9 10 11
Birth
1 year
1 2 3 4 5 6
Age (completed months and years)


16
15
14
13
12
11
10
9
8
7
6
5
4
3
97th
85th
50th
15th
3rd


Weight (kg)
11
10
9
8
7
6
5
4
3
2
6.5 kilograms
Months
1 2 3 4 5 6 7 8 9 10 11 1 2 3 4 5 6
Birth
1 year
Age (completed months and years)


Weight (kg)
11
10
9
8
7
6
5
4
3
2
8.8 kilograms
Months
1 2 3 4 5 6 7 8 9 10 11 1 2 3 4 5 6
Birth
1 year
Age (completed months and years)





For every child points should be plotted over weekly or monthly measurements. Always connect adjacent points with a straight line. This will help to identify any growth problems in the child. Let us use an example to understand plotting points on this chart. This graph shows Amit's weight for age plotted thrice over 6 months. Amit weight 4.4 kgs at 1 month of age, it is almost at the 50th percentile. It means he is of average weight 1 month after birth.

He weighed 6.5 kgs at 3 months of age, it is a little above the 50th percentile line. It means he is of average weight at 3 months of age, he weighed 8.8 kgs at 6 months of age. It is at the 85th percentile line, it means Amit is of above average weight at 6 months of age. It means 15 percent

of children of his age weigh more than him. 85 percent of children of his age weigh less than him.

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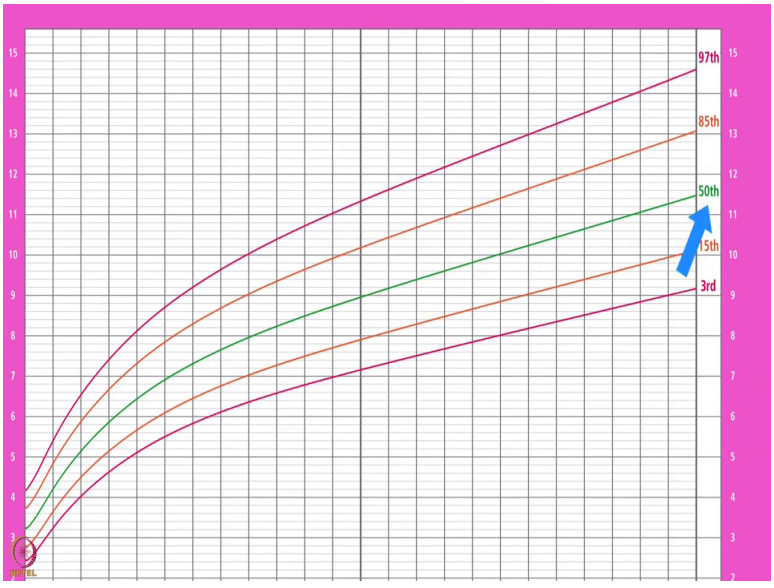
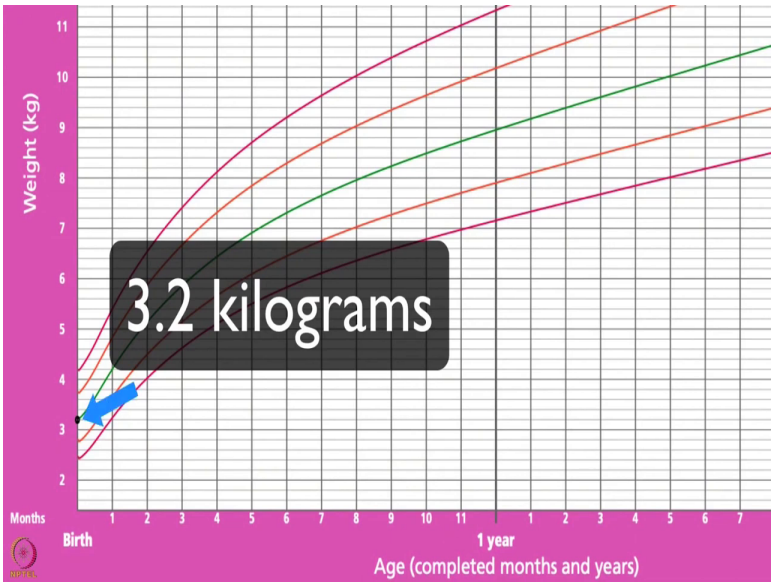
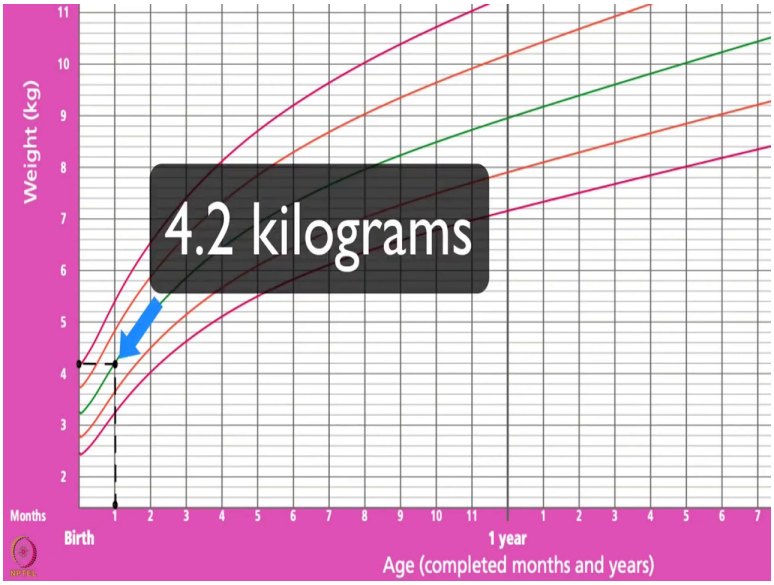
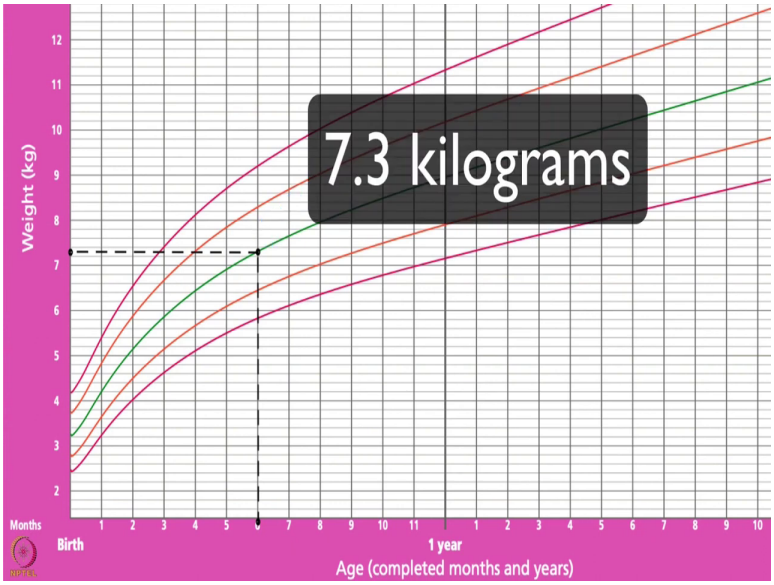
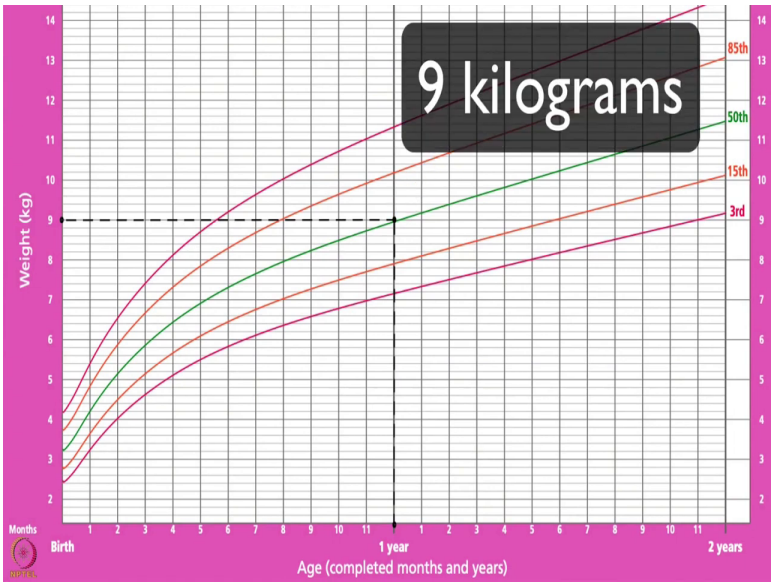


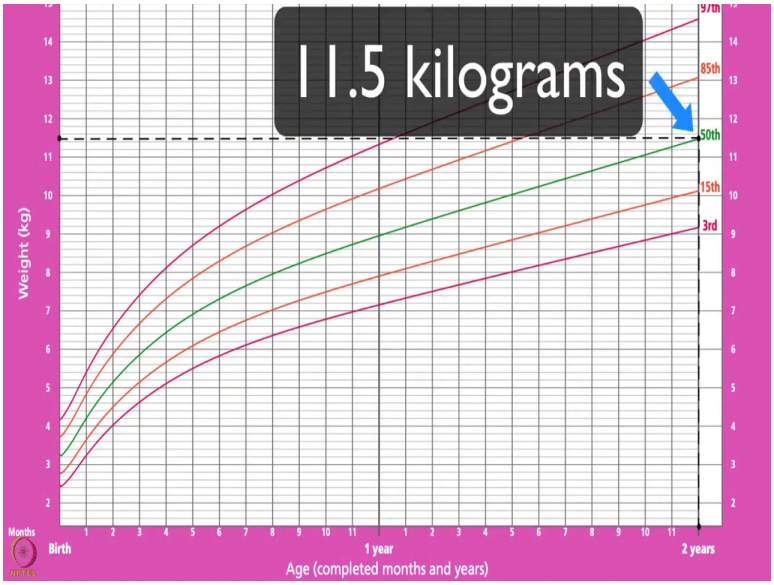

Weight (kg)
11
10
9
8
7
6
5
4
3
2
3.2 kilograms
Months
1 2 3 4 5 6 7 8 9 10 11
1 2 3 4 5 6 7
Birth
1 year
Age (completed months and years)


Weight (kg)
11
10
9
8
7
6
5
4
3
2
4.2 kilograms
Months
1 2 3 4 5 6 7 8 9 10 11
1 2 3 4 5 6 7
Birth
1 year
Age (completed months and years)

5.8 kilograms
Weight (kg)
Months
Birth
1 year
Age (completed months and years)


7.3 kilograms
Weight (kg)
Months
Birth
1 year
Age (completed months and years)





Next, let us learn more about the average weight of a child. It is along the 50th percentile line in the weight for age growth chart. The average birth weight of a girl is 3.2 kgs. At 1 month, a girl's average weight is 4.2 kgs, at 3 months it is 5.8 kgs. The average weight of a 6-month-old girl is 7.3 kgs. At 1 year, it is 9 kgs, at 2 years, it is 11.5 kgs.

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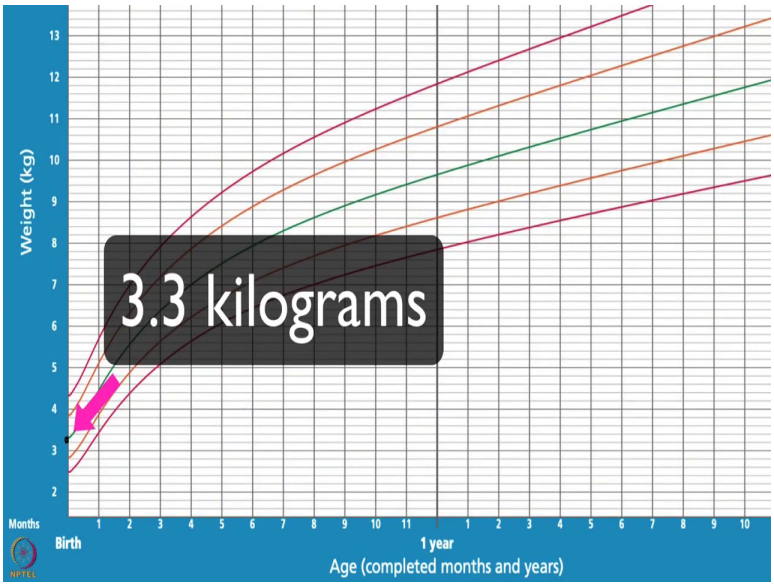
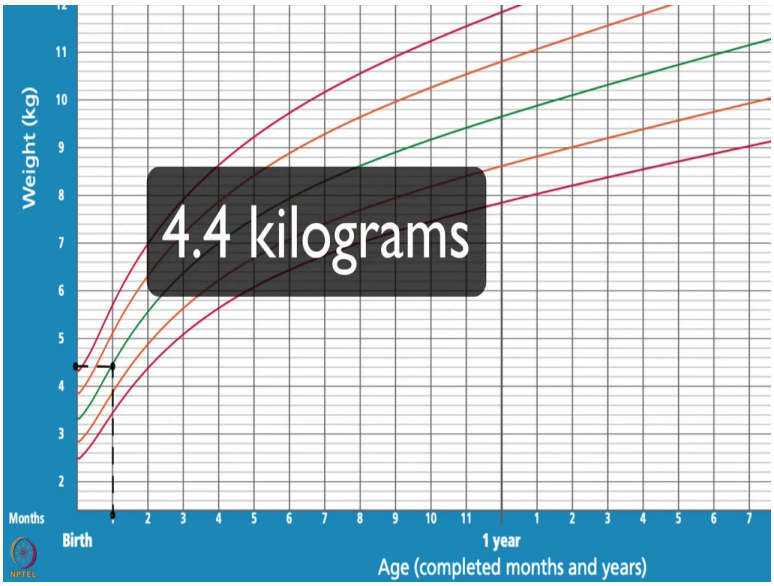
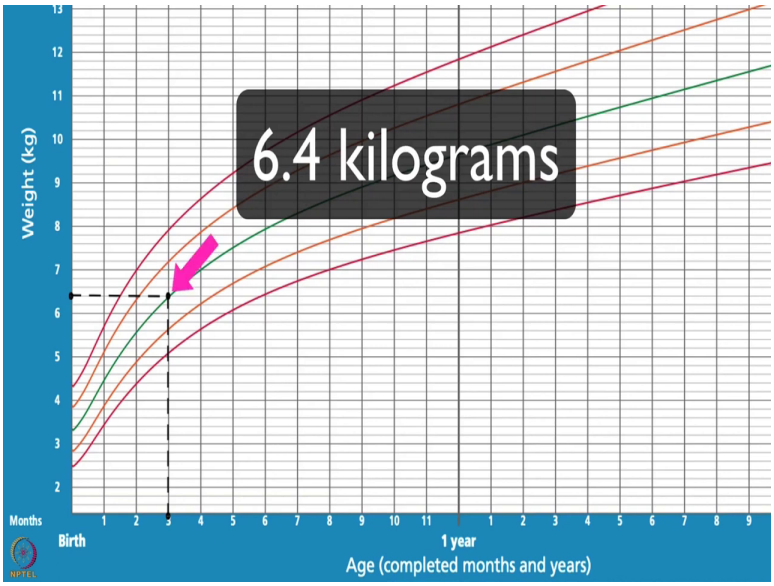
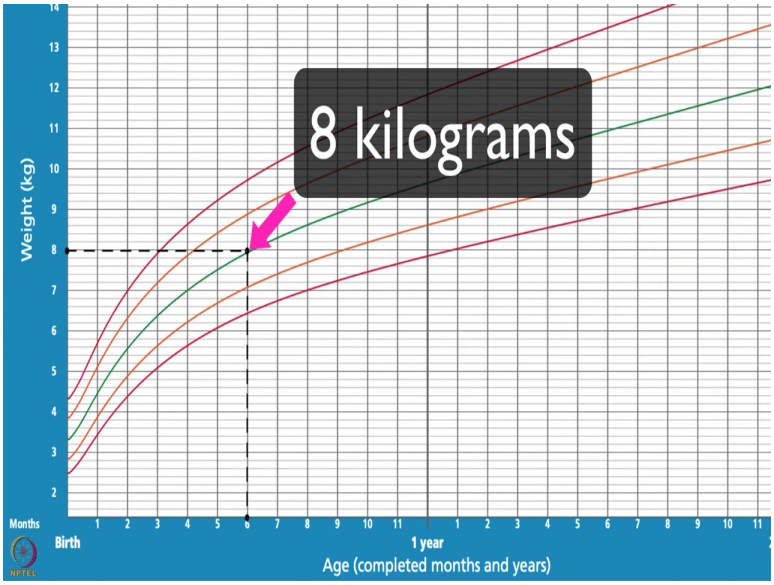
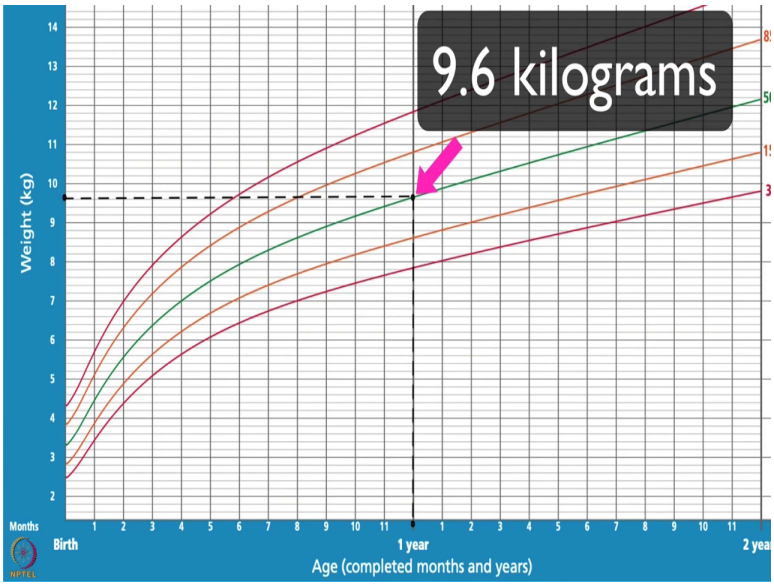
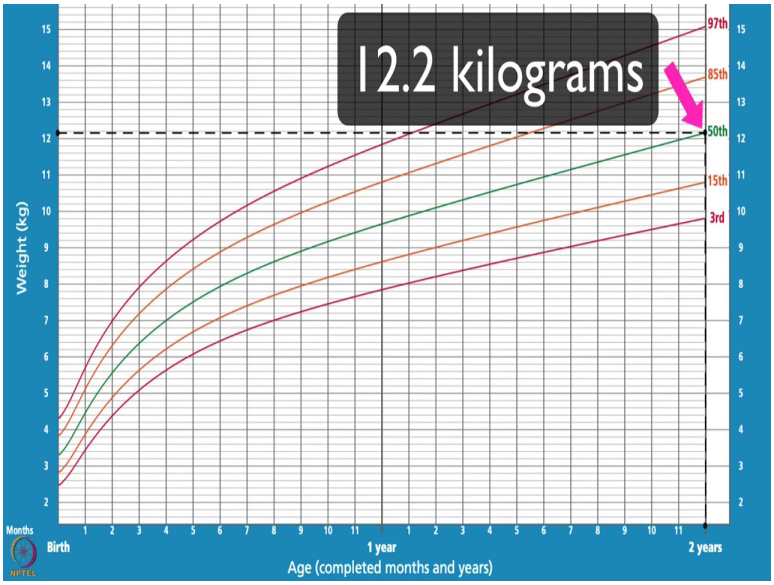





6.4 kilograms
Weight (kg)
Months
Birth
1 year
Age (completed months and years)


8 kilograms
Weight (kg)
Months
Birth
1 year
Age (completed months and years)





The average birth weight of a boy is 3.3 kgs. At 1 month, a boy's average weight is 4.4 kgs, at 3 months, it is 6.4 kgs. The average weight of a 6-month-old boy is 8 kgs, at 1 year, it is 9.6 kgs. At 2 years, it is 12.2 kgs.

