

Canterbury District Health Board

Canterbury Health Laboratories

Haematology Biological Reference Intervals Manual

Date of Issue: July 2020

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1st Issue: 03 December 1999
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2. Basophils

Reported to (no. DP)	If the cell count $\geq 100 = 0dp$ If the cell count ≥ 0.5 and $<100 = 1dp$ If the cell count $< 0.5 = 2dp$	Units	x10 ⁹ /L
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Age Range	Reference Interval
Cord	0 – 0.2
0 – 30 days	0 – 0.2
1 month	0 – 0.2
2 months – 3 months	0 – 0.2
4 months – 5 months	0 – 0.2
6 months – 7 months	0 – 0.2
8 months – 9 months	0 – 0.2
10 months – 11 months	0 – 0.2
1 year	0 – 0.2
2 years	0 – 0.2
3 years	0 – 0.2
4 years	0 – 0.2
5 years	0 – 0.2
6 years	0 – 0.2
7 years	0 – 0.2
8 years	0 – 0.2
9 years	0 – 0.2
10 years	0 – 0.2
11 years	0 – 0.2
12 years	0 – 0.2
13 years	0 – 0.2
14 years	0 – 0.2
15 years	0 – 0.2
16 + (Adult)	0 – 0.2

3. Eosinophils

Reported to (no. DP)	If the cell count $\geq 100 = 0dp$ If the cell count ≥ 0.5 and $<100 = 1dp$ If the cell count $< 0.5 = 2dp$	Units	$\times 10^9/L$
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Age Range	Reference Interval
Cord	0 – 1
0 – 30 days	0 – 0.9
1 month	0 – 0.9
2 months – 3 months	0 – 0.9
4 months – 5 months	0 – 0.9
6 months – 7 months	0 – 0.9
8 months – 9 months	0 – 0.9
10 months – 11 months	0 – 0.9
1 year	0 – 0.9
2 years	0 – 0.9
3 years	0 – 0.9
4 years	0 – 1
5 years	0 – 1
6 years	0 – 1
7 years	0 – 1
8 years	0 – 0.9
9 years	0 – 0.9
10 years	0 – 0.9
11 years	0 – 0.9
12 years	0 – 0.9
13 years	0 – 0.8
14 years	0 – 0.8
15 years	0 – 0.8
16 + (Adult)	0 – 0.5

4. ESR

(Erythrocyte Sedimentation Rate)

Reported to (no. DP)	0	Units	mm/hr
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Age Range	Reference Interval
1-30 years	1 - 10
31-50 years	1 - 15
51-70 years	1 - 20
>71 years	1 - 30

5. Haematocrit

Alternative name: (Hct / Packed Cell Volume)

Reported to (no. DP)	2	Units	Ratio
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Age Range	Reference Interval	
	Female	Male
Cord	0.37 – 0.56	0.37 – 0.56
0 – 30 days	0.40 – 0.65	0.40 – 0.65
1 month	0.27 – 0.46	0.27 – 0.46
2 months – 3 months	0.29 – 0.38	0.29 – 0.38
4 months – 5 months	0.31 – 0.40	0.31 – 0.40
6 months – 7 months	0.31 – 0.40	0.31 – 0.40
8 months – 9 months	0.31 – 0.40	0.31 – 0.40
10 months – 11 months	0.31 – 0.40	0.31 – 0.40
1 year	0.32 – 0.41	0.32 – 0.41
2 years	0.32 – 0.41	0.32 – 0.41
3 years	0.32 – 0.41	0.32 – 0.41
4 years	0.33 – 0.42	0.33 – 0.42
5 years	0.33 – 0.42	0.33 – 0.42
6 years	0.33 – 0.42	0.33 – 0.42
7 years	0.33 – 0.42	0.33 – 0.42
8 years	0.35 – 0.43	0.35 – 0.43
9 years	0.35 – 0.43	0.35 – 0.43
10 years	0.35 – 0.43	0.35 – 0.43
11 years	0.35 – 0.43	0.35 – 0.43
12 years	0.35 – 0.43	0.35 – 0.43
13 years	0.35 – 0.44	0.37 - 0.47
14 years	0.35 – 0.44	0.37 - 0.47
15 years	0.35 - 0.44	0.37 - 0.47
16 + (Adult)	0.35 - 0.46	0.40 - 0.52
Antenatal 1 st Trimester	0.31 - 0.47	X
Antenatal 2 nd Trimester	0.31 - 0.47	X
Antenatal 3 rd Trimester	0.31 - 0.47	X

