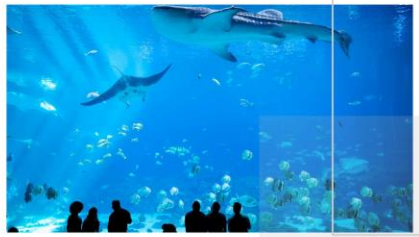
International Biometric Conference

IBC

8-13 December 2024

Atlanta USA



Early Growth Patterns in Argentine Infants: Environmental Influences on Anthropometric Development

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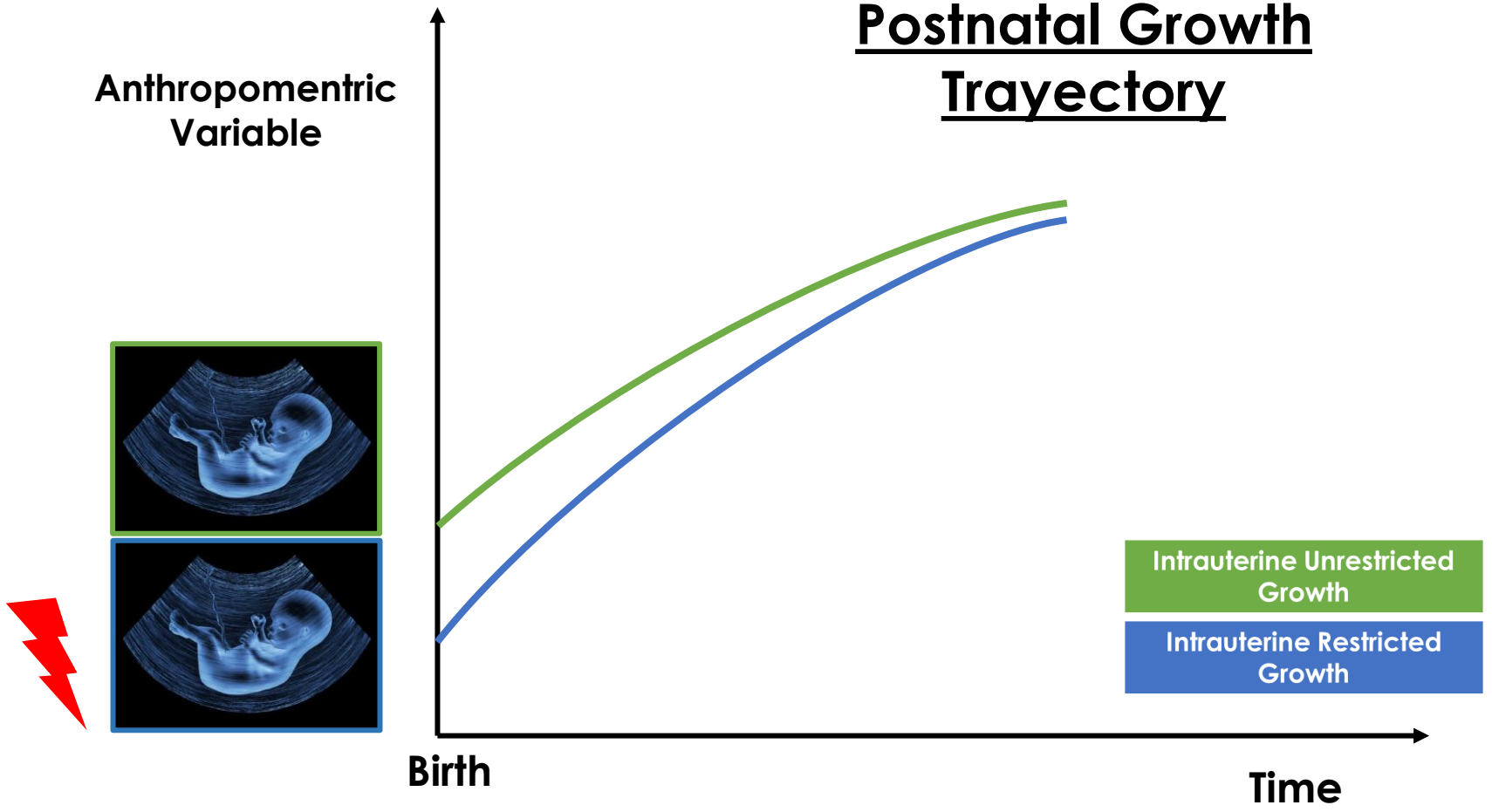
Catch-Up


Postnatal Growth Trayectory
Anthropomentric Variable
Intrauterine Unrestricted Growth
Intrauterine Restricted Growth
Birth
Time

Brain Sparing Effect

Intrauterine Unrestricted Growth

The fetus received a sufficient supply of resources during gestation.