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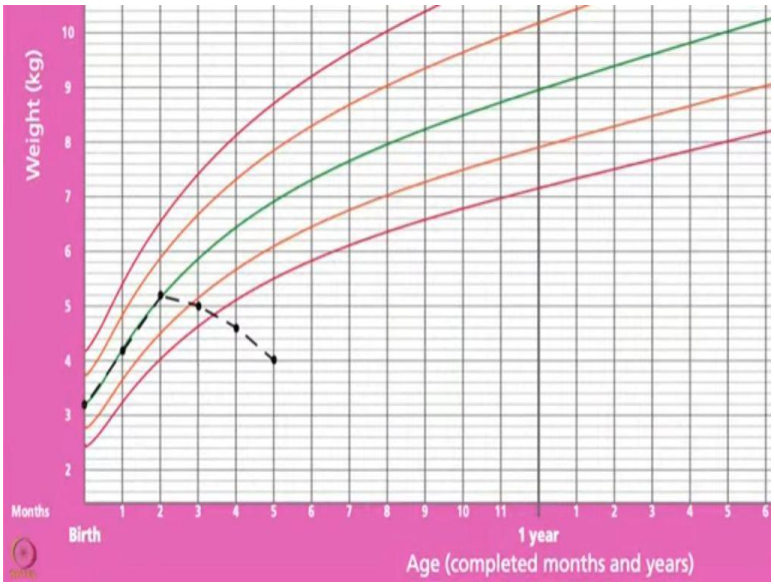
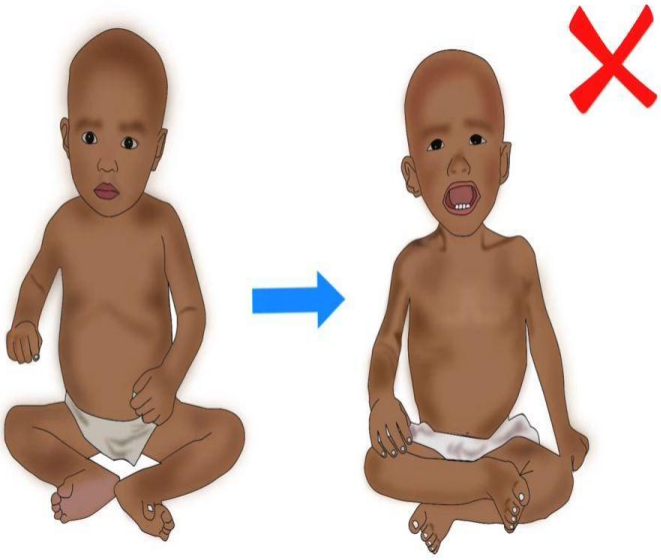
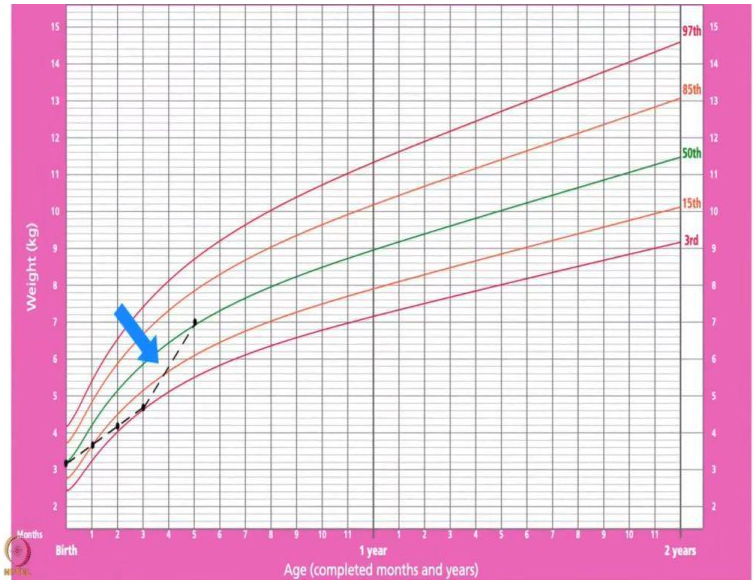
Age in weeks	Weight (kg)	Weight gain per week	Weight gain /day
1	3.5	200	28.5
2	3.8	300	42.8
3	4.1	300	42.8
4	4.4	300	42.8
5	4.7	300	42.8
6	4.9	200	28.5
7	5.2	300	42.8
8	5.4	200	28.5
9	5.6	200	28.5
10	5.8	200	28.5
11	6.0	200	28.5
12	6.2	200	28.5
13	6.4	200	28.5







Now, let us look at the average weight gain for a boy in this table. This column shows the average weight gain per day for a boy, this column shows the average weight gain per week for a boy. In the first week, the weight gain is 28.5 grams per day, total weight gain in the first week is 200 grams. In the fifth week, the weight gain is 42.8 grams per day, total weight gain in the fifth week is 300 grams. In the ninth week, the weight gain is 28.5 grams per day, total weight gain in the ninth week is 200 grams. When interpreting growth charts, be alert for situations that suggest risk.

A sharp decline in the growth line of a child indicates a growth problem. Even if a child is overweight, he should not have a sharp decline in his growth. Losing too much weight rapidly is not healthy for any child. The overweight child should maintain his weight while increasing in length. On the other hand, a rapid incline in the growth line is healthy sometimes.

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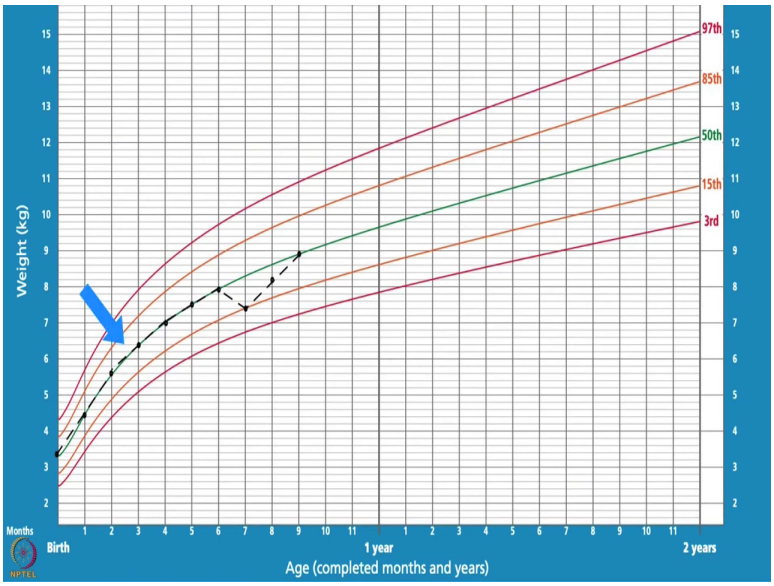
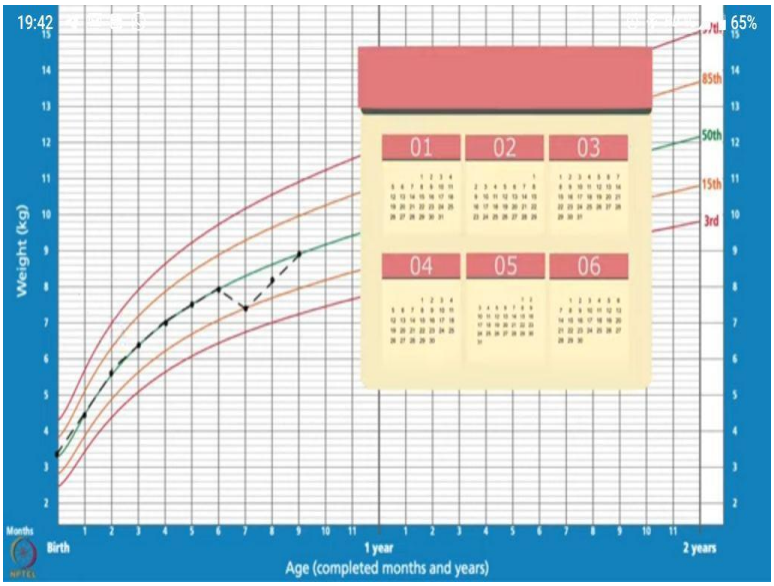
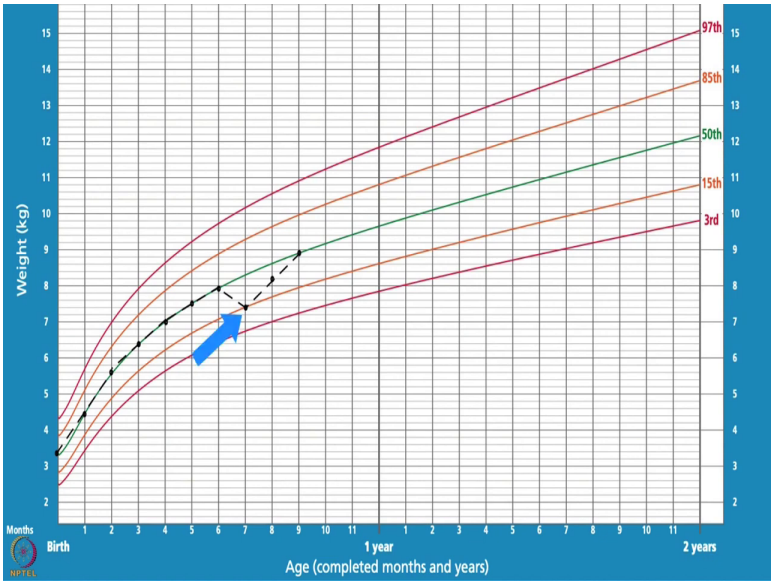
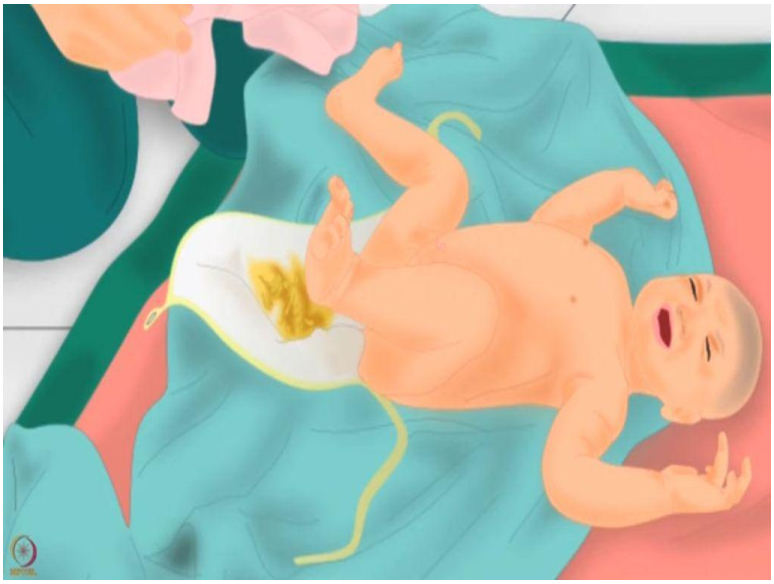
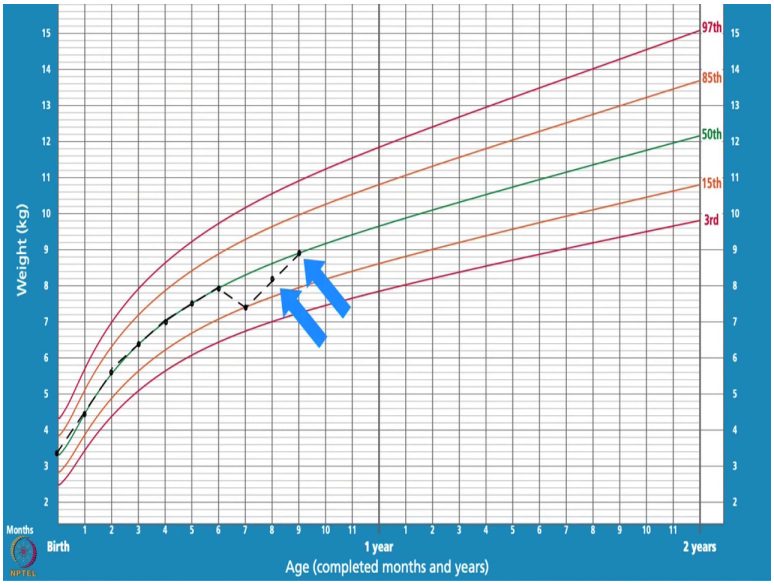





Weight (kg)
97th
85th
50th
15th
3rd
Months
Birth
1 year
2 years
Age (completed months and years)

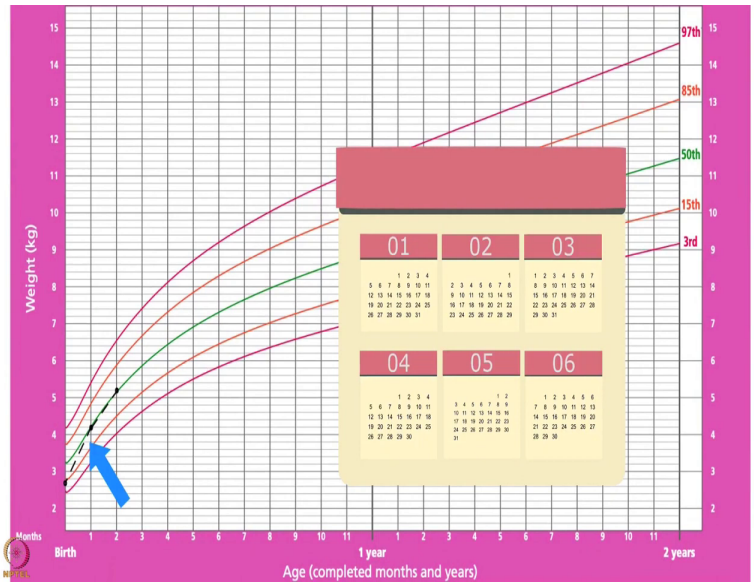
1
2
3
4
5
6
7
8

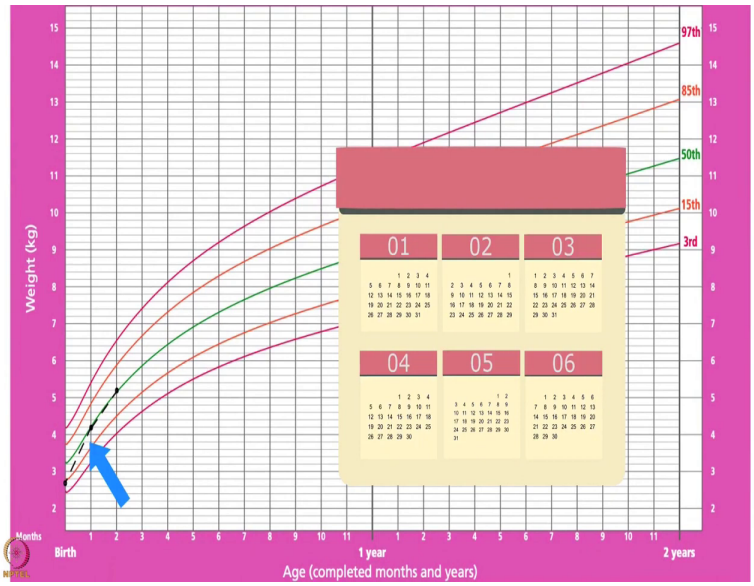


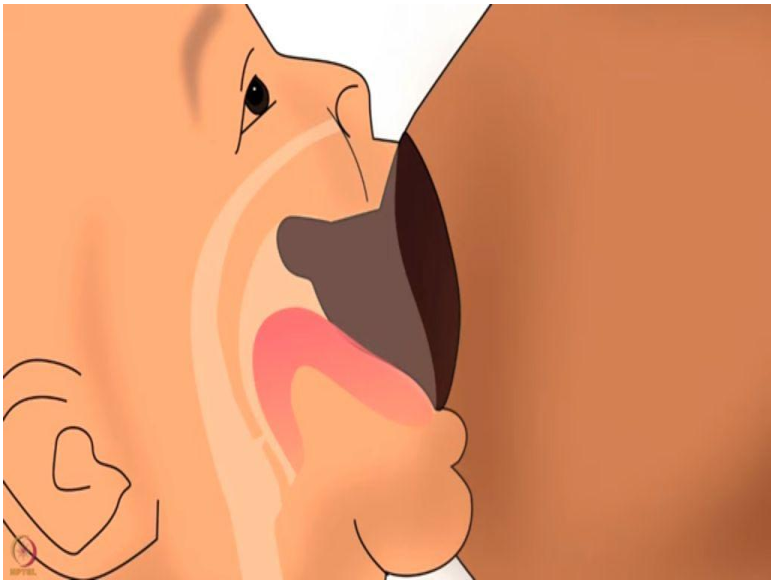

Weight (kg)
97th
85th
50th
15th
3rd
Months
Birth
1 year
2 years
Age (completed months and years)

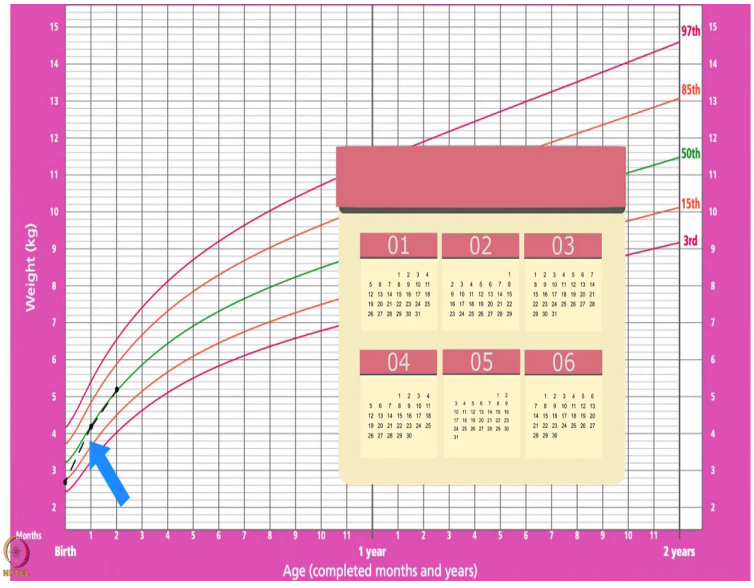
This chart shows Arun's weight on the 50th percentile line till 6 months of age. This was because of adequate and effective breast feeding, then his weight dropped to the 15th percentile line in the seventh month. He did not get adequate complementary food after completing 6 months, he was also ill and had diarrhea. Then, in the eighth and ninth months, his weight started increasing. In these months he got adequate breast milk and complementary food, therefore, his growth chart shows an incline.