6. Haemoglobin

Reported to (no. DP)	0	Units	g/L
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Age Range	Reference Interval	
	Female	Male
Cord	124 – 192	124 – 192
0 – 30 days	120 – 200	120 – 200
1 month	93 – 158	93 – 158
2 months – 3 months	97 – 130	97 – 130
4 months – 5 months	105 – 136	105 – 136
6 months – 7 months	105 – 136	105 – 136
8 months – 9 months	105 – 136	105 – 136
10 months – 11 months	105 – 136	105 – 136
1 year	105 – 140	105 – 140
2 years	105 – 140	105 – 140
3 years	105 – 140	105 – 140
4 years	113 – 145	113 – 145
5 years	113 – 145	113 – 145
6 years	113 – 145	113 – 145
7 years	113 – 145	113 – 145
8 years	115 – 145	115 – 145
9 years	115 – 145	115 – 145
10 years	115 – 145	115 – 145
11 years	115 – 145	115 – 145
12 years	115 – 145	115 – 145
13 years	115 – 150	125 – 160
14 years	115 – 150	125 – 160
15 years	115 – 150	125 – 160
16+ years (Adult)	115 – 155	130 – 175
Antenatal 1 st Trimester	100 – 150	X
Antenatal 2 nd Trimester	100 – 150	X
Antenatal 3 rd Trimester	100 – 150	X

7. Lymphocyte

Reported to (no. DP)	If the cell count $\geq 100 = 0dp$ If the cell count ≥ 0.5 and $<100 = 1dp$ If the cell count $< 0.5 = 2dp$	Units	$\times 10^9/L$
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Age Range	Reference Interval
Cord	2.1 – 10.7
0 – 30 days	2 -14
1 month	3.7 – 8
2 months – 3 months	4.2 – 10.6
4 months – 5 months	3.5 – 11.5
6 months – 7 months	3.5 – 11.5
8 months – 9 months	3.5 – 11.5
10 months – 11 months	3.5 – 11.5
1 year	2 – 8
2 years	2 – 8
3 years	2 – 8
4 years	1.4 – 5.7
5 years	1.4 – 5.7
6 years	1.4 – 5.7
7 years	1.4 – 5.7
8 years	1.4 – 4.5
9 years	1.4 – 4.5
10 years	1.4 – 4.5
11 years	1.4 – 4.5
12 years	1.4 – 4.5
13 years	1.4 - 4
14 years	1.4 - 4
15 years	1.4 - 4
16 + (Adult)	1 – 4

8. MCH

(Mean Cell Haemoglobin)

Reported to (no. DP)	0	Units	pg
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Age Range	Reference Interval
Cord	32 – 39
0 – 30 days	28 – 38
1 month	28 – 34
2 months – 3 months	24 – 32
4 months – 5 months	22 – 29
6 months – 7 months	22 – 29
8 months – 9 months	22 – 29
10 months – 11 months	22 – 29
1 year	23 – 29
2 years	23 – 29
3 years	23 – 29
4 years	24 – 29
5 years	24 – 29
6 years	24 – 29
7 years	24 – 29
8 years	24 – 30
9 years	24 – 30
10 years	24 – 30
11 years	24 – 30
12 years	24 – 30
13 years	25 – 31
14 years	25 – 31
15 years	25 – 31
16 + (Adult)	27 – 33

9. MCHC

(Mean Cell Haemoglobin Concentration)