As a result, the child is likely to have normal growth patterns and a balanced development of both the brain and other bodily structures.

Intrauterine Restricted Growth

The fetus does not reach its full growth potential.
In this condition, the fetus faces a trade-off between allocating resources for brain growth and allocating them for other functions, such as somatic growth and survival

Objective

The aim of this study is to assess the trade-off between brain and bone growth during the first year of life in infants from Argentina

Hypothesis

First year postnatal brain growth is spared at the expense of bone tissue growth

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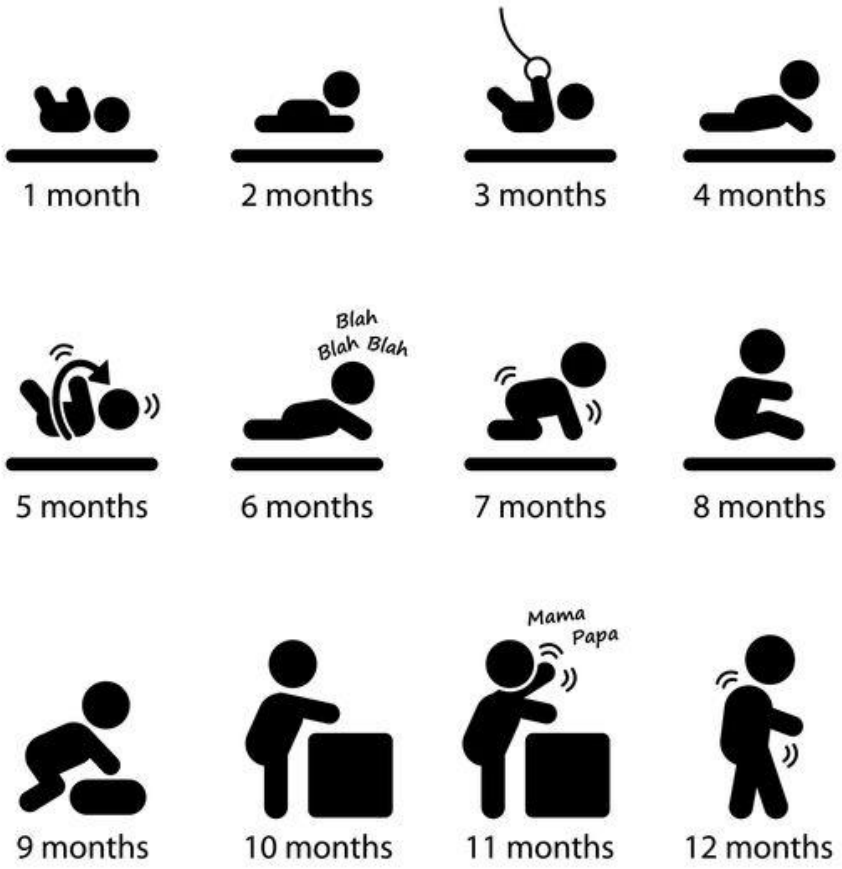
First year postnatal brain growth is spared at the expense of bone tissue growth

Prediction

We expect that the postnatal trajectories of **head circumference (HC)** and **body length (BL)** vary according to the growth status at birth. Particularly, we expect an earlier catch-up growth of HC trajectories compared to body length

Analytical Sample



Individuals Included on Analysis

- <1 year old
- 1 measurement before first week of life (<7 days)
- 3 or more BL and HC measurements during first year of life