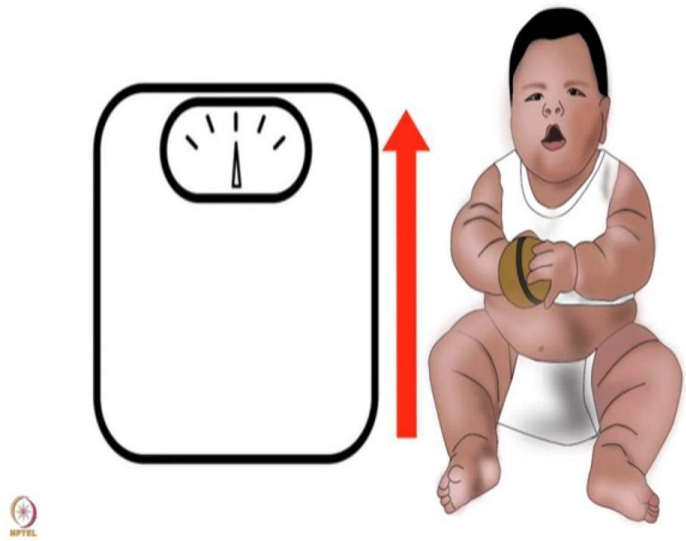
(Refer Slide Time: 09:11)


Weight (kg)
97th
85th
50th
15th
3rd
01
02
03
04
05
06
Months
Birth
1 year
2 years
Age (completed months and years)


Weight (kg)
97th
85th
50th
15th
3rd
01
02
03
04
05
06
Months
Birth
1 year
2 years
Age (completed months and years)



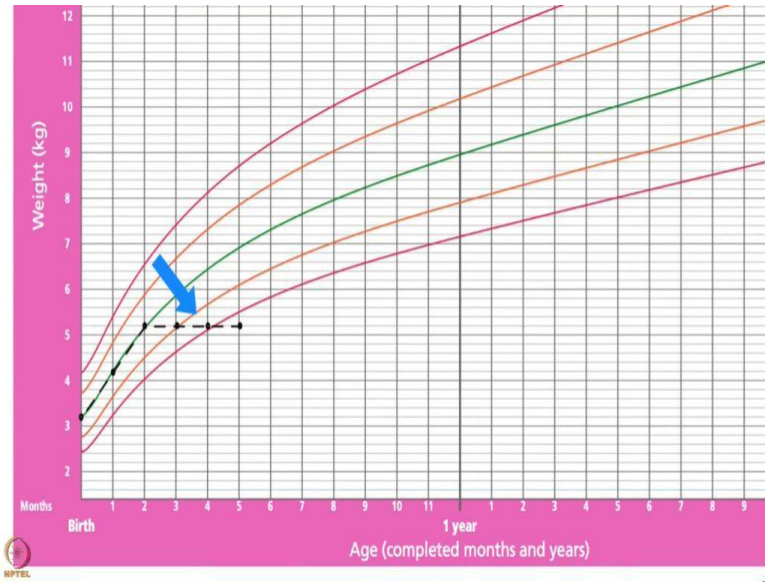

Weight (kg)
97th
85th
50th
15th
3rd
01
02
03
04
05
06
Months
Birth
1 year
2 years
Age (completed months and years)

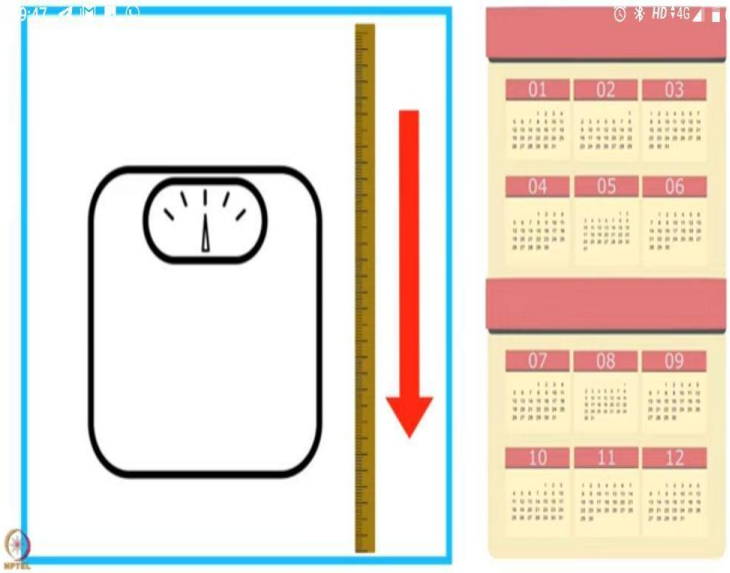


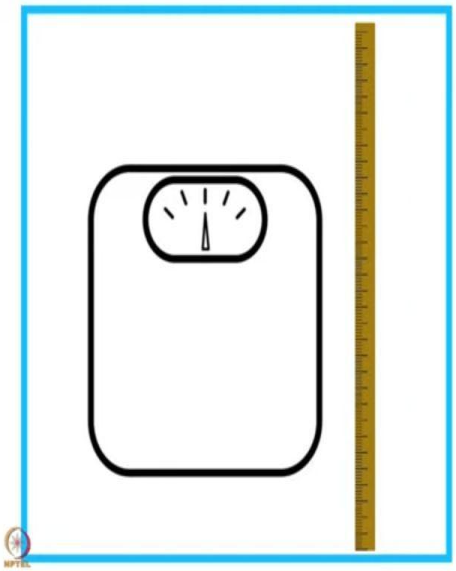
The average birth weight of an Indian child is 2.7 kgs. So, an incline in their growth line is important in the first few months. Correct breastfeeding techniques also cause a sharp incline in the charts. This chart shows that Supriya's birth weight was on the 50th percentile line. Then, in first month, her weight dropped to the 15th percentile line, this happened because of ineffective breastfeeding.

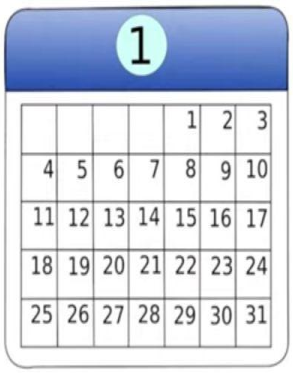
Her mother was taught the correct breastfeeding technique for deep latching. Within a month Supriya's weight increased to the 50th percentile line. However, a sharp incline is risky for babies who are fed animal milk or formula. If they gain weight rapidly, then they can become overweight at 1 year of age.

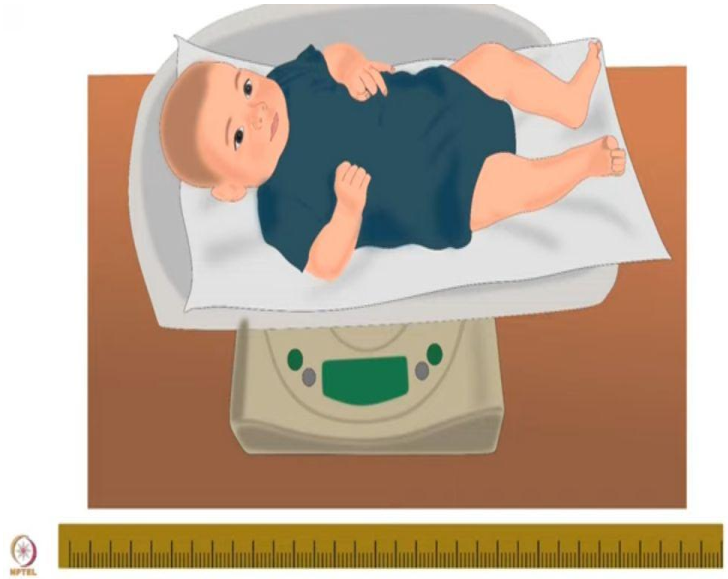
(Refer Slide Time: 10:28)





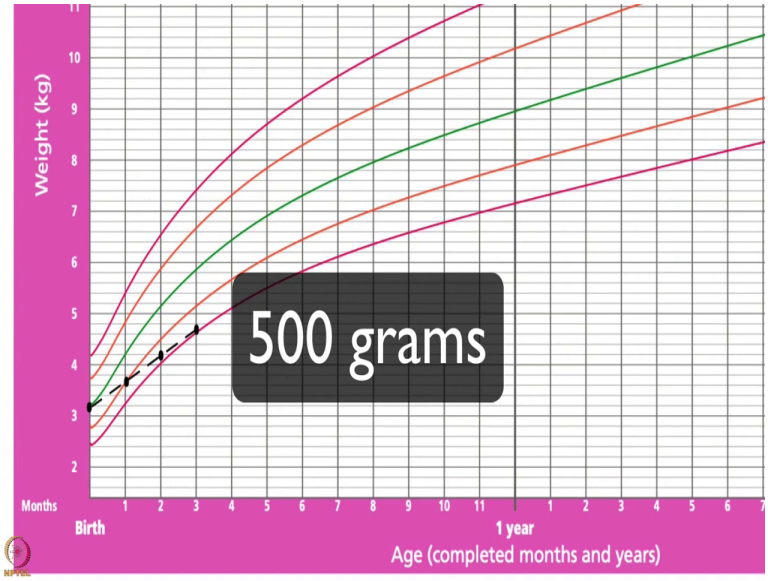


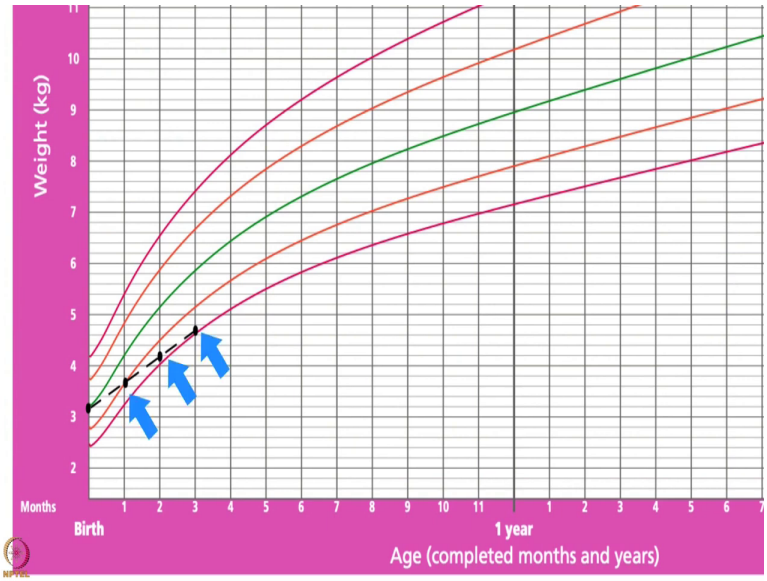

1
1 2 3
4 5 6 7 8 9 10
11 12 13 14 15 16 17
18 19 20 21 22 23 24
25 26 27 28 29 30 31

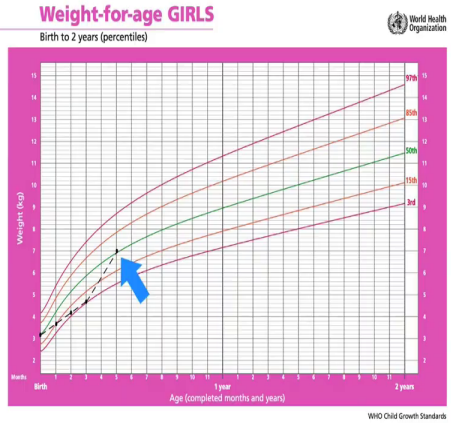


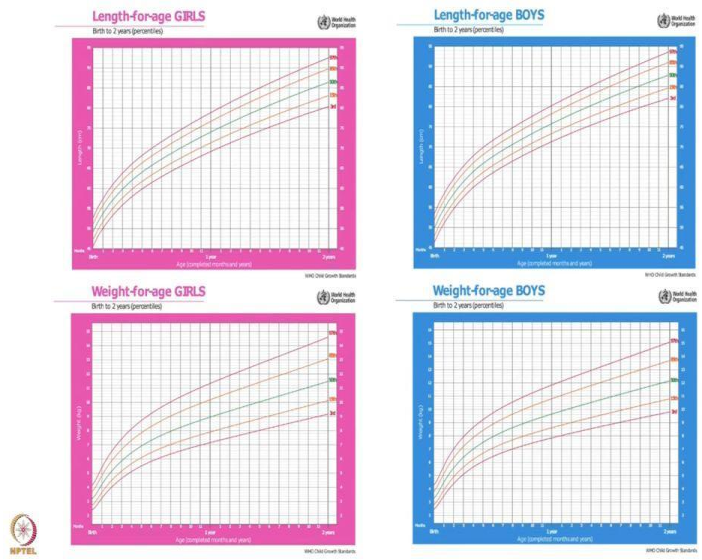
Another growth problem for any child is a flat growth line or growth stagnation. A flat growth line also called stagnation usually indicates a problem. If a child's length or weight stays the same over time, she is not growing. Even one-month's stagnation in growth represents a possible problem, the only exception is with an overweight child. This child can maintain the same weight over time while the length increases, this will bring the child to a healthier weight for his length.

(Refer Slide Time: 11:22)



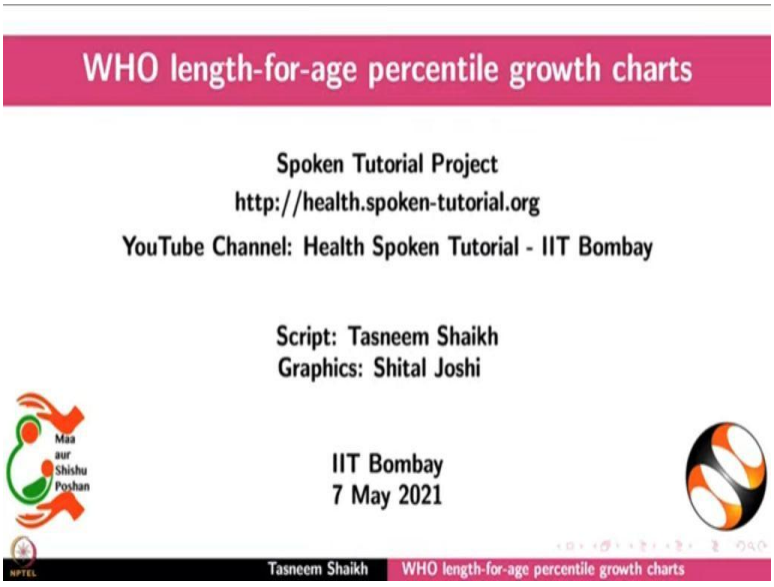

Weight (kg)
Months
Birth
1 year
Age (completed months and years)

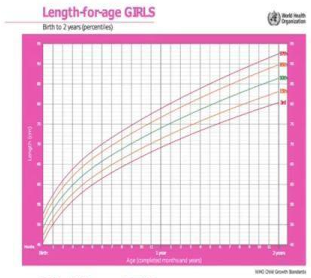

Weight-for-age GIRLS
Birth to 2 years (percentiles)
World Health Organization
97th
85th
50th
15th
3rd
Weight (kg)
Birth
1 year
2 years
Age (completed months and years)
WHO Child Growth Standards

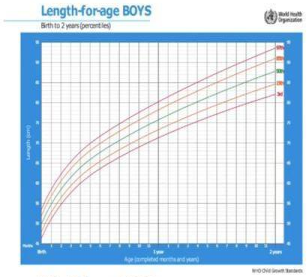


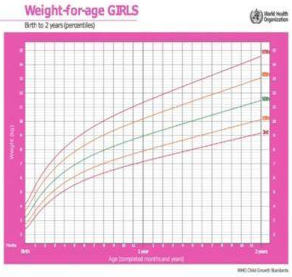
Another problem is slow growth. Here Puja's average weight gain is only 500 grams per month. Her birth weight was average at the 50th percentile line. However, here we can see that she became undernourished in just 3 months. She needs effective breastfeeding to come back to the 50th percentile line. Please follow the growth chart to evaluate a child's growth. Take adequate measures if the growth falters due to any reason. This brings us to the end of this tutorial.

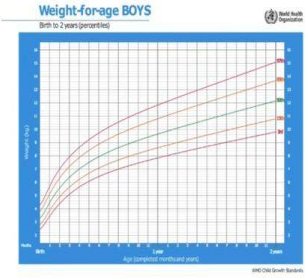
(Refer Slide Time: 12:18)

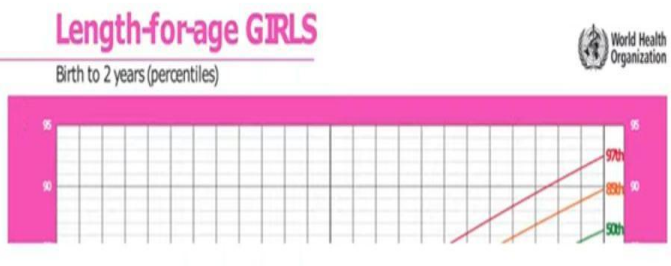


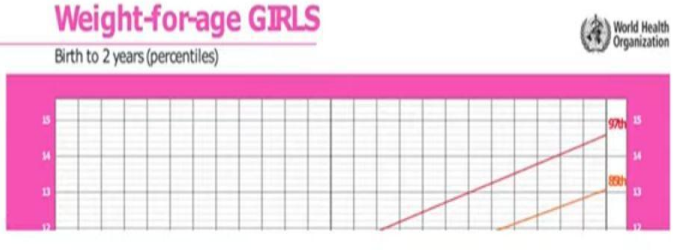

Length-for-age GIRLS
Birth to 2 years (percentiles)
World Health Organization
Age (completed months and years)
WHO Child Growth Standards

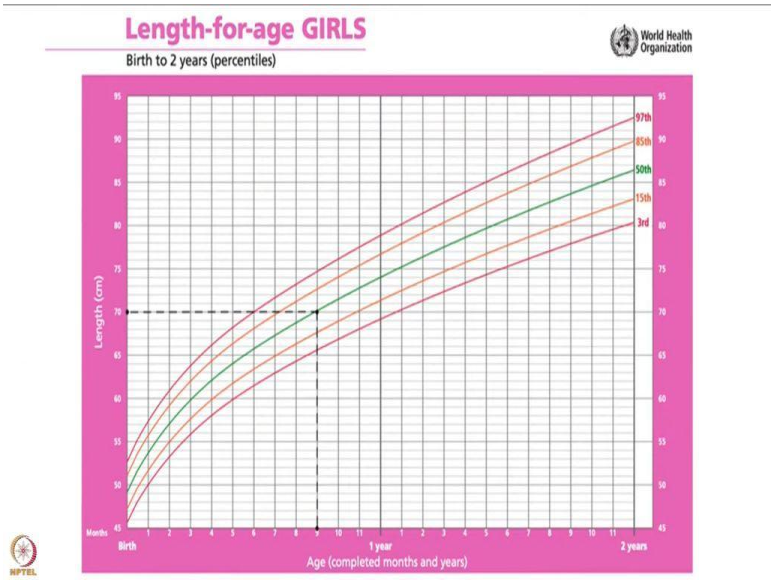

Length-for-age BOYS
Birth to 2 years (percentiles)
World Health Organization
Age (completed months and years)
WHO Child Growth Standards

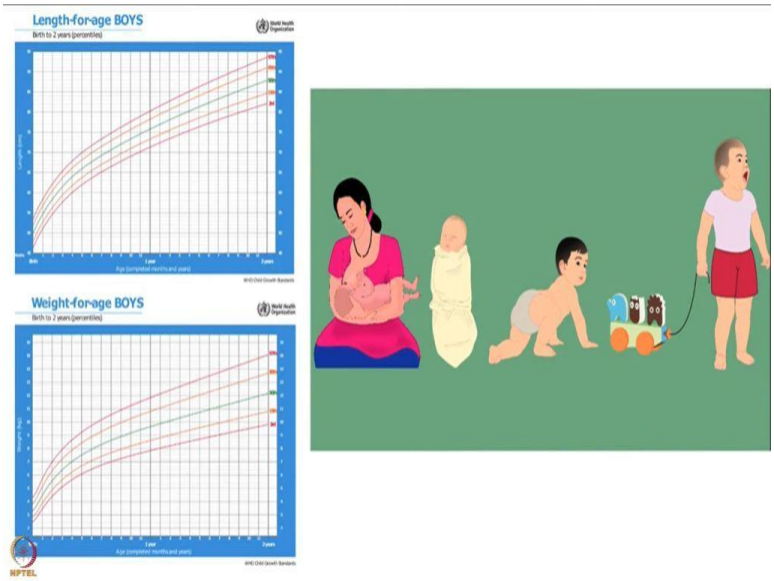

Weight-for-age GIRLS
Birth to 2 years (percentiles)
World Health Organization
Age (completed months and years)
WHO Child Growth Standards


Weight-for-age BOYS
Birth to 2 years (percentiles)
World Health Organization
Age (completed months and years)
WHO Child Growth Standards


Length-for-age GIRLS
Birth to 2 years (percentiles)
World Health Organization
95
90
97th
85th
50th

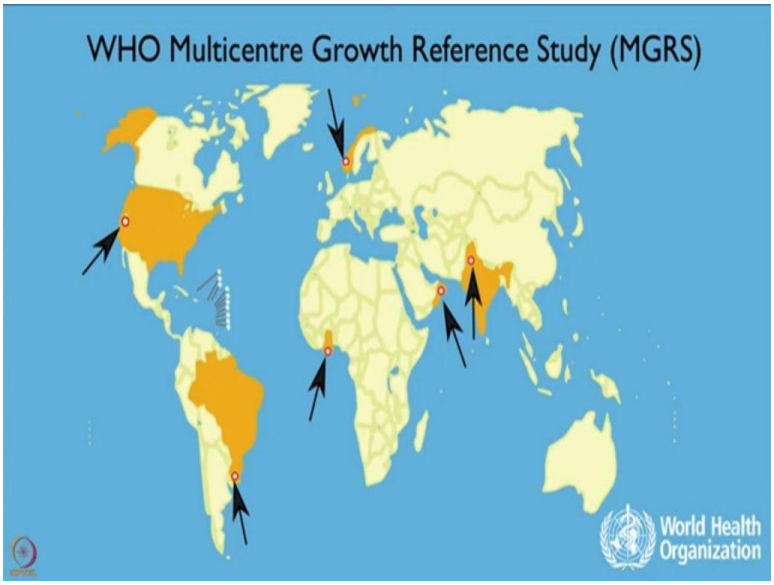

Weight-for-age GIRLS
Birth to 2 years (percentiles)
World Health Organization
15
14
13
97th
85th