Reported to (no. DP)	0	Units	g/L
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Age Range	Reference Interval	
	Female	Male
Cord	305 – 345	305 – 345
0 – 30 days	324 – 364	324 – 364
1 month	324 – 364	324 – 364
2 months – 3 months	323 – 361	323 – 361
4 months – 5 months	315 – 353	315 – 353
6 months – 7 months	315 – 353	315 – 353
8 months – 9 months	315 – 353	315 – 353
10 months – 11 months	315 – 353	315 – 353
1 year	317 – 353	317 – 353
2 years	317 – 353	317 – 353
3 years	317 – 353	317 – 353
4 years	319 – 353	319 – 353
5 years	319 – 353	319 – 353
6 years	319 – 353	319 – 353
7 years	319 – 353	319 – 353
8 years	315 – 350	315 – 350
9 years	315 – 350	315 – 350
10 years	315 – 350	315 – 350
11 years	315 – 350	315 – 350
12 years	315 – 350	315 – 350
13 years	315 – 350	318 – 353
14 years	315 – 350	318 – 353
15 years	315 – 350	318 – 353
16 + (Adult)	300 – 365	300 – 365

10. MCV

(Mean Cell Volume)

Reported to (no. DP)	0	Units	fL
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Age Range	Reference Interval
Cord	99 – 119
0 – 30 days	90 – 120
1 month	89 – 100
2 months – 3 months	72 – 91
4 months – 5 months	69 – 84
6 months – 7 months	69 – 84
8 months – 9 months	69 – 84
10 months – 11 months	69 – 84
1 year	70 – 86
2 years	70 – 86
3 years	70 – 86
4 years	74 – 87
5 years	74 – 87
6 years	74 – 87
7 years	74 – 87
8 years	75 – 90
9 years	75 – 90
10 years	75 – 90
11 years	75 – 90
12 years	75 – 90
13 years	78 – 93
14 years	78 – 93
15 years	78 – 93
16 + (Adult)	80 - 99

11. Meta/myelocytes (Immature Granulocytes)

Reported to (no. DP)	If the cell count $\geq 100 = 0dp$ If the cell count ≥ 0.5 and $<100 = 1 dp$ If the cell count $< 0.5 = 2 dp$	Units	x10(9)/L
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Age Range	Reference Interval
All ages	0 – 0.06

12. Monocytes

Reported to (no. DP)	If the cell count $\geq 100 = 0dp$ If the cell count ≥ 0.5 and $<100 = 1dp$ If the cell count $< 0.5 = 2dp$	Units	x10(9)/L
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Age Range	Reference Interval
Cord	0.7 – 2.7
0 – 30 days	0.5 – 1.5
1 month	0.5 – 1.5
2 months – 3 months	0.4 – 1.3
4 months – 5 months	0.3 – 1.5
6 months – 7 months	0.3 – 1.5
8 months – 9 months	0.3 – 1.5
10 months – 11 months	0.3 – 1.5
1 year	0.3 – 1.3
2 years	0.3 – 1.3
3 years	0.3 – 1.3
4 years	0.3 – 1
5 years	0.3 – 1
6 years	0.3 – 1
7 years	0.3 – 1
8 years	0.3 – 0.9
9 years	0.3 – 0.9
10 years	0.3 – 0.9
11 years	0.3 – 0.9
12 years	0.3 – 0.9
13 years	0.3 – 0.9
14 years	0.3 – 0.9
15 years	0.3 – 0.9
16 + (Adult)	0.2 - 1.0
Antenatal 1 st Trimester	0.2 - 1.2
Antenatal 2 nd Trimester	0.2 - 1.2
Antenatal 3 rd Trimester	0.2 - 1.2