3,399 Infants

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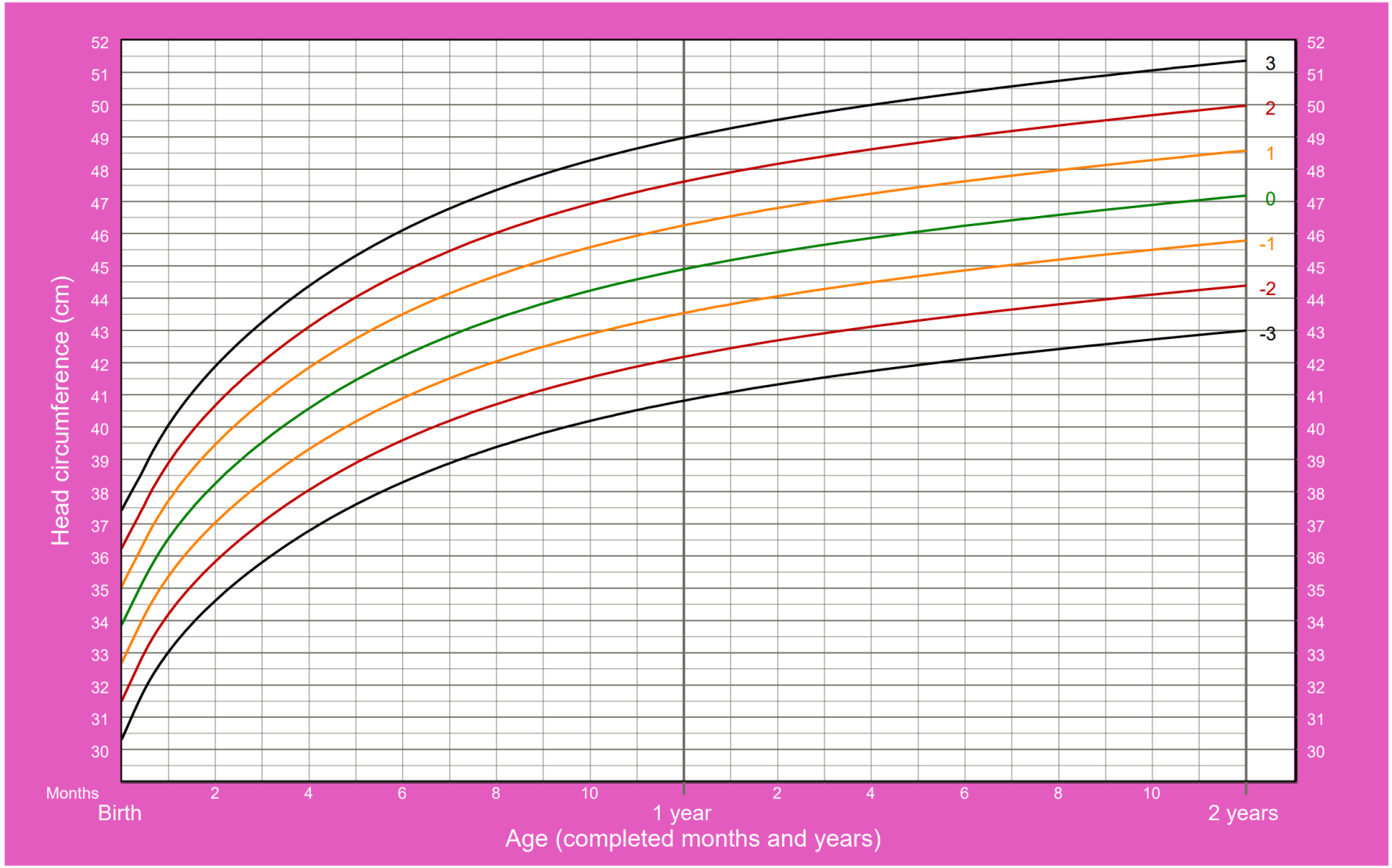
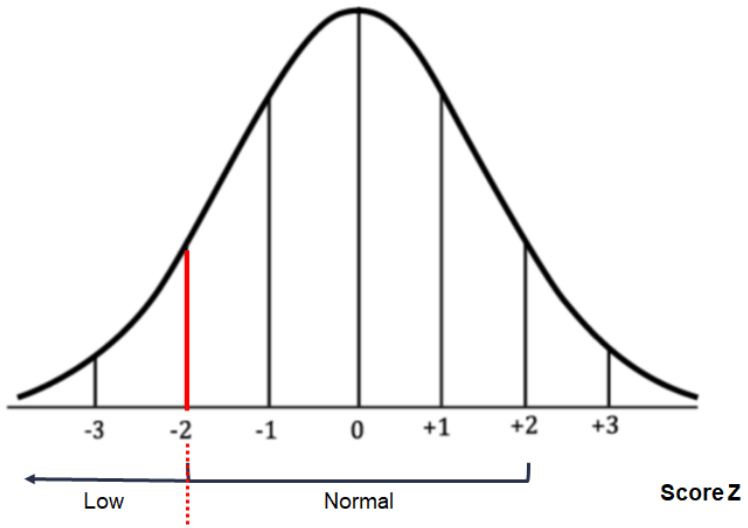
Head circumference-for-age GIRLS