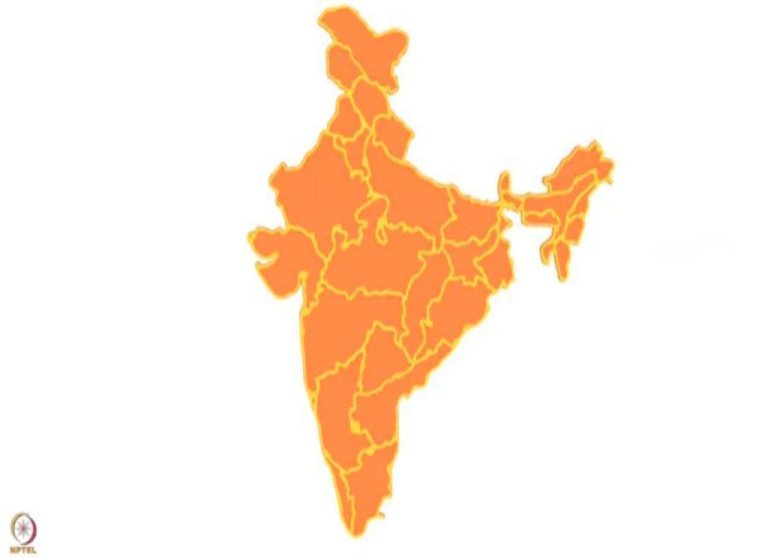


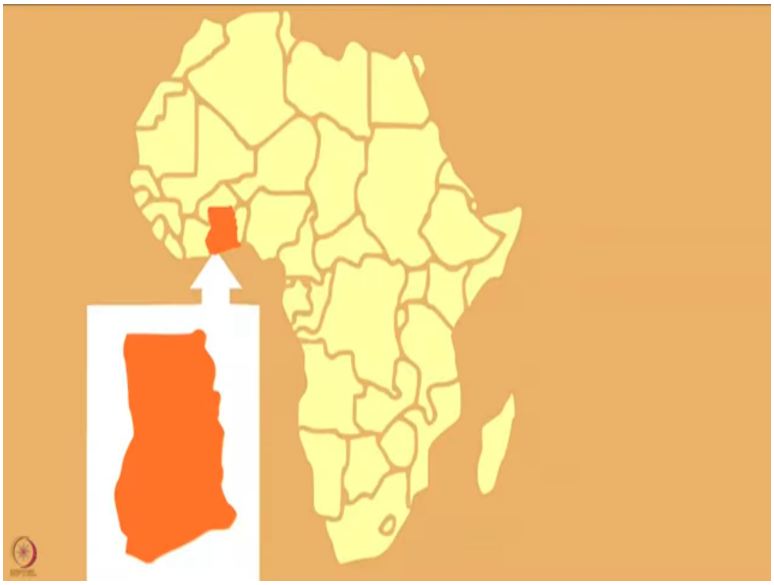


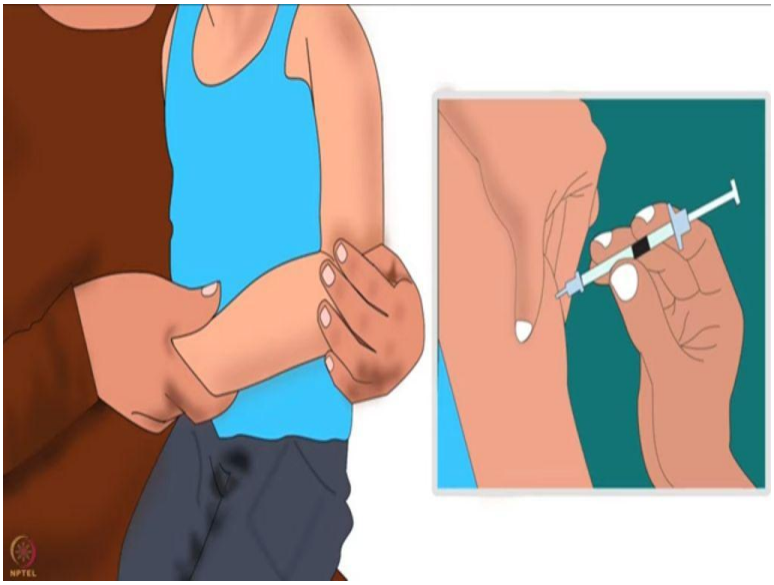
Welcome to the Spoken Tutorial on WHO length for age percentile growth charts. In this tutorial, we will learn about two types of percentile growth charts, growth indicators, the plot points for growth indicators. Let us begin by understanding what are percentile growth charts, they are charts designed to help you follow a child's growth.

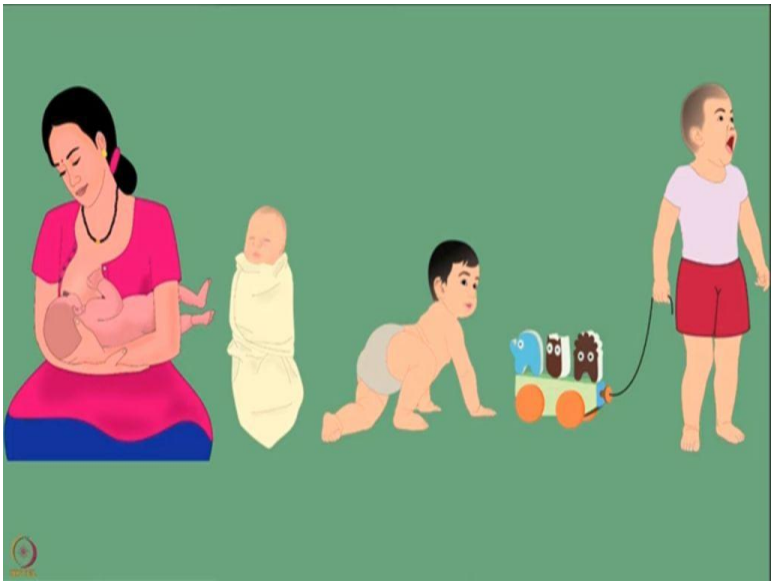
(Refer Slide Time: 12:57)

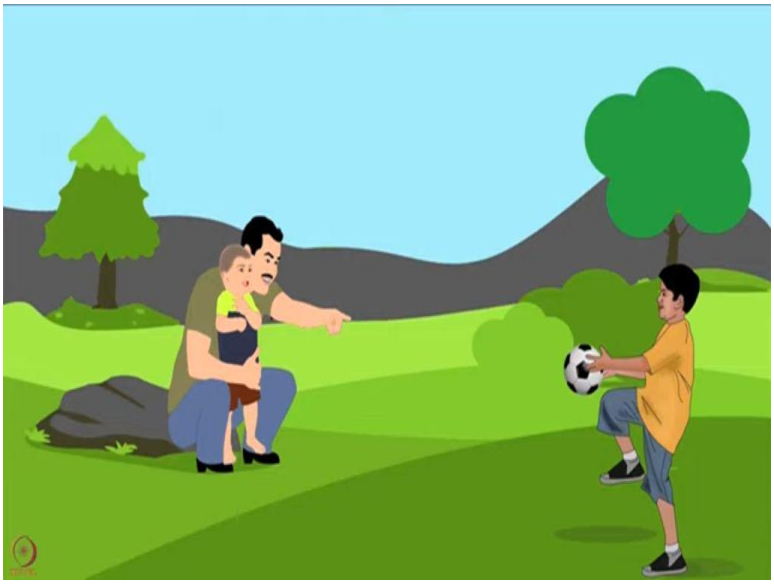


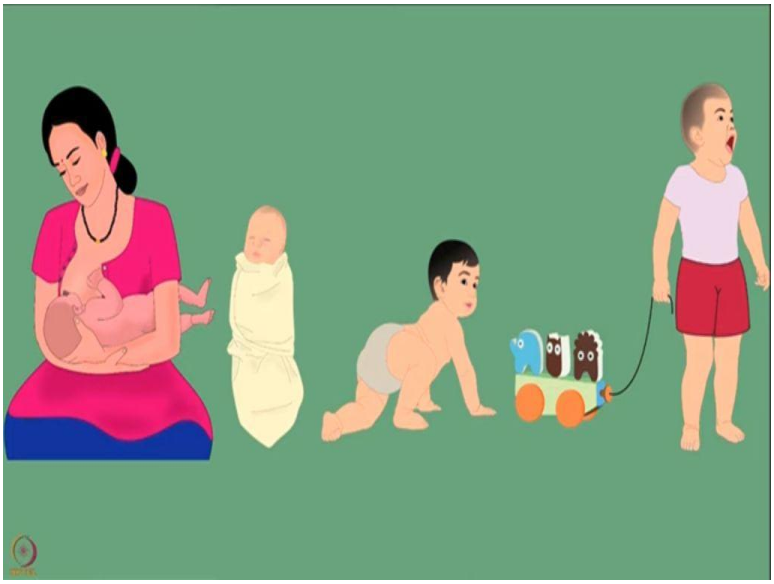


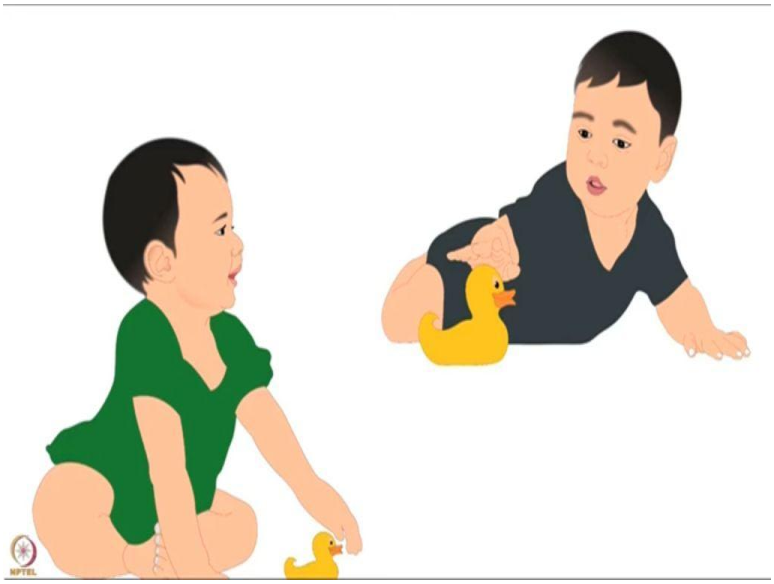




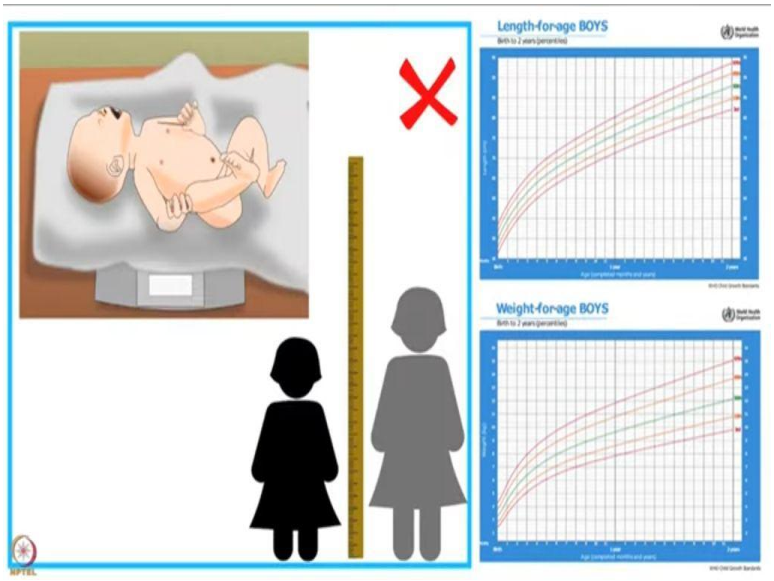








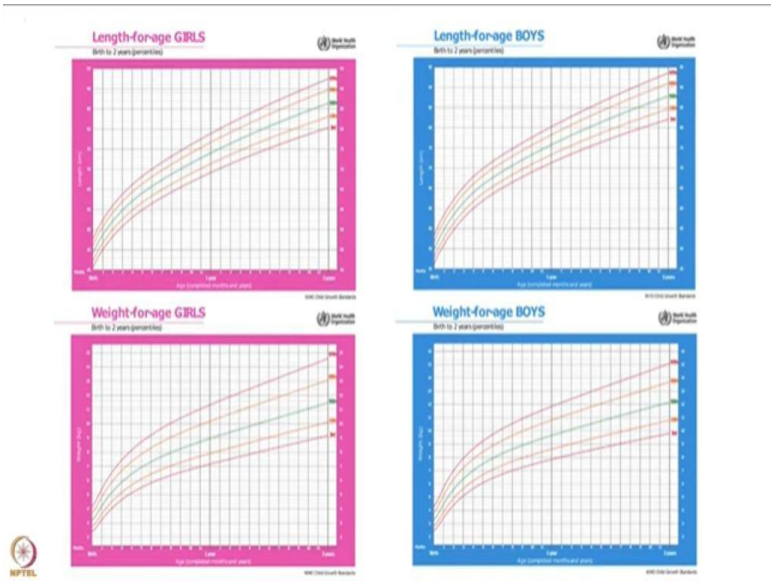
Length-for-age BOYS
Weight-for-age BOYS

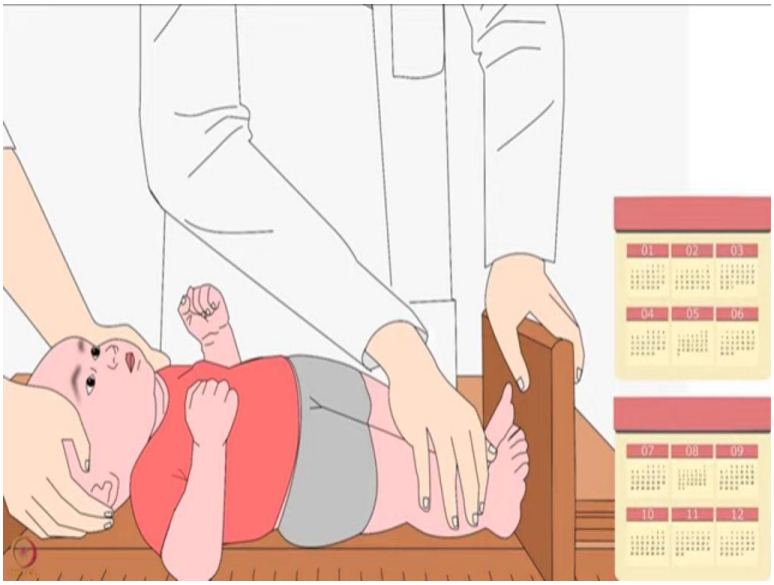


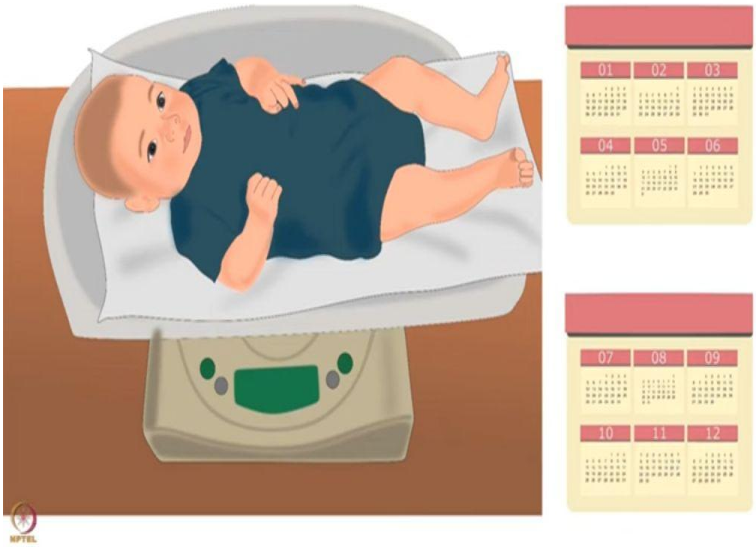
They were developed through the World Health Organization's MGRS, MGRS means Multicenter Growth Reference Study. 8500 selected children from 6 different countries were measured. The countries were India, Brazil, Ghana, Norway, Oman and the USA. The children were from different cultural backgrounds. Three things were kept constant among them. All the selected children were breastfed, they all were vaccinated. They all had access to a clean environment. It showed that children from different countries grew in a similar way.

This means the environment played a major role in their growth. Good nutrition, health and sanitation is required for proper growth. The average weight and length for each age and gender were established. Growth charts compare a child length and weight with other children, these children are of the same age and gender as the child. These charts provide an early warning that the child has a growth problem.

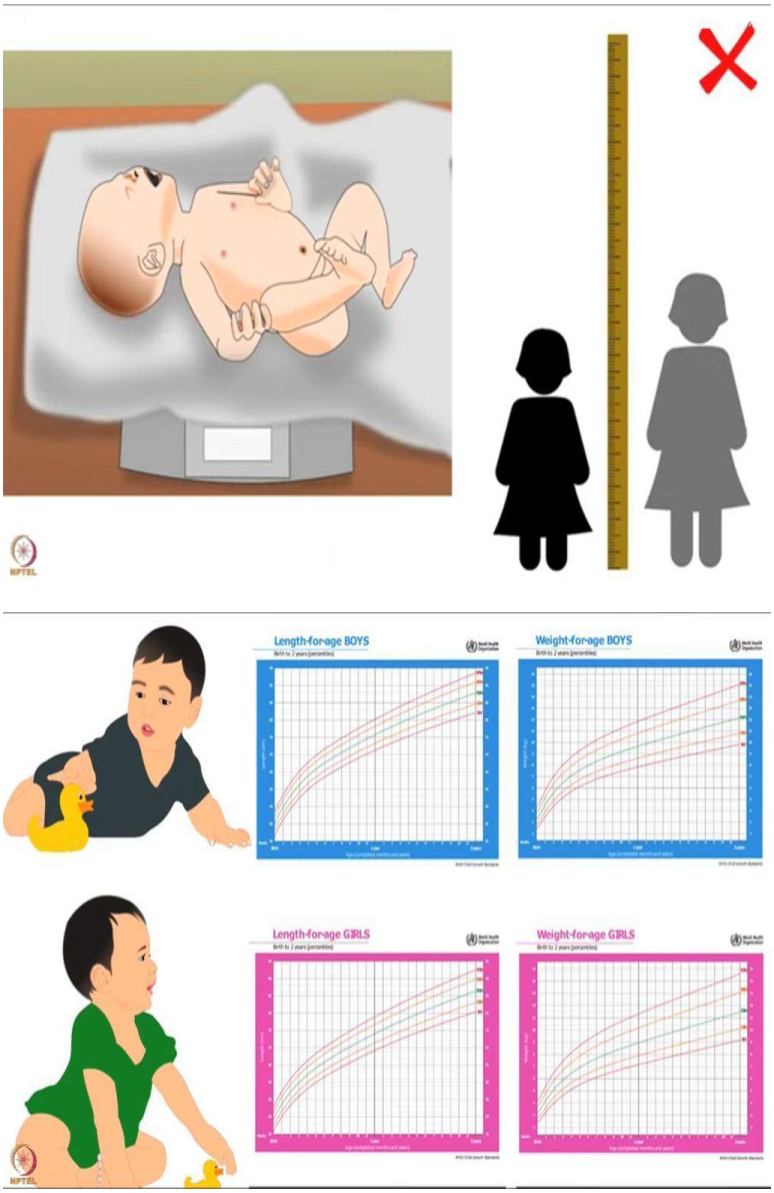
(Refer Slide Time: 14:41)




01 02 03
04 05 06
07 08 09
10 11 12

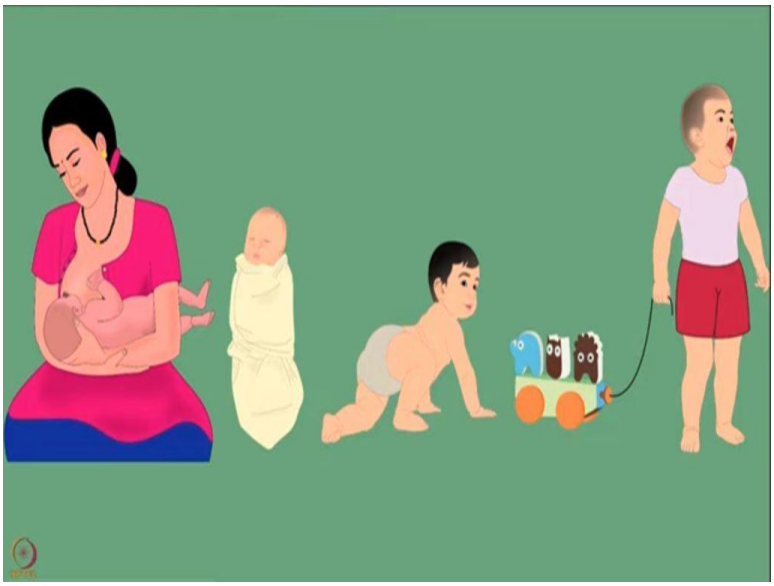


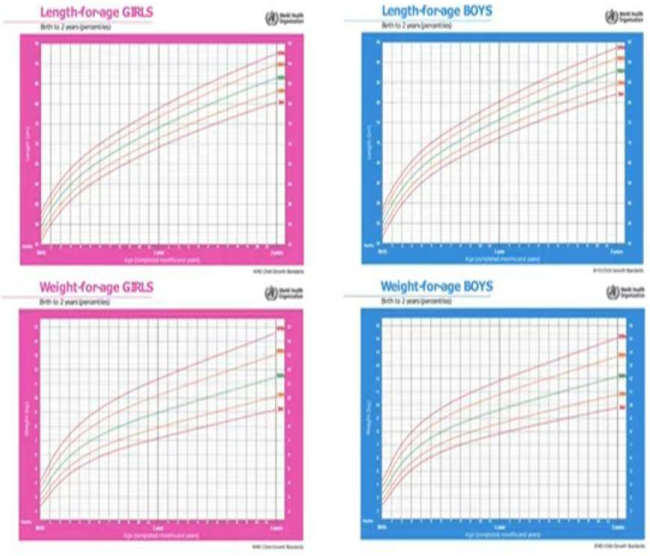
Length-for-age GIRLS
Birth to 2 years (percentiles)
World Health Organization
97th
85th
50th
15th
3rd
Length (cm)
Months
Birth
1 year
2 years
Age (completed months and years)
WHO Child Growth Standards



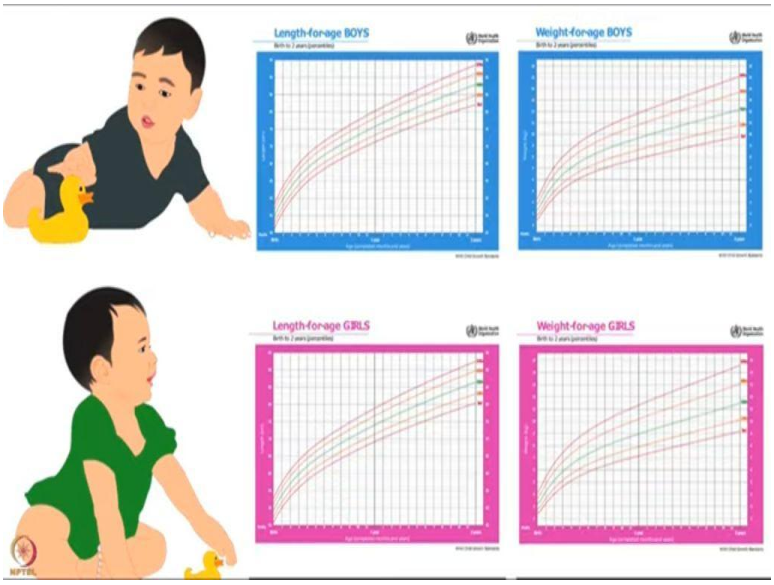
In this tutorial, we will discuss two types of percentile growth charts. Each growth chart is used to measure a specific growth indicator, growth indicators are used to assess growth. They take a child's age and measurements together into consideration. The first growth indicator is length for age, the second one is weight for age. These indicators are plotted on growth charts over weeks, months or years. This helps us to identify any growth problems. It is important to use growth charts as per the child's gender.