13. Neutrophils

Reported to (no. DP)	If the cell count $\geq 100 = 0dp$ If the cell count ≥ 0.5 and $<100 = 1dp$ If the cell count $< 0.5 = 2dp$	Units	$\times 10^9/L$
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Age Range	Reference Interval
Cord	3.3 – 13
0 – 30 days	2 – 12
1 month	0.5 – 3.9
2 months – 3 months	0.8 – 4.7
4 months – 5 months	0.9 – 5.9
6 months – 7 months	0.9 – 5.9
8 months – 9 months	0.9 – 5.9
10 months – 11 months	0.9 – 5.9
1 year	1 – 7
2 years	1 – 7
3 years	1 – 7
4 years	1.5 – 8
5 years	1.5 – 8
6 years	1.5 – 8
7 years	1.5 – 8
8 years	1.5 – 7
9 years	1.5 – 7
10 years	1.5 – 7
11 years	1.5 – 7
12 years	1.5 – 7
13 years	1.8 – 7
14 years	1.8 – 7
15 years	1.8 – 7
16 + (Adult)	1.9 - 7.5
Antenatal 1 st Trimester	1.9 - 10.5
Antenatal 2 nd Trimester	1.9 - 10.5
Antenatal 3 rd Trimester	1.9 - 10.5

14. Nucleated Red Cells

(NRBCs)

Reported to (no. DP)	If the cell count $\geq 100 = 0dp$ If the cell count ≥ 0.5 and $<100 = 1dp$ If the cell count $< 0.5 = 2dp$	Units	$\times 10^9/L$
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Age	Reference Interval
At birth	0 – 1.5
1 week	0

Premature infants average 21 NRBC / 100 WBC.

Prematurity should be considered when more than 10 NRBC / 100 WBC are present in peripheral blood at time of birth.

To correct a WBC for the presence of NRBC:

$$\frac{\text{Total WBC} \times 100}{100 + \text{NRBC}}$$

e.g. WBC 21.5 $\times 10^9/L$
NRBC 38/100 WBC

$$\text{Corrected WBC} = 15.6 \times 10^9/L$$

15. Platelets

Reported to (no. DP)	0	Units	x10 ⁹ /L
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Age Range	Reference Interval
Cord	150 – 400
0 – 30 days	150 – 650
1 month	150 – 650
2 months – 3 months	150 – 650
4 months – 5 months	150 – 575
6 months – 7 months	150 – 575
8 months – 9 months	150 – 575
10 months – 11 months	150 – 575
1 year	150 – 500
2 years	150 – 500
3 years	150 – 500
4 years	150 – 475
5 years	150 – 475
6 years	150 – 475
7 years	150 – 475
8 years	150 – 425
9 years	150 – 425
10 years	150 – 425
11 years	150 – 425
12 years	150 – 425
13 years	150 – 400
14 years	150 – 400
15 years	150 – 400
16 + (Adult)	150 – 400
Antenatal 1 st Trimester	150 – 400
Antenatal 2 nd Trimester	150 – 400
Antenatal 3 rd Trimester	150 – 400

16. RBC

(Red Blood Cell Count)

Reported to (no. DP)	2	Units	x10(12)/L
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Age Range	Reference Interval	
	Female	Male
Cord	3.53 – 5.52	3.53 – 5.52
0 – 30 days	3.9 – 6	3.9 – 6
1 month	2.9 – 4.8	2.9 – 4.8
2 months – 3 months	3.3 – 4.8	3.3 – 4.8
4 months – 5 months	4 – 5.3	4 – 5.3
6 months – 7 months	4 – 5.3	4 – 5.3
8 months – 9 months	4 – 5.3	4 – 5.3
10 months – 11 months	4 – 5.3	4 – 5.3
1 year	4 – 5.4	4 – 5.4
2 years	4 – 5.4	4 – 5.4
3 years	4 – 5.4	4 – 5.4
4 years	4.1 – 5.4	4.1 – 5.4
5 years	4.1 – 5.4	4.1 – 5.4
6 years	4.1 – 5.4	4.1 – 5.4
7 years	4.1 – 5.4	4.1 – 5.4
8 years	4.15 – 5.4	4.15 – 5.4
9 years	4.15 – 5.4	4.15 – 5.4
10 years	4.2 – 5.6	4.2 – 5.6
11 years	4.2 – 5.6	4.2 – 5.6
12 years	4.2 – 5.6	4.2 – 5.6
13 years	4 – 5.35	4.4 – 5.7
14 years	4 – 5.35	4.4 – 5.7
15 years	4 – 5.35	4.4 – 5.7
16 + (Adult)	3.6 – 5.6	4.3 – 6.0