World Health Organization

Birth to 2 years (z-scores)



Analytical Sample



	Nor HC at birth	Low HC at birth
Nor BL at birth	**Group 1** Female = 681 Male = 689	**Group 2** Female = 213 Male = 121
Low BL at birth	**Group 3** Female = 675 Male = 703	**Group 4** Female = 180 Male = 137

Statistical Analysis

Count Model

$$E(y_i) = \beta_0 + \beta_1 * Age_i + \beta_2 * ln(Age_i + 1)$$

```
Anthropometric Variable ~ β0 + β1 * (Age) + β2 * log(Age + 1),
                          fixed = β0 + β1 + β2 ~ Growth Status,
                          random = β0 + β1 + β2 ~ 1|ID
```


Statistical Analysis

Models by sex

Female

$$HC \sim \beta_0 + \beta_1 * (Age) + \beta_2 * \log(Age + 1),$$
$$\text{fixed} = \beta_0 + \beta_1 + \beta_2 \sim \text{Growth Status},$$
$$\text{random} = \beta_0 + \beta_1 + \beta_2 \sim 1|ID$$

$$BL \sim \beta_0 + \beta_1 * (Age) + \beta_2 * \log(Age + 1),$$
$$\text{fixed} = \beta_0 + \beta_1 + \beta_2 \sim \text{Growth Status},$$
$$\text{random} = \beta_0 + \beta_1 + \beta_2 \sim 1|ID$$

Male

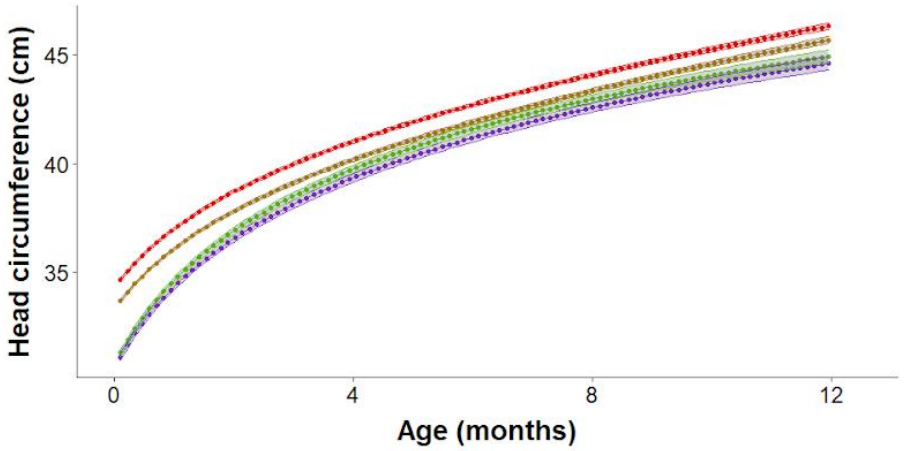
$$HC \sim \beta_0 + \beta_1 * (Age) + \beta_2 * \log(Age + 1),$$
$$\text{fixed} = \beta_0 + \beta_1 + \beta_2 \sim \text{Growth Status},$$
$$\text{random} = \beta_0 + \beta_1 + \beta_2 \sim 1|ID$$