(Refer Slide Time: 15:40)



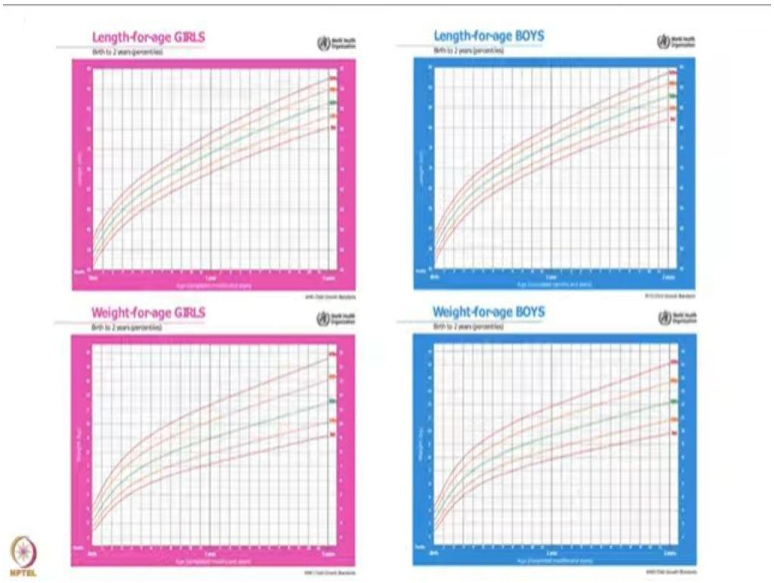

Length-for-age GIRLS
Birth to 2 years (percentiles)
Length-for-age BOYS
Birth to 2 years (percentiles)
Weight-for-age GIRLS
Birth to 2 years (percentiles)
Weight-for-age BOYS
Birth to 2 years (percentiles)

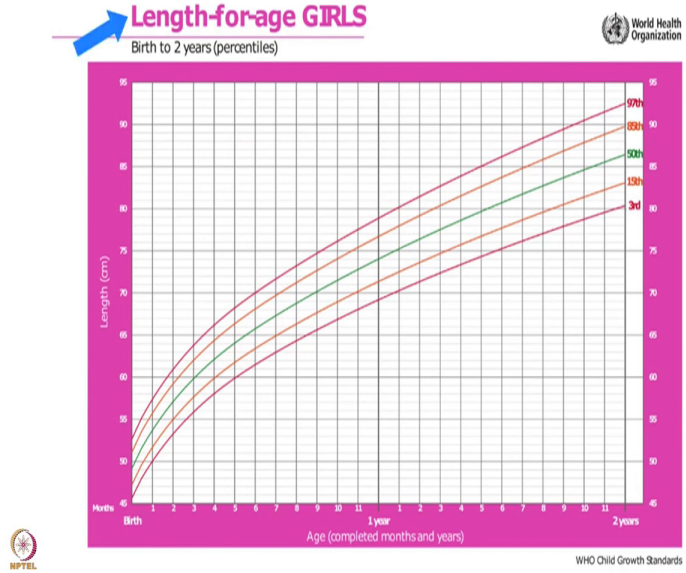
www.who.int

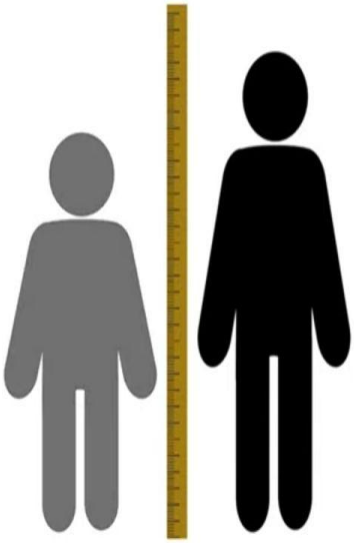


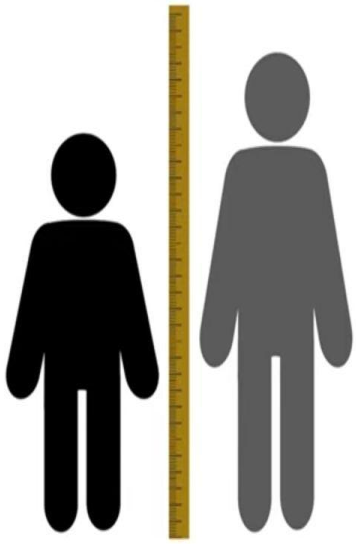
The growth charts used in this tutorial are from the World Health Organization. They are for children in the 0 to 2 years age group. These growth charts are available on their website www.who.int. Please select the appropriate charts as per the child's gender, download and print them.

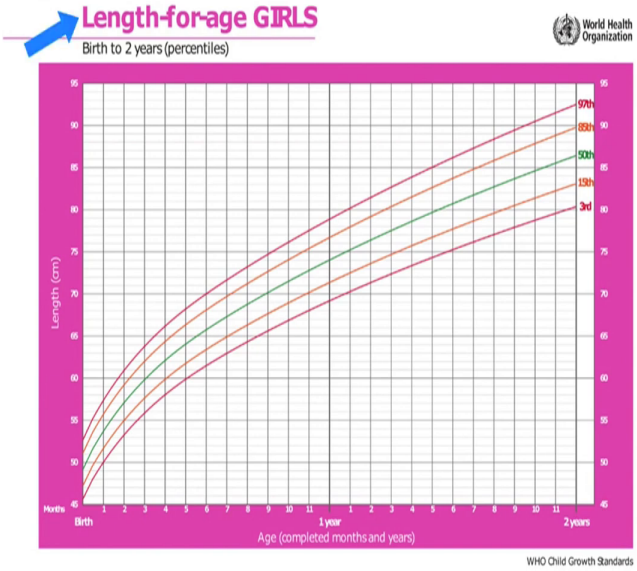
(Refer Slide Time: 16:12)

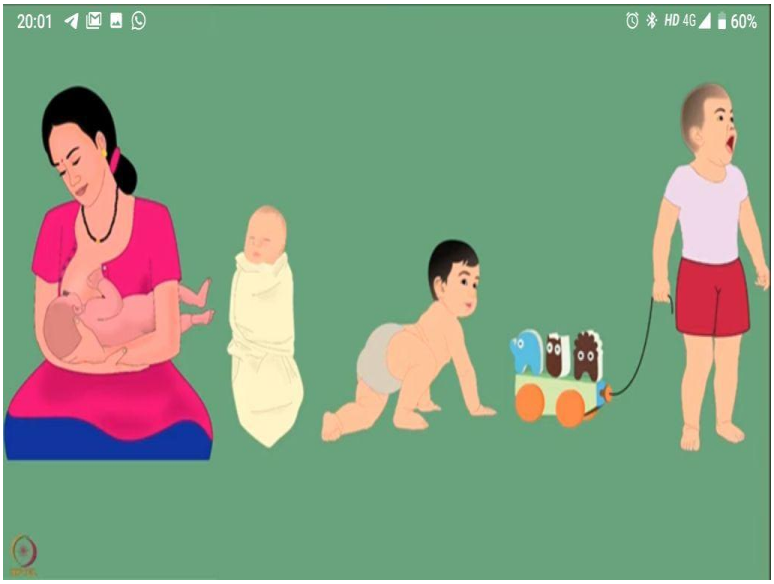


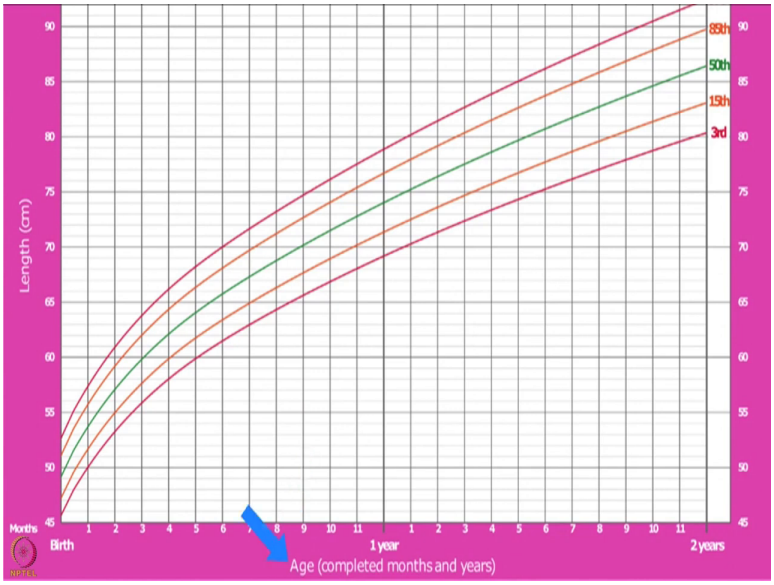

Length-for-age GIRLS
Birth to 2 years (percentiles)
World Health Organization
Length (cm)
Months
Birth
1 year
2 years
Age (completed months and years)
97th
85th
50th
15th
3rd
WHO Child Growth Standards

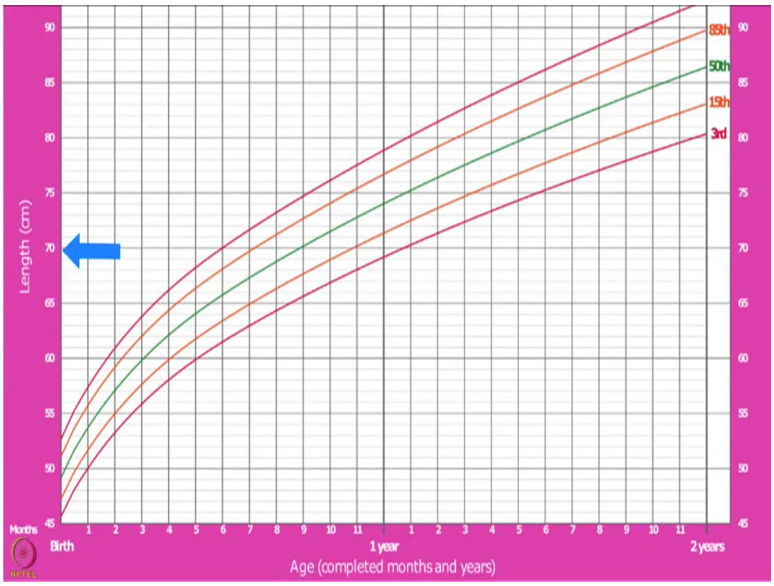


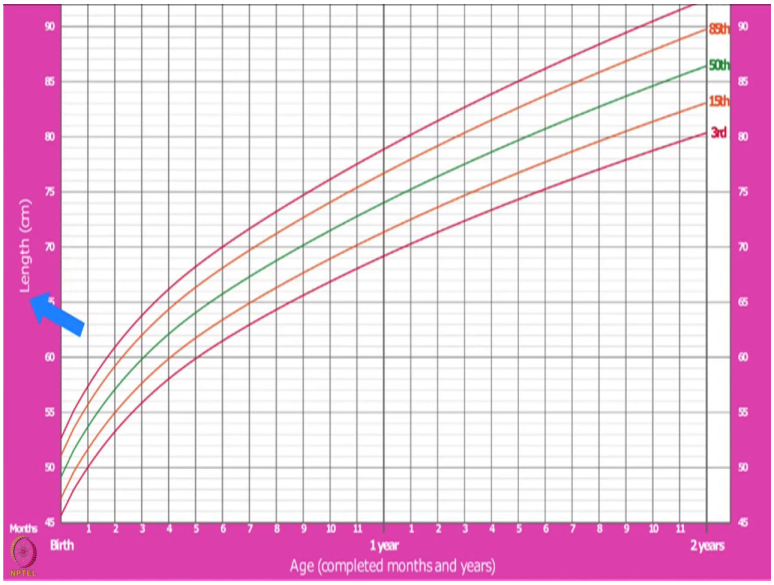


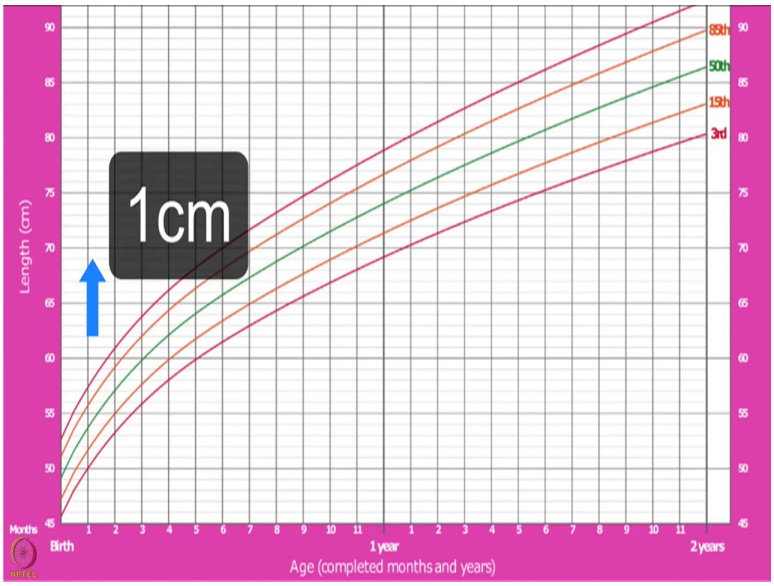

Length-for-age GIRLS
Birth to 2 years (percentiles)
World Health Organization
97th
85th
50th
15th
3rd
Length (cm)
Months
Birth
1 year
2 years
Age (completed months and years)
WHO Child Growth Standards


20:01
HD 4G 60%


Length (cm)
90
85
80
75
70
65
60
55
50
45
85th
50th
15th
3rd
Months
Birth
1 year
2 years
Age (completed months and years)


Length (cm)
85th
50th
15th
3rd
Months
Birth
1 year
2 years
Age (completed months and years)


Length (cm)
85th
50th
15th
3rd
Months
Birth
1 year
2 years
Age (completed months and years)



Next, let us learn more about the first type of percentile growth chart. It is the length for age growth chart, it is used to plot the length for age growth indicator. This indicator can help identify children who are stunted or short. Such children might have had prolonged under nutrition or repeated illness. Children who are tall for the age can also be identified. In these charts, the horizontal reference line at the bottom is the x-axis. It shows age, the exact age is plotted in weeks and months from birth until 2 years of age. The vertical reference line at the left side is the y-axis, it shows length in centimeters. The thin gray horizontal lines represent an increase in length by 1 centimeter.

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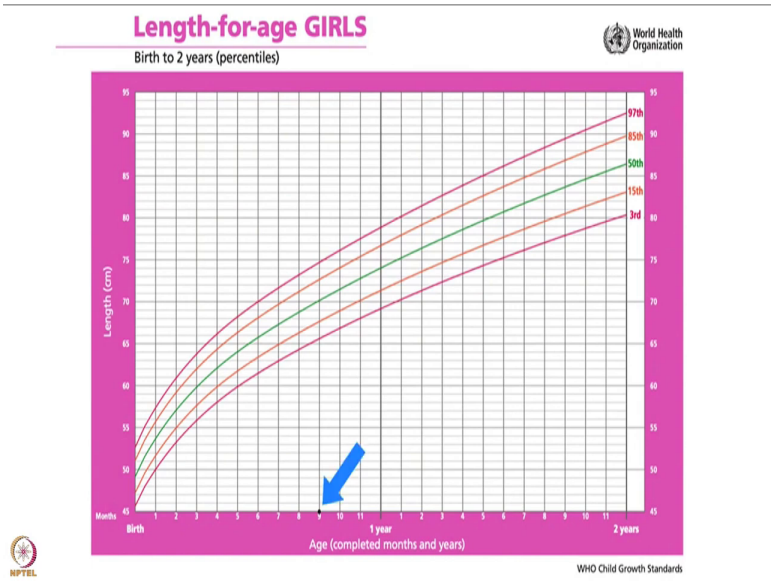
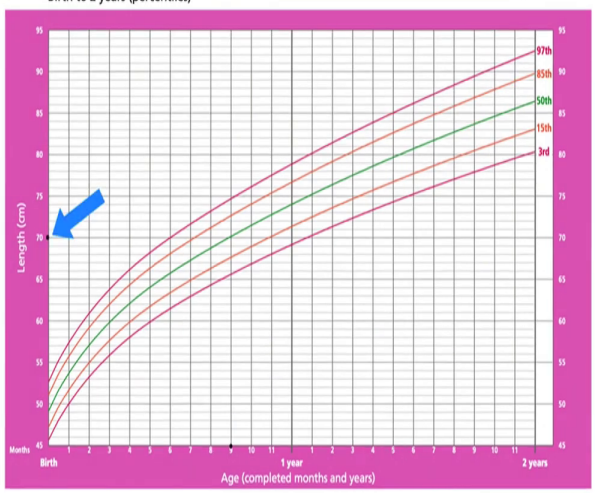


Length-for-age GIRLS

Birth to 2 years (percentiles)

World Health Organization

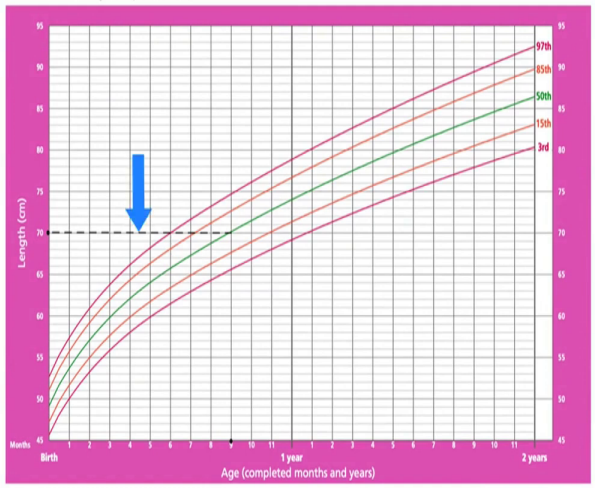


WHO Child Growth Standards

Length-for-age GIRLS

Birth to 2 years (percentiles)