17. RDW

(Red Cell Distribution Width)

Reported to (no. DP)	1	Units	%
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Age Range	Reference Interval	
	Female	Male
Cord	15.2 – 19	15.2 – 19
0 – 30 days	13.2 – 18	13.2 – 18
1 month	13.2 – 17.5	13.2 – 17.5
2 months – 3 months	11.9 – 16.2	11.9 – 16.2
4 months – 5 months	12 – 16	12 – 16
6 months – 7 months	12 – 16	12 – 16
8 months – 9 months	12 – 16	12 – 16
10 months – 11 months	12 – 16	12 – 16
1 year	12 – 15.5	12 – 15.5
2 years	12 – 15.5	12 – 15.5
3 years	12 – 15.5	12 – 15.5
4 years	12 – 14.5	12 – 14.5
5 years	12 – 14.5	12 – 14.5
6 years	12 – 14.5	12 – 14.5
7 years	12 – 14.5	12 – 14.5
8 years	12 – 14.5	12 – 14.5
9 years	12 – 14.5	12 – 14.5
10 years	12 – 14.5	12 – 14.5
11 years	12 – 14.5	12 – 14.5
12 years	12 – 14.5	12 – 14.5
13 years	12 – 15	12 – 14.5
14 years	12 – 15	12 – 14.5
15 years	12 – 15	12 – 14.5
16 + (Adult)	11.5 – 15	11.5 – 15

18. Reticulocytes

Alternative name: (Retics)

Reported to (no. DP)	0	Units	x10 ⁹ /L
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Age Range	Reference Interval
Adult	20-100

19. WBC

(White Blood Cell Count)

Reported to (no. DP)	If the cell count $\geq 100 = 0dp$ All others = 1dp	Units	x10(9)/L
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Age Range	Reference Interval
Cord	7.3 – 25.8
0 – 30 days	5 – 20
1 month	5.8 – 13
2 months – 3 months	6.6 – 15
4 months – 5 months	6.4 – 17
6 months – 7 months	6.4 – 17
8 months – 9 months	6.4 – 17
10 months – 11 months	6.4 – 17
1 year	5 – 14.5
2 years	5 – 14.5
3 years	5 – 14.5
4 years	4.5 – 12
5 years	4.5 – 12
6 years	4.5 – 12
7 years	4.5 – 12
8 years	4.3 – 12
9 years	4.3 – 12
10 years	4.3 – 12
11 years	4.3 – 12
12 years	4.3 – 12
13 years	4.2 – 10
14 years	4.2 – 10
15 years	4.2 – 10
16 + (Adult)	4 – 11
Antenatal 1 st Trimester	4 – 15
Antenatal 2 nd Trimester	4 – 15
Antenatal 3 rd Trimester	4 – 15

20. Adult Reference Intervals

This document is valid at the date of issue and will be updated as required within Canterbury Health Laboratories. People outside of Canterbury Health Laboratories should use this document with caution or contact the laboratory for updated information.

	Units	Male	Female
Haemoglobin	g/L	130 - 175	115 - 155
Hct	Ratio	0.40 - 0.52	0.35 - 0.46
Red Cell Count	$\times 10^{12}/L$	4.30 - 6.00	3.60 - 5.60
MCV	fL	80 - 99	
MCH	pg	27 - 33	
MCHC	g/L	300 - 365	
RDW (CV)	%	11.5 - 15.0	
Platelets	$\times 10^9/L$	150 - 400	

	Units	Adult
White Cell Count	$\times 10^9/L$	4.0 - 11.0
Neutrophils	$\times 10^9/L$	1.9 - 7.5
Lymphocytes	$\times 10^9/L$	1.0 - 4.0
Monocytes	$\times 10^9/L$	0.2 - 1.0
Eosinophils	$\times 10^9/L$	0.0 - 0.5
Basophils	$\times 10^9/L$	0.0 - 0.2
Meta/myelocytes	$\times 10^9/L$	0.0 - 0.06