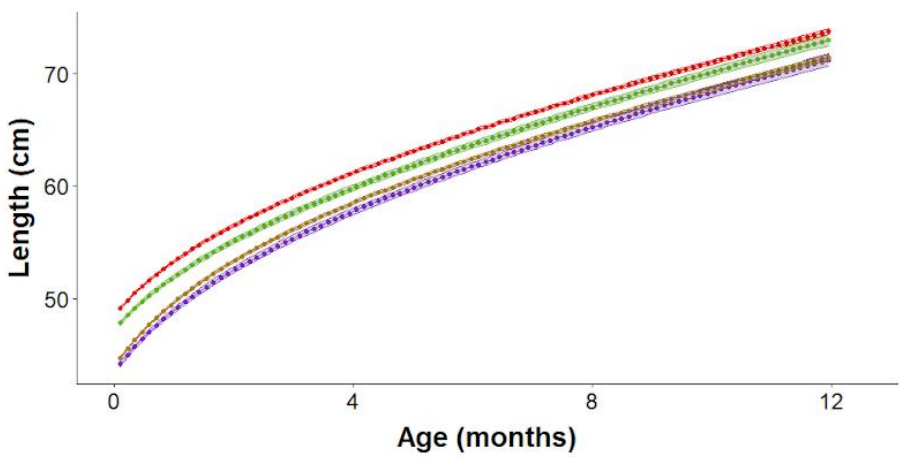
$$BL \sim \beta_0 + \beta_1 * (Age) + \beta_2 * \log(Age + 1),$$
$$\text{fixed} = \beta_0 + \beta_1 + \beta_2 \sim \text{Growth Status},$$
$$\text{random} = \beta_0 + \beta_1 + \beta_2 \sim 1|ID$$

Growth Trajectories

NorHC_NorL | LowHC_NorL
NorHC_LowL | LowHC_LowL

♀





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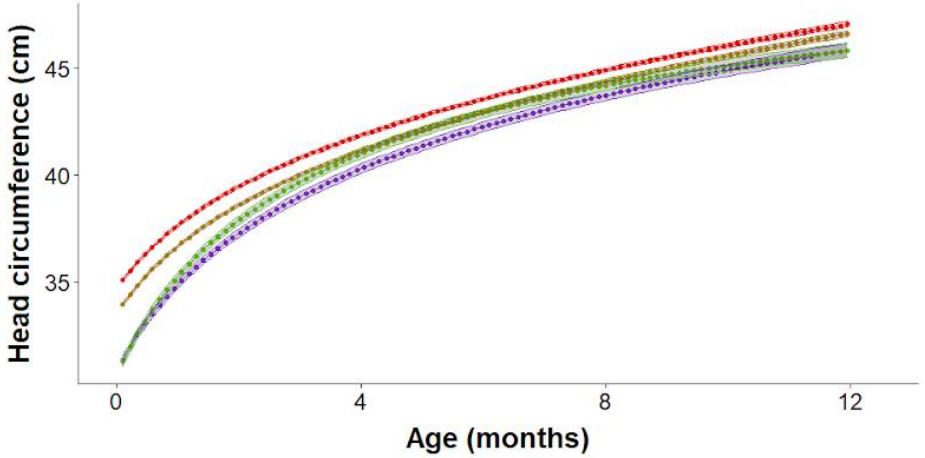