World Health Organization

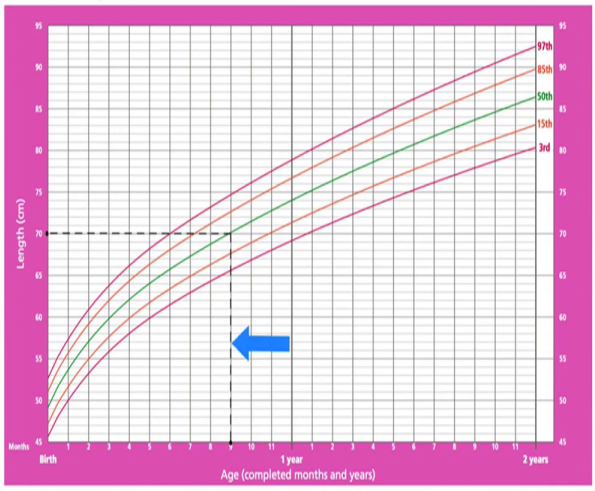


WHO Child Growth Standards

Length-for-age GIRLS

Birth to 2 years (percentiles)

World Health Organization

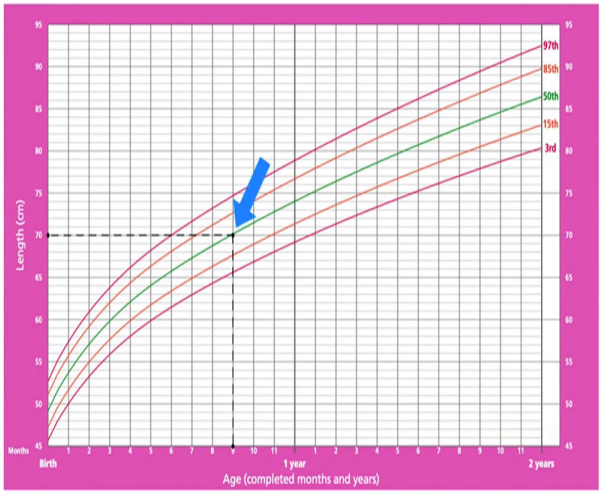


WHO Child Growth Standards

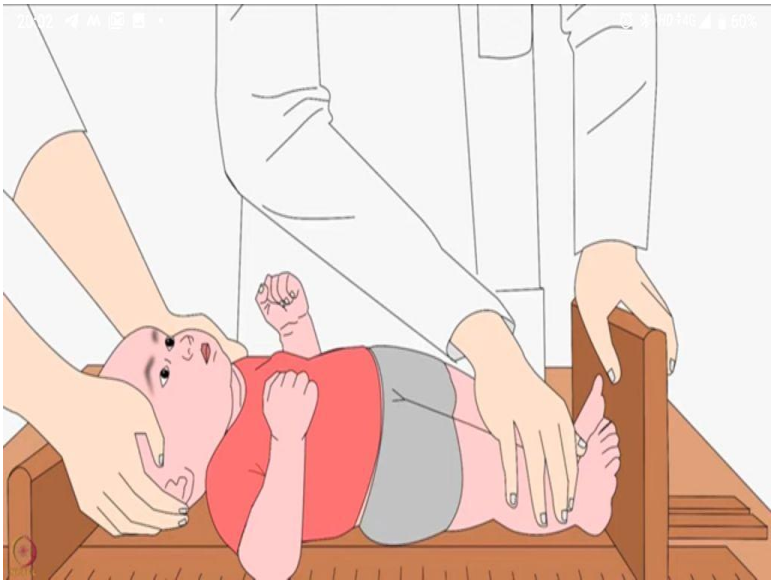
Length-for-age GIRLS

Birth to 2 years (percentiles)

World Health Organization

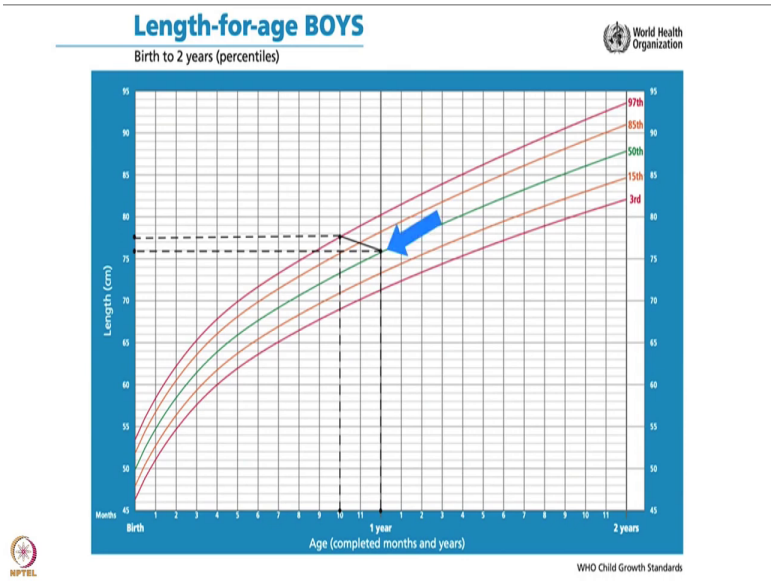


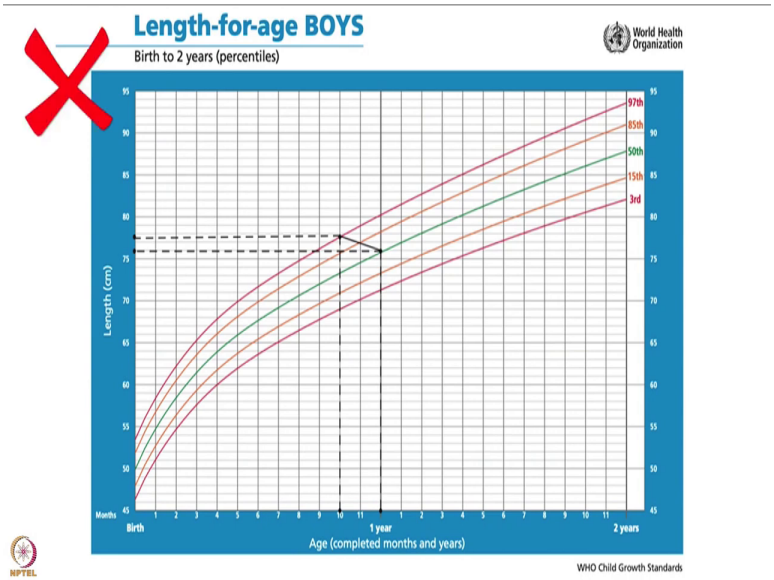
WHO Child Growth Standards



Let us go through the steps to plot length for age in these charts. First, mark the exact age, months and years on the x-axis with a point. Then, mark the length on the y-axis with a point, extend it over the connected horizontal line till the marked point for the age. Extend the marked point for age over the connected vertical line. The point where two extended lines intersect is called a plotted point. For every child, points are plotted over weekly or monthly measurements. Check whether a plotted point seems sensible, if necessary, re measure the child.

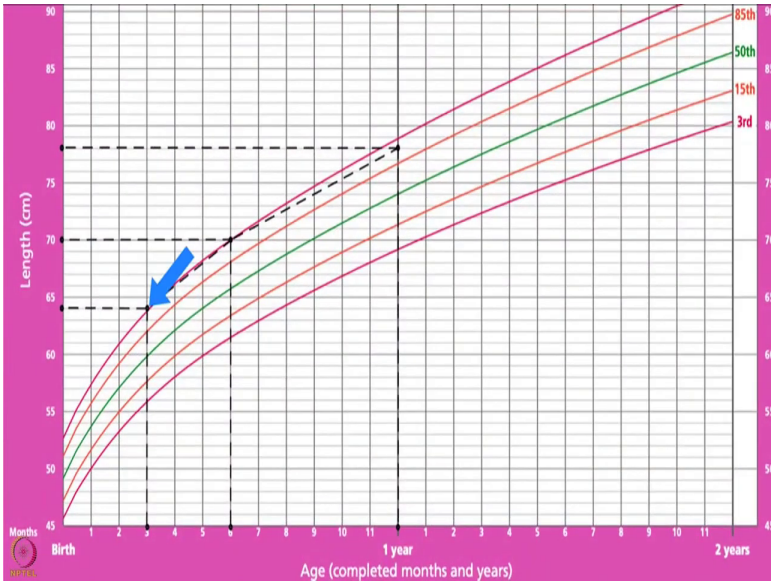
(Refer Slide Time: 18:33)

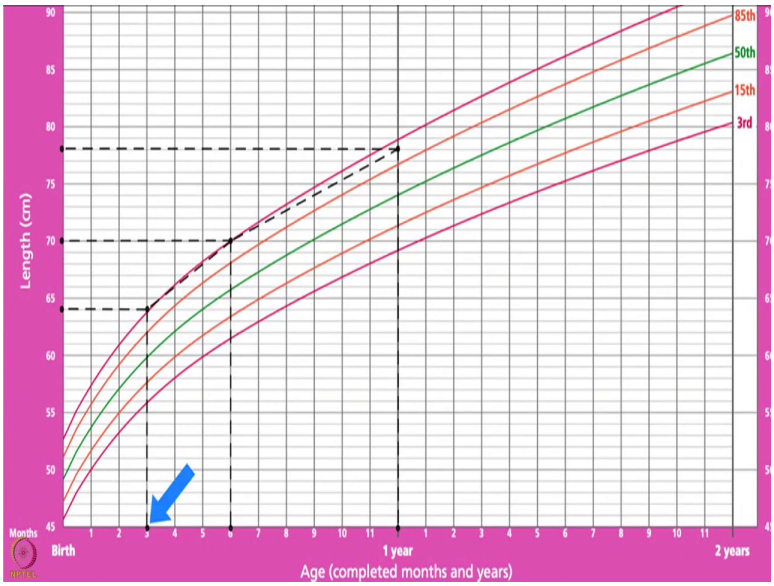


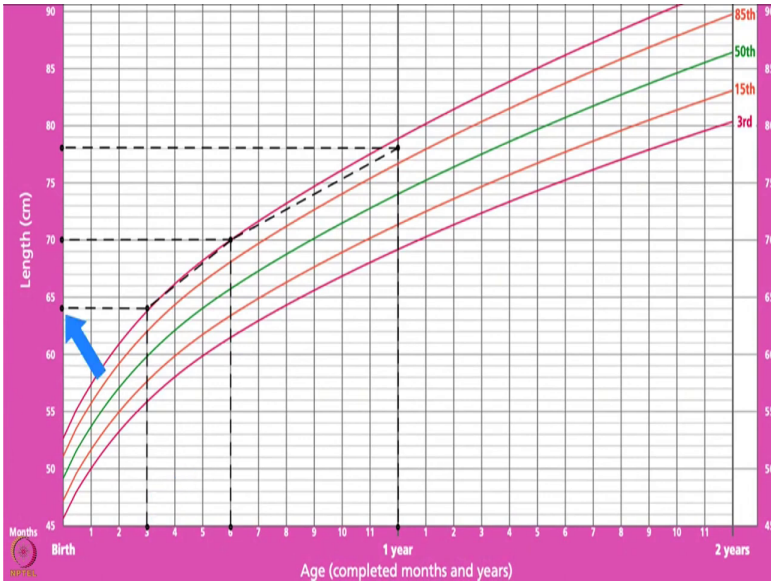


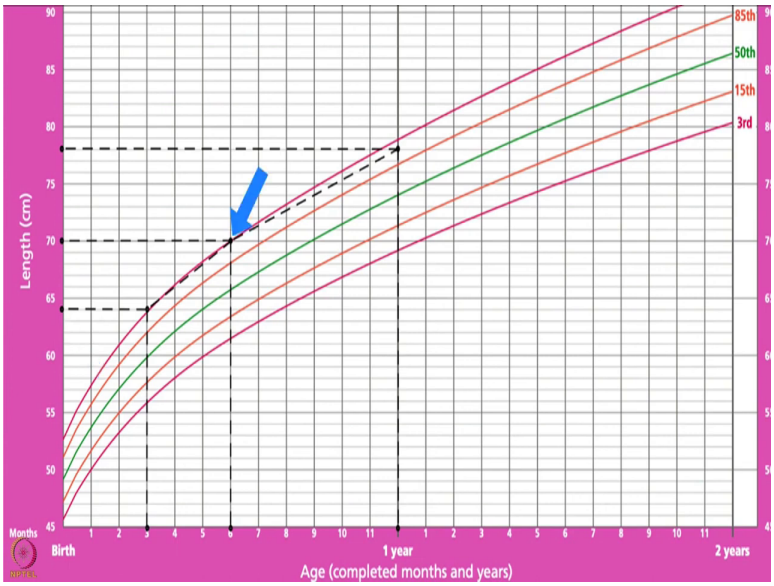
For example, a baby's length should not be shorter than at a previous visit. If it is, then one of the measurements was wrong.

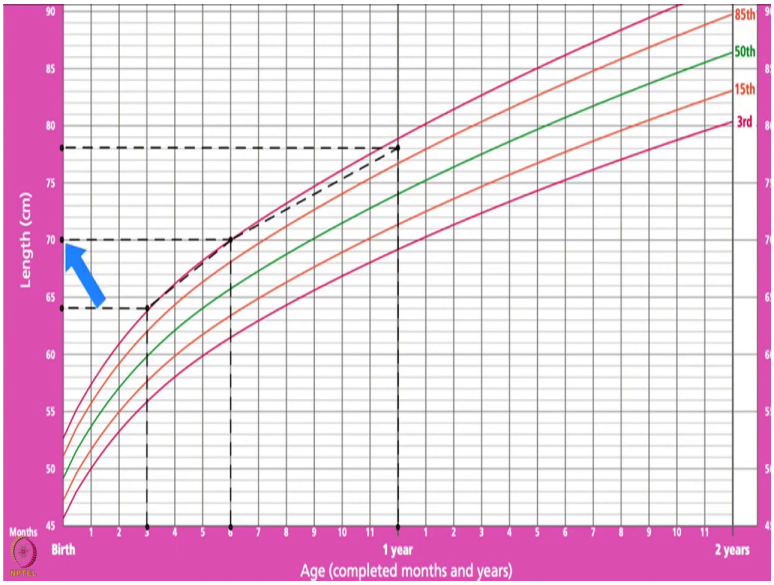
(Refer Slide Time: 18:44)

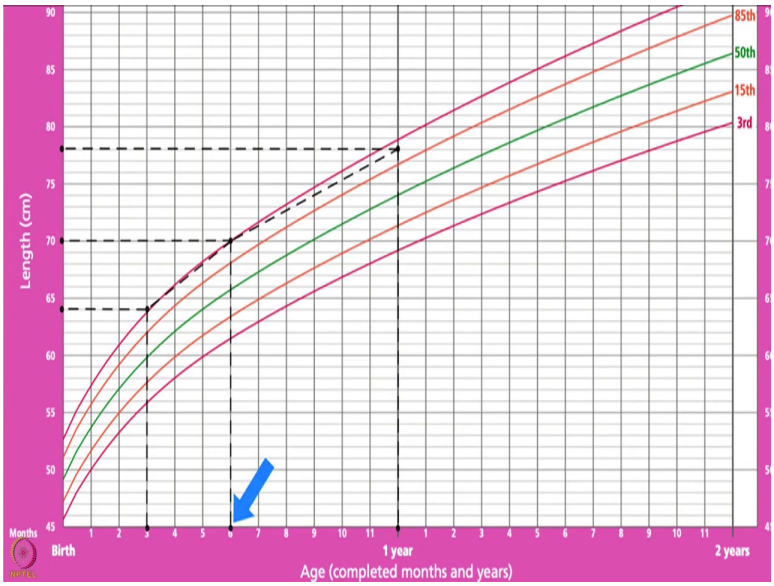


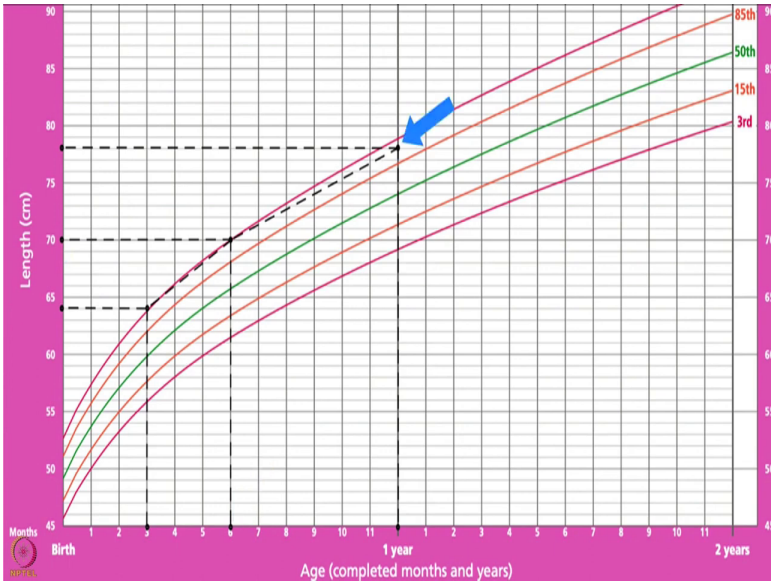

Length (cm)
90
85
80
75
70
65
60
55
50
45
85th
50th
15th
3rd
Months
Birth
1 year
2 years
Age (completed months and years)

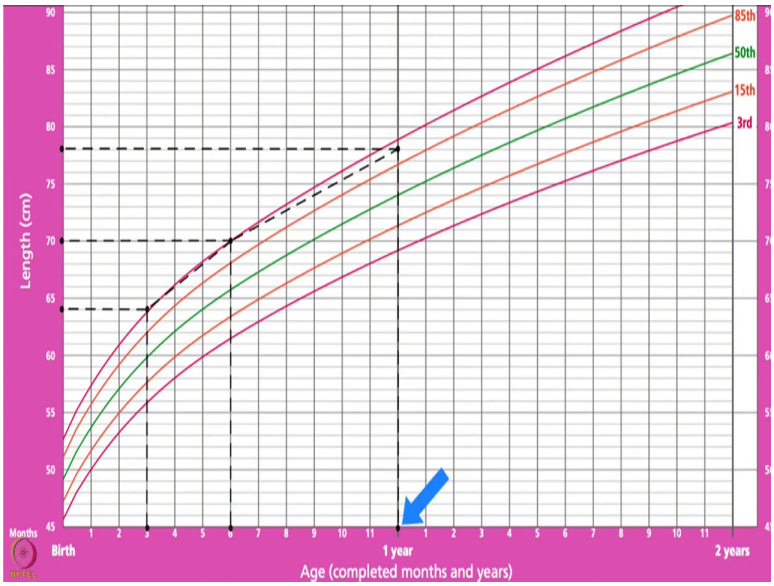

Length (cm)
90
85
80
75
70
65
60
55
50
45
85th
50th
15th
3rd
Months
Birth
1 year
2 years
Age (completed months and years)


85th
50th
15th
3rd
Length (cm)
90
85
80
75
70
65
60
55
50
45
Months
Birth
1 year
2 years
Age (completed months and years)


85th
50th
15th
3rd
Length (cm)
90
85
80
75
70
65
60
55
50
45
Months
Birth
1 year
2 years
Age (completed months and years)

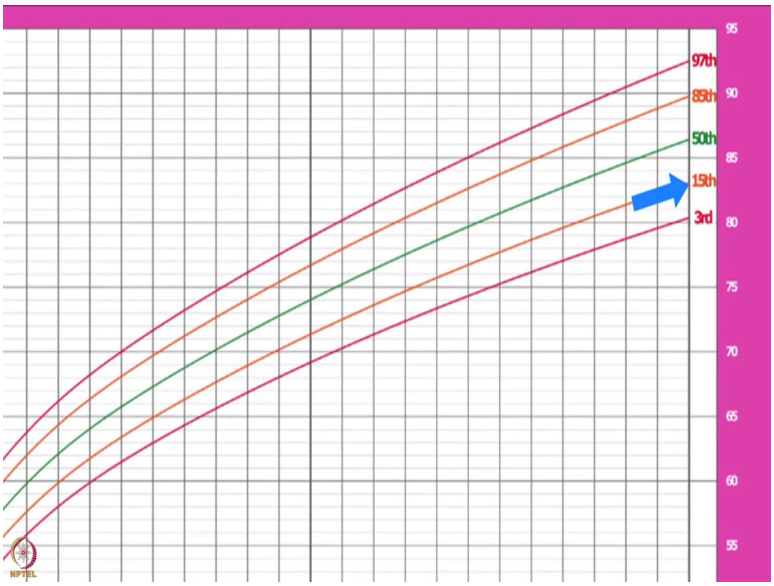

85th
50th
15th
3rd
Length (cm)
90
85
80
75
70
65
60
55
50
45
Months
Birth
1 year
2 years
Age (completed months and years)


85th
50th
15th
3rd
Length (cm)
90
85
80
75
70
65
60
55
50
45
Months
Birth
1 year
2 years
Age (completed months and years)



Let us use an example to understand plotting on this chart. This graph shows Anita's length for age plotted three times over a few months. At this point, Anita was 3 months of age and 64 centimeters in length. Now, here at this point, Anita was 70 centimeters in length at 6 months of age. Finally, here at this point, she was 78 centimeters in length at 1 year of age.