	Units	Adult
Reticulocytes	$\times 10^9/L$	20 - 100

ESR	mm/hour
1-30 years	1 - 10
31-50 years	1 - 15
51-70 years	1 - 20
>71 years	1 - 30

21. Paediatric Reference Intervals

Age	Haemoglobin g/L	HCT Ratio L/L	Red Cell Count x 10 ¹² /L	MCV fL	MCH pg	MCHC g/L	RDW %
Cord	124 - 192	0.37 - 0.56	3.53 - 5.52	99 - 119	32 - 39	305 - 345	15.0 - 19.0
0 - 30 days	120 - 200	0.40 - 0.65	3.90 - 6.00	90 - 120	28 - 38	324 - 364	13.2 - 18.0
1 month	93 - 158	0.27 - 0.46	2.90 - 4.80	89 - 100	28 - 34	324 - 364	13.2 - 17.5
2 - 3 months	97 - 130	0.29 - 0.38	3.30 - 4.80	72 - 91	24 - 32	323 - 361	11.9 - 16.2
4 - 11 months	105 - 136	0.31 - 0.40	4.00 - 5.30	69 - 84	22 - 29	315 - 353	12.0 - 16.0
1 - 3 years	105 - 140	0.32 - 0.41	4.00 - 5.40	70 - 86	23 - 29	317 - 353	12.0 - 15.5
4 - 7 years	113 - 145	0.33 - 0.42	4.10 - 5.40	74 - 87	24 - 29	319 - 353	12.0 - 14.5
8 - 9 years	115 - 145	0.35 - 0.43	4.15 - 5.4	75 - 90	24 - 30	315 - 350	12.0 - 14.5
10 - 12 years	115 - 145	0.35 - 0.43	4.20 - 5.60	75 - 90	24 - 30	315 - 350	12.0 - 14.5
13 - 15 years	Female	Female	Female	78 - 93	25 - 31	Female	Female
	115 - 150	0.35 - 0.44	4.00 - 5.35			315 - 350	12.0 - 15.0
	Male	Male	Male			Male	Male
125 - 160	0.37 - 0.47	4.40 - 5.70		318 - 353	12.0 - 14.5		

Age	White Cell Count x10 ⁹ /L	Neutrophils x10 ⁹ /L	Lymphocytes x 10 ⁹ /L	Monocytes x10 ⁹ /L	Eosinophils x10 ⁹ /L	Basophils x10 ⁹ /L	Platelets x10 ⁹ /L
Cord	7.2 - 25.8	3.3 - 13.0	2.1 - 10.7	0.7 - 2.7	0 - 1.0	0 - 0.2	150 - 400
0 - 30 days	5.0 - 20.0	2.0 - 12.0	2.0 - 14.0	0.5 - 1.5	0 - 0.9	0 - 0.2	150 - 650
1 month	5.8 - 13.0	0.5 - 3.9	3.7 - 8.0	0.5 - 1.5	0 - 0.9	0 - 0.2	150 - 650
2 - 3 months	6.6 - 15.0	0.8 - 4.7	4.2 - 10.6	0.4 - 1.3	0 - 0.9	0 - 0.2	150 - 650
4 - 11 months	6.4 - 17.0	0.9 - 5.9	3.5 - 11.5	0.3 - 1.5	0 - 0.9	0 - 0.2	150 - 575
1 - 3 years	5.0 - 14.5	1.0 - 7.0	2.0 - 8.0	0.3 - 1.3	0 - 0.9	0 - 0.2	150 - 500
4 - 7 years	4.5 - 12.0	1.5 - 8.0	1.4 - 5.7	0.3 - 1.0	0 - 1.0	0 - 0.2	150 - 475
8 - 12 years	4.3 - 12.0	1.5 - 7.0	1.4 - 4.5	0.3 - 0.9	0 - 0.9	0 - 0.2	150 - 425
13 - 15 years	4.2 - 10.0	1.8 - 7.0	1.4 - 4.0	0.3 - 0.9	0 - 0.8	0 - 0.2	150 - 400