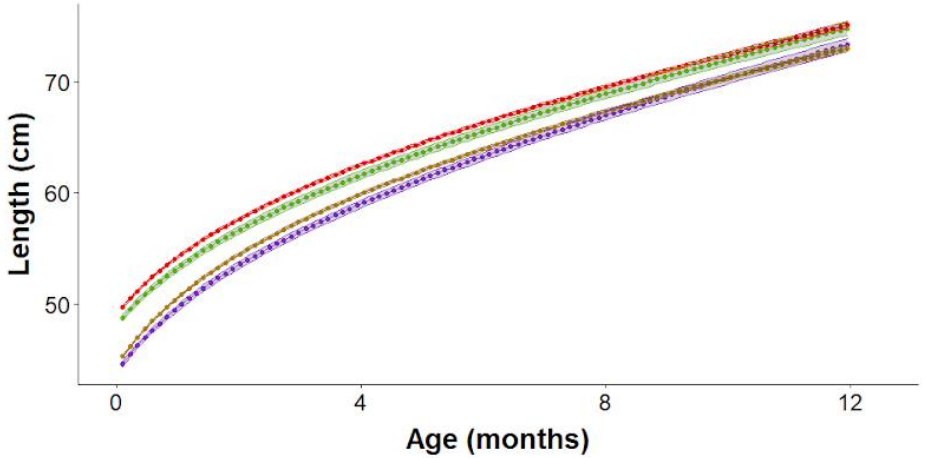

Growth Trajectories

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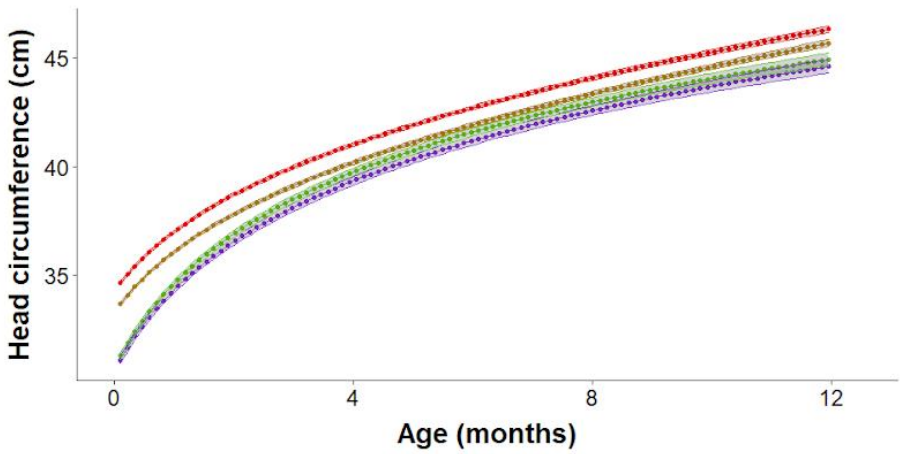

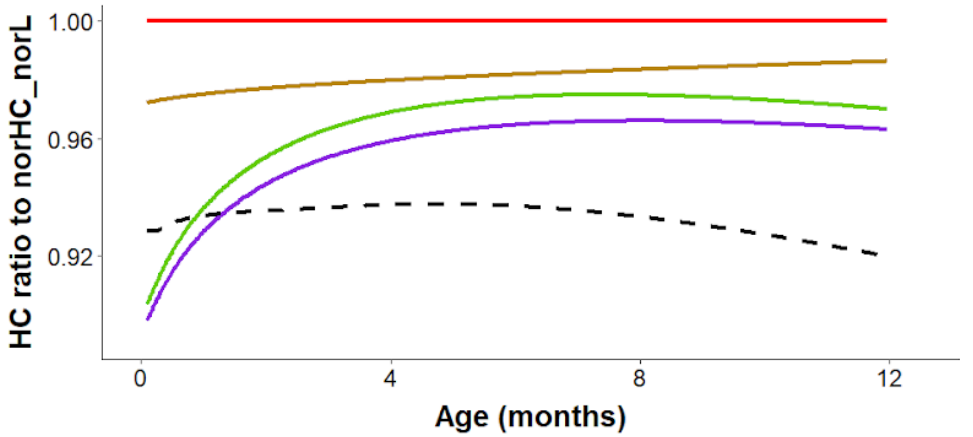

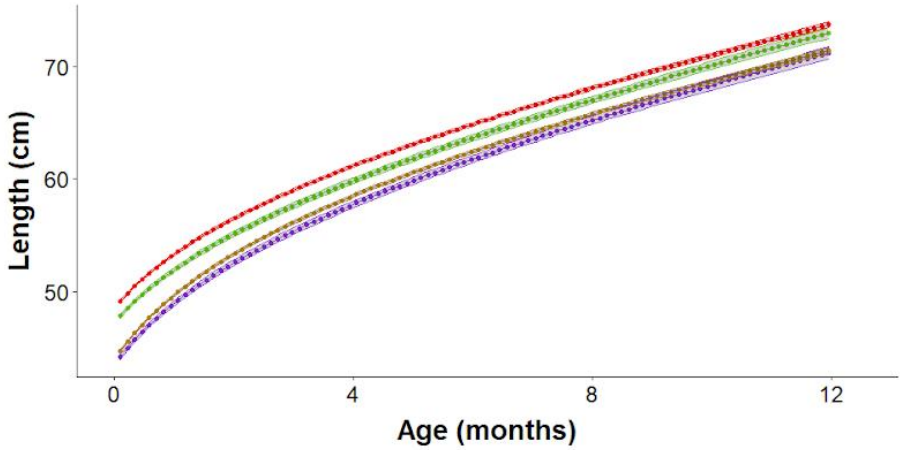