(Refer Slide Time: 19:30)


97th
85th
50th
15th
3rd
95
90
85
80
75
70
65
60
55

97th
85th
50th
15th
3rd
95
90
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97th
85th
50th
15th
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97th
85th
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15th
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85
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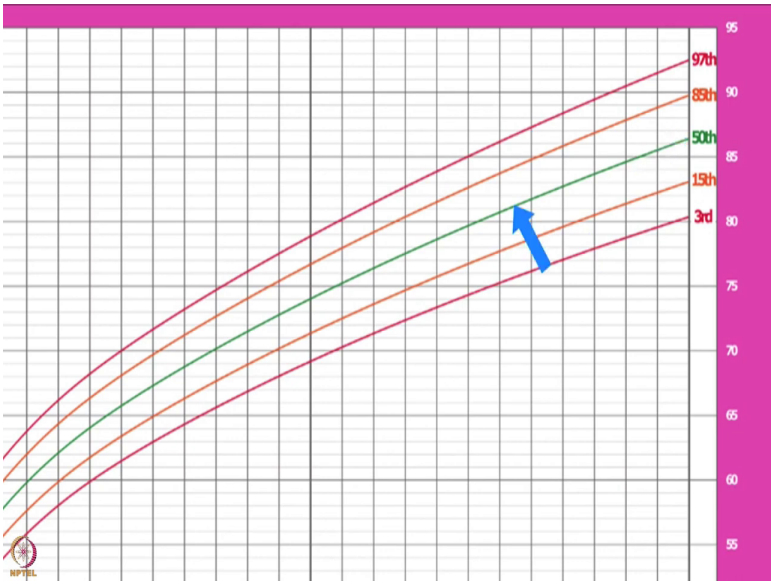
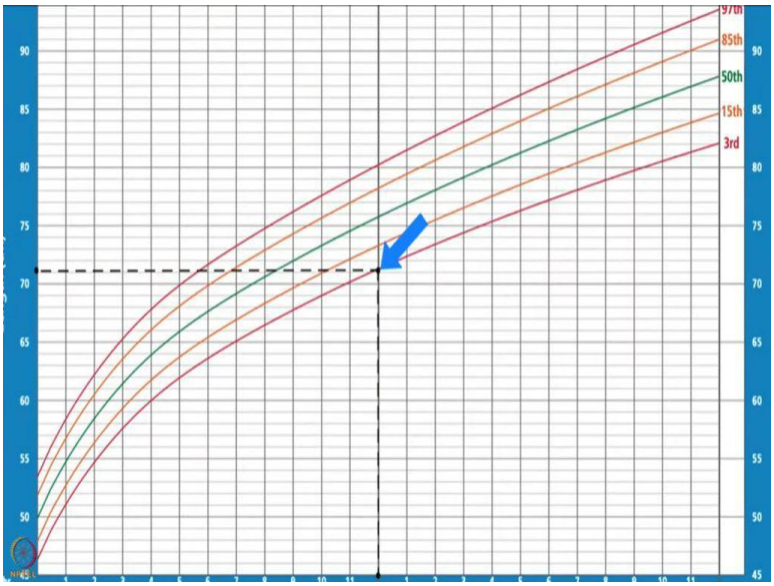
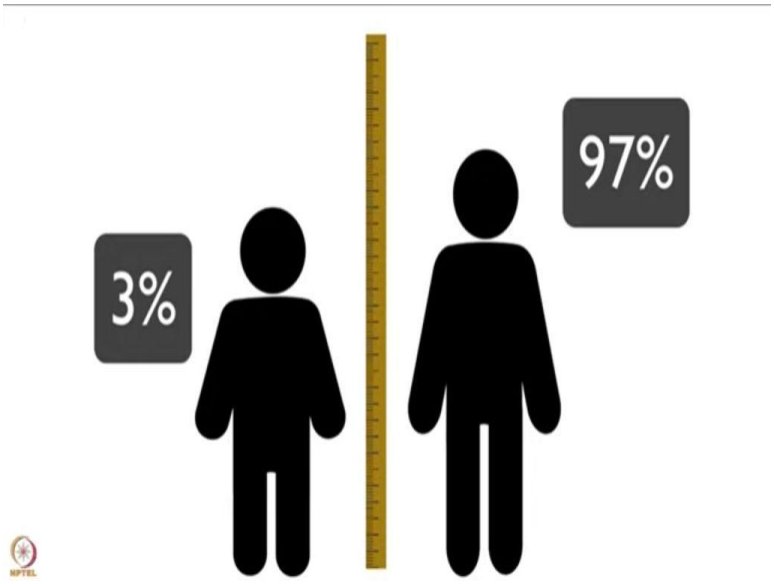
75
70
65
60
55

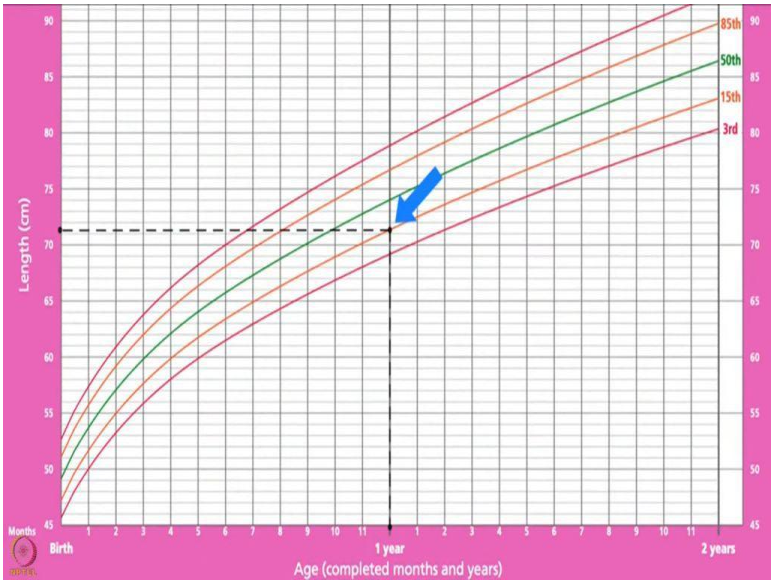


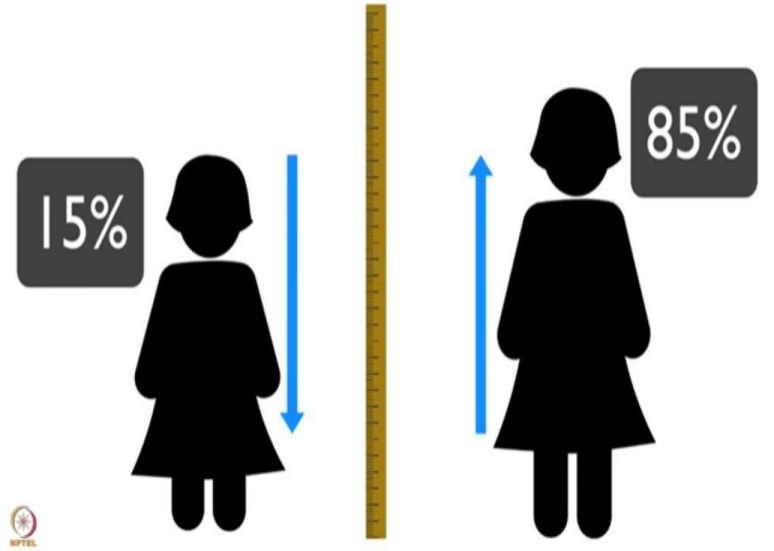
Now, let us learn more about the five curved colored lines on growth charts. These five curved lines show selected percentiles, they are 3rd, 15th, 50th, 85th and 97th percentiles. The 3rd and 97th percentiles are shown by red colored lines. The 15th and 85th percentiles are shown by orange colored lines, the 50th percentile is shown by a green colored line. These percentiles indicate the rank of the child's measurement. Let us understand each percentile line with specific examples.

(Refer Slide Time: 20:32)





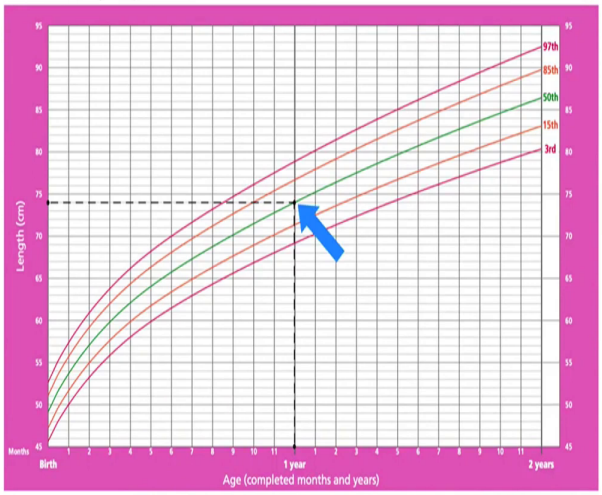

85th
50th
15th
3rd
Length (cm)
90
85
80
75
70
65
60
55
50
45
Months
Birth
1 year
2 years
Age (completed months and years)


15%
85%

Length-for-age GIRLS

Birth to 2 years (percentiles)

World Health Organization

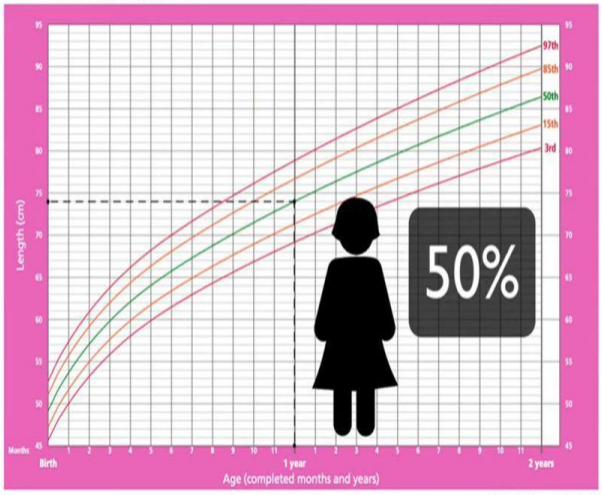


WHO Child Growth Standards

Length-for-age GIRLS

Birth to 2 years (percentiles)

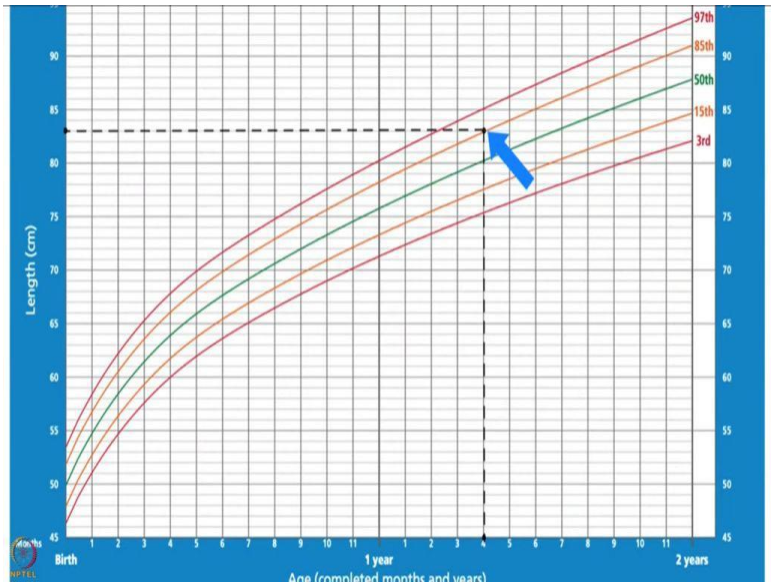
World Health Organization



WHO Child Growth Standards

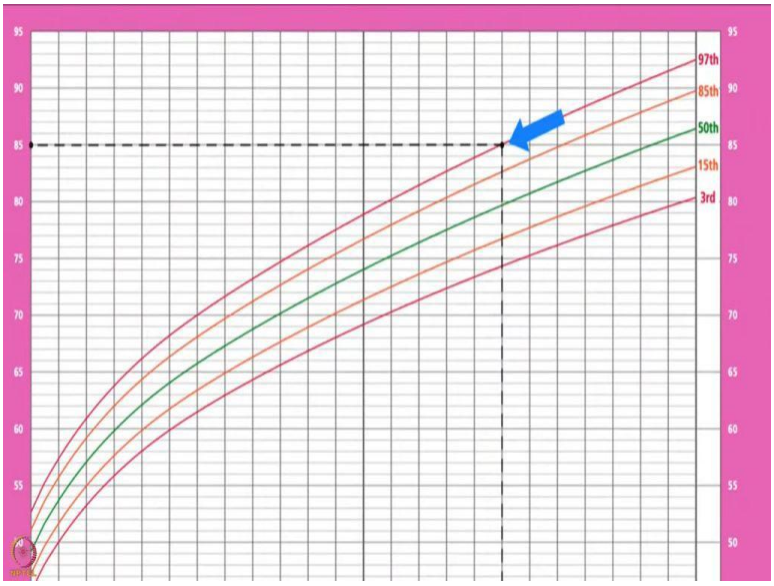
In this graph, Madhav's length is plotted on the third percentile line. It means that 97 percent of children of his age are taller than him, only 3 percent of children of his age are shorter than him. In this graph, Anu's length is plotted on the 15th percentile line. It means that 85 percent of children of her age are taller than her, only 15 percent of children of her age are shorter than her. In this graph, Priya's length is plotted on the 50th percentile line, the length of 50 percent of children is on this percentile line. Therefore, Priya's length is the average length among the children of her age.

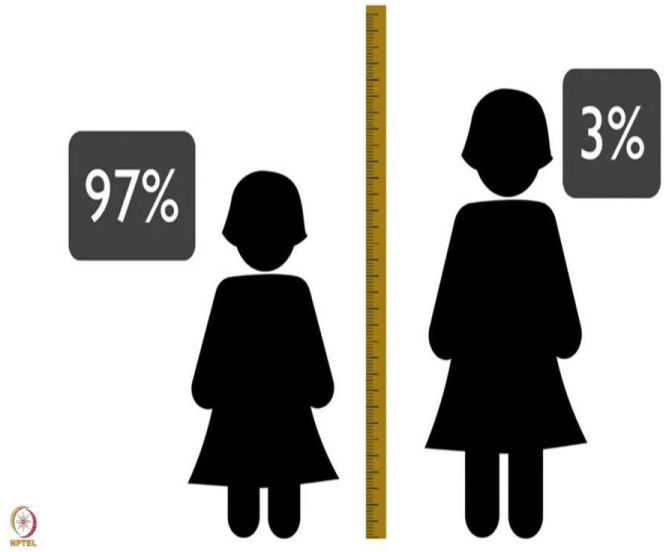
(Refer Slide Time: 21:40)



In this graph, Rohan's length is plotted on the 85th percentile line. It means that 15 percent of children of his age are taller than him. 85 percent of children of his age are shorter than him.

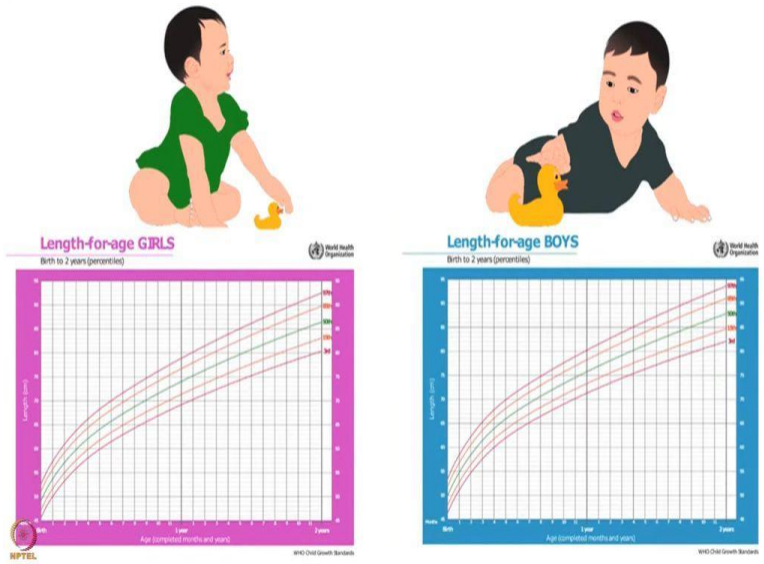
(Refer Slide Time: 22:01)

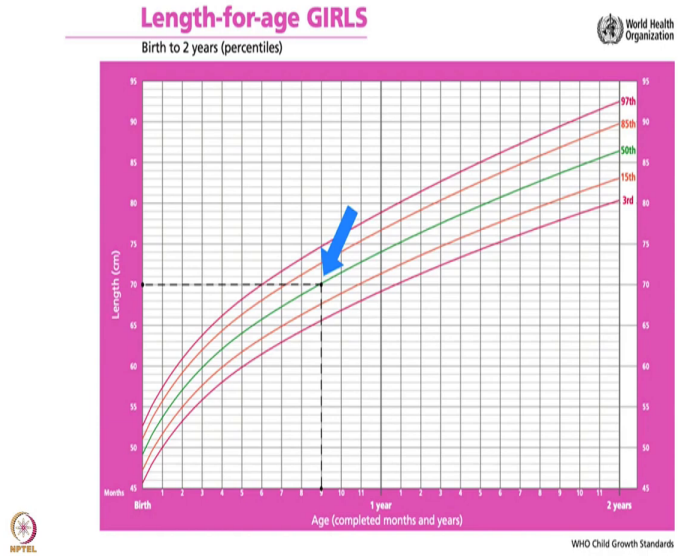


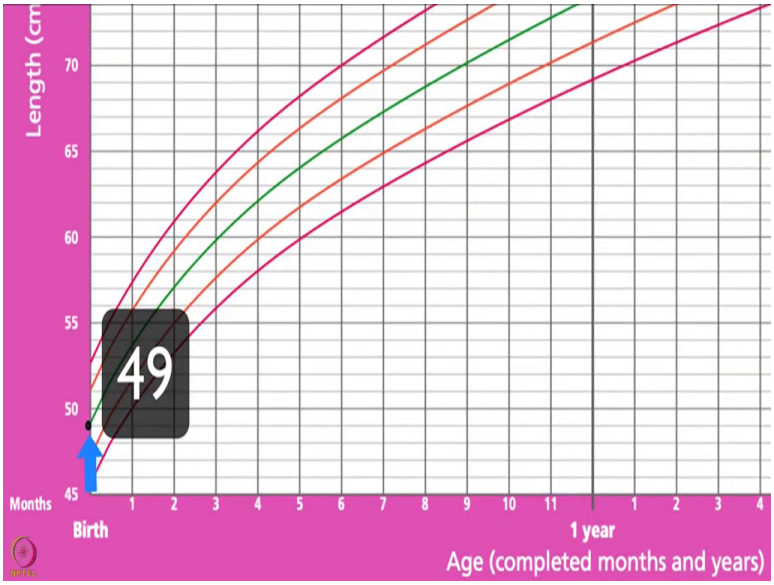


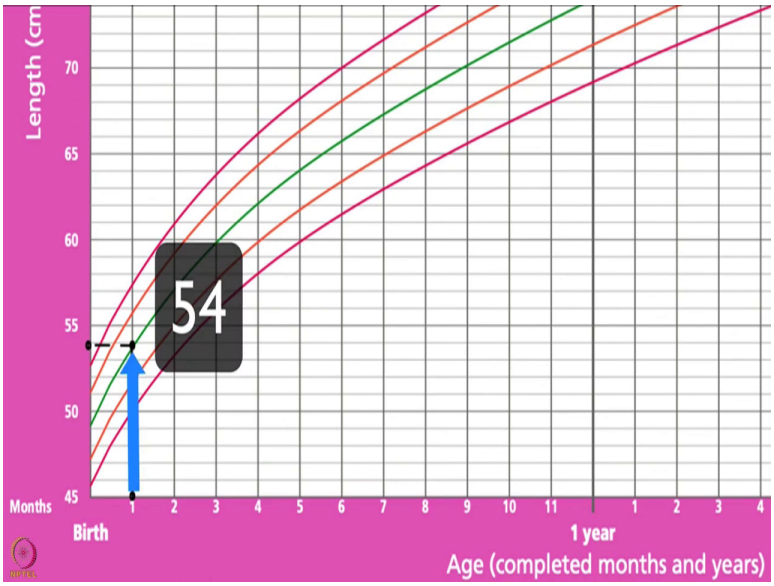
In this graph, Fatima's length is plotted on the 97th percentile. It means that 3 percent of children of her age are taller than her. 97 percent of children of her age are shorter than her.

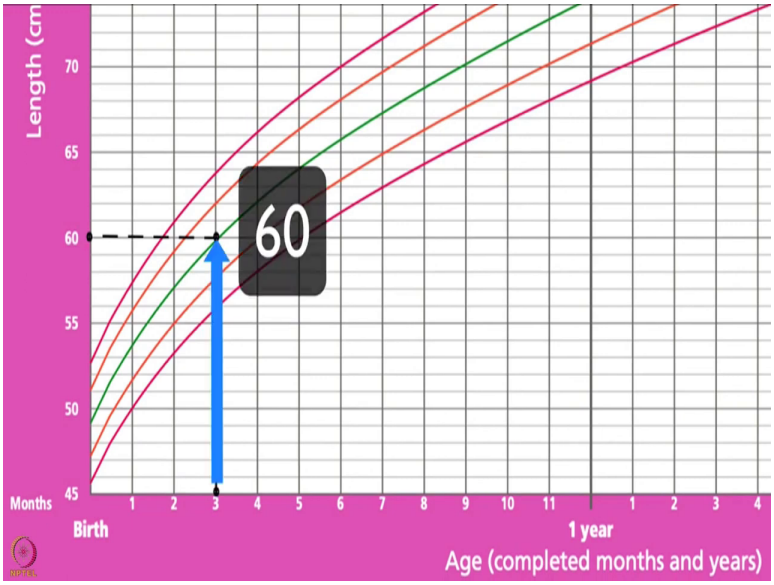
(Refer Slide Time: 22:22)

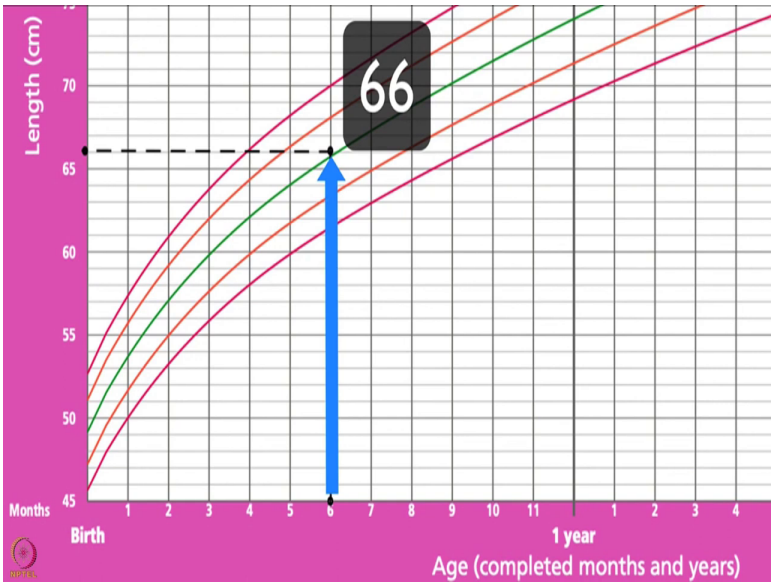


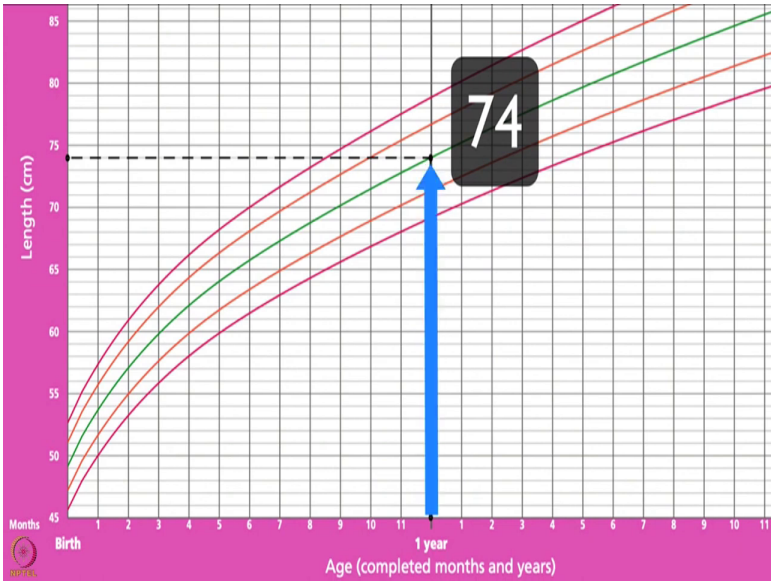

Length-for-age GIRLS
Birth to 2 years (percentiles)
World Health Organization
97th
85th
50th
15th
3rd
Length (cm)
Months
Birth
1 year
2 years
Age (completed months and years)
WHO Child Growth Standards

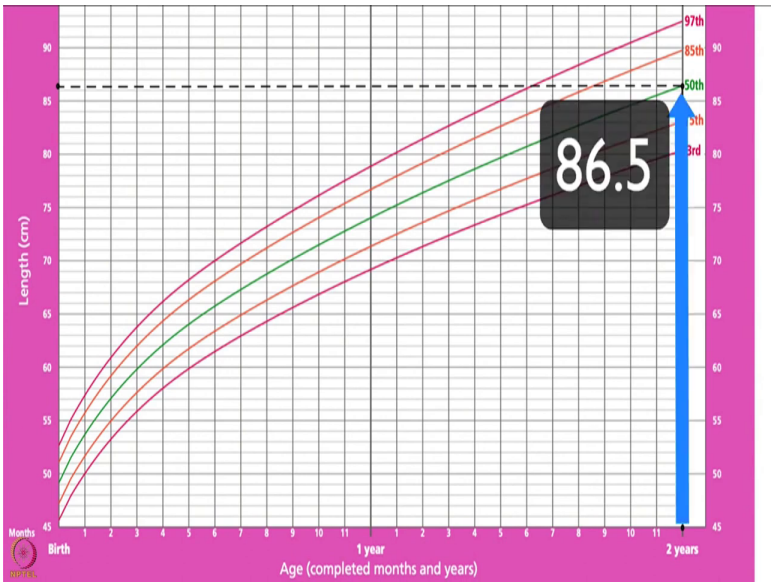

Length (cm
70
65
60
55
50
45
49
Months
Birth
1 year
Age (completed months and years)


Length (cm
70
65
60
55
50
45
54
Months
1 2 3 4 5 6 7 8 9 10 11 1 2 3 4
Birth
1 year
Age (completed months and years)


Length (cm
70
65
60
55
50
45
60
Months
1 2 3 4 5 6 7 8 9 10 11 1 2 3 4
Birth
1 year
Age (completed months and years)


66
Length (cm)
70
65
60
55
50
45
Months
1 2 3 4 5 6 7 8 9 10 11
1 2 3 4
Birth
1 year
Age (completed months and years)


74
Length (cm)
85
80
75
70
65
60
55
50
45
Months
1 2 3 4 5 6 7 8 9 10 11
1 2 3 4 5 6 7 8 9 10 11
Birth
1 year
Age (completed months and years)



Next, let us discuss the average length of a child from birth to 2 years of age. It is along the 50th percentile line in the length for age growth chart. Average birth length of a girl is 49 centimeters. At one month, the average length of a girl is 54 centimeters, at 3 months, it is 60 centimeters. At 6 months, it is 66 centimeters. At 1 year, it is 74 centimeters. At 2 years, the average length of a girl is 86.5 centimeters.

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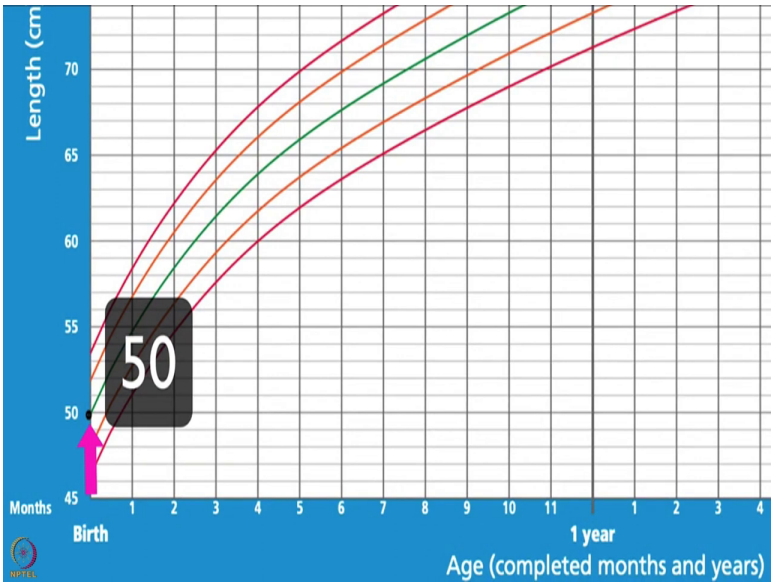
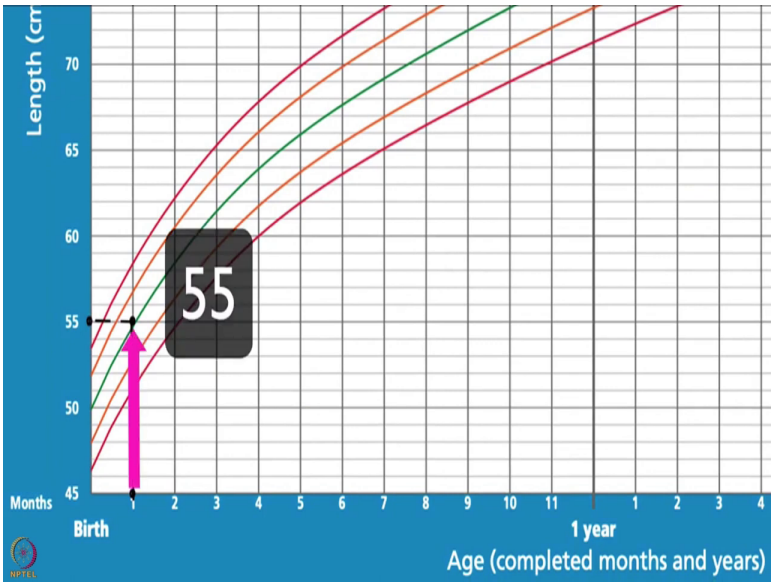
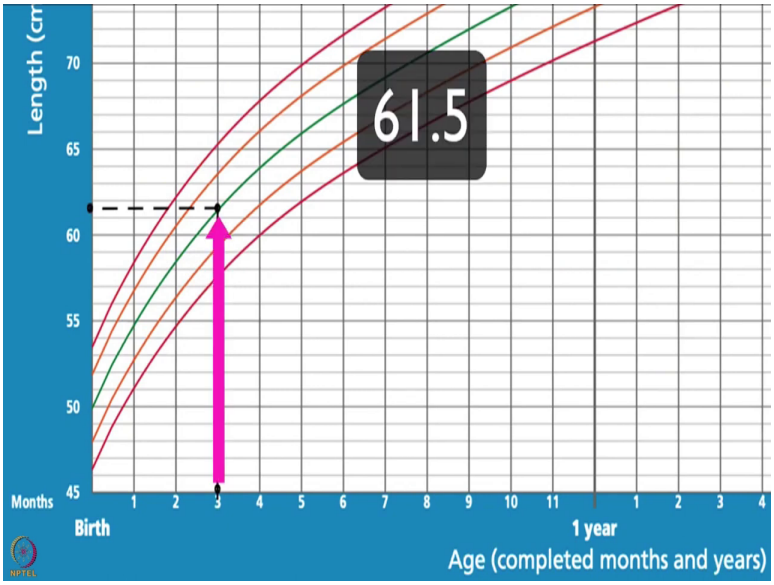
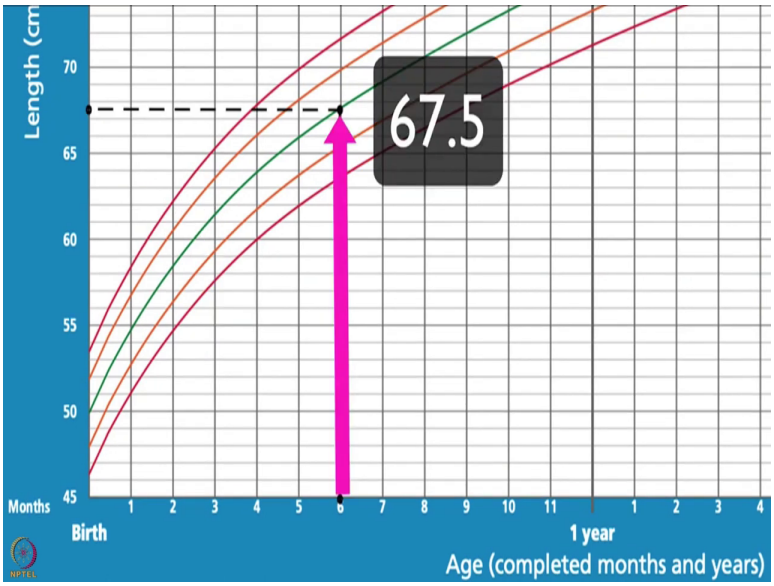
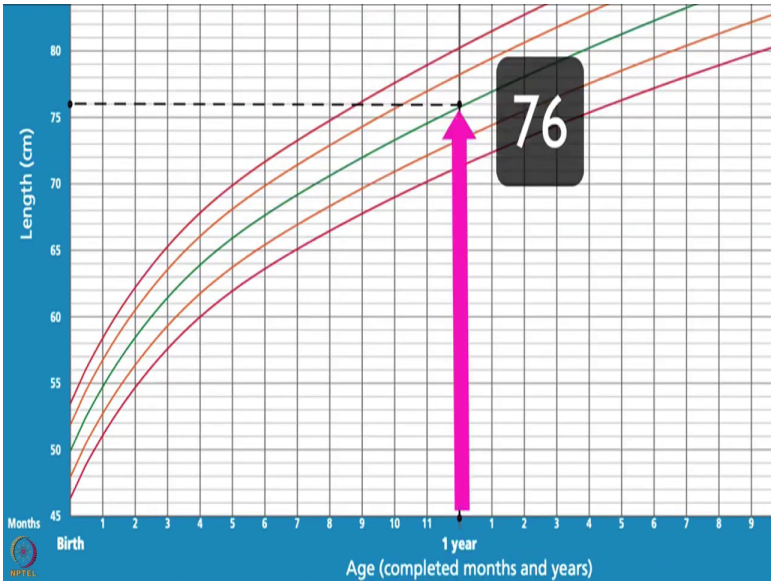
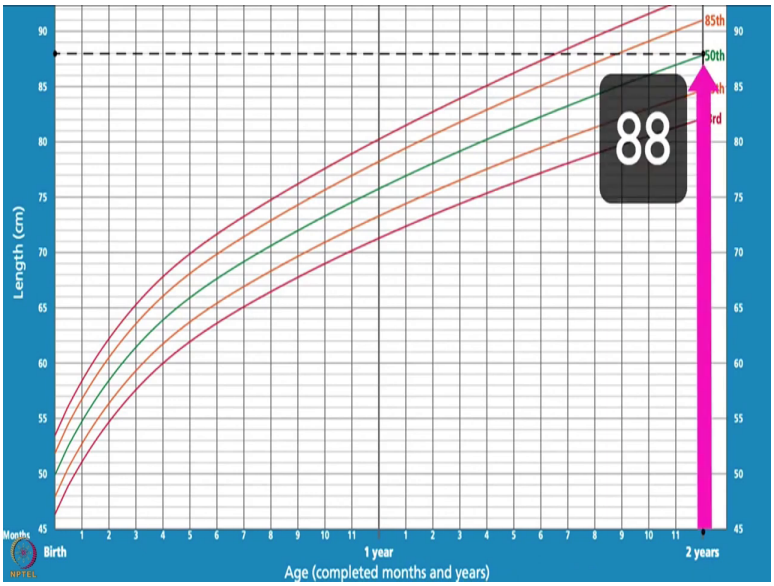



Length (cm
70
65
60
55
50
45
55
Months
1
2
3
4
5
6
7
8
9
10
11
1
2
3
4
Birth
1 year
Age (completed months and years)


Length (cm
70
65
60
55
50
45
61.5
Months
1
2
3
4
5
6
7
8
9
10
11
1
2
3
4
Birth
1 year
Age (completed months and years)


Length (cm
70
65
60
55
50
45
67.5
Months
1 2 3 4 5 6 7 8 9 10 11 1 2 3 4
Birth
1 year
Age (completed months and years)


Length (cm)
80
75
70
65
60
55
50
45
76
Months
1 2 3 4 5 6 7 8 9 10 11 1 2 3 4 5 6 7 8 9
Birth
1 year
Age (completed months and years)



Average birth length of a boy is 50 centimeters. At 1 month, the average length of a boy is 55 centimeters. At 3 months, it is 61.5 centimeters. At 6 months, it is 67.5 centimeters, at 1 year, it is 76 centimeters. At 2 years, the average length of a boy is 88 centimeters.

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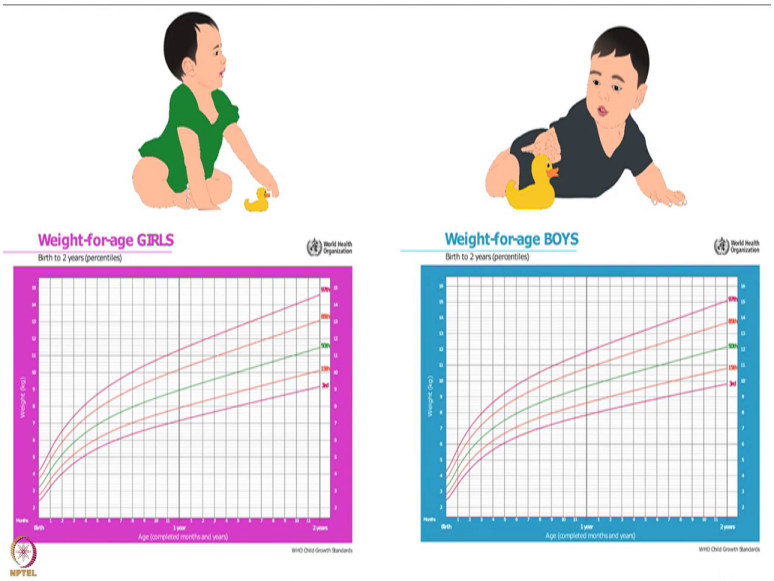

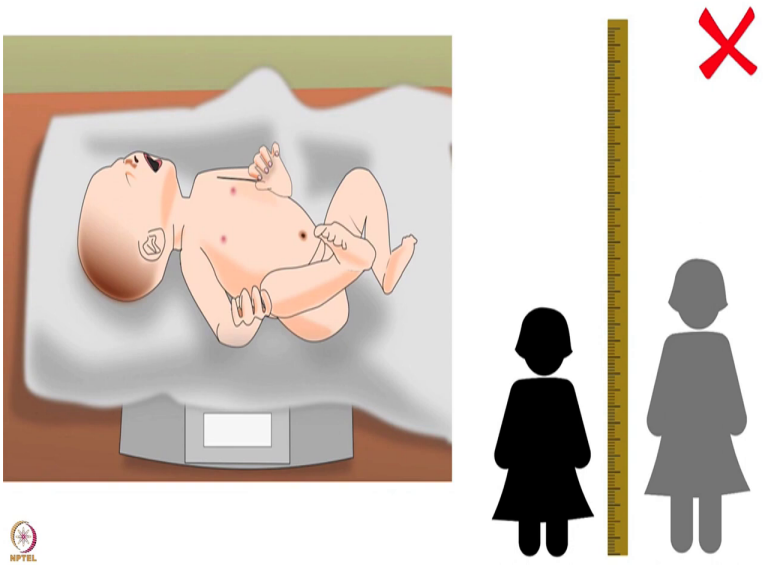

The second percentile growth chart is called the weight for age growth chart. It is discussed in another tutorial in the same series. Growth problems are also discussed in the same tutorial. Please visit our website for more details. This brings us to the end of this tutorial. Thank you for joining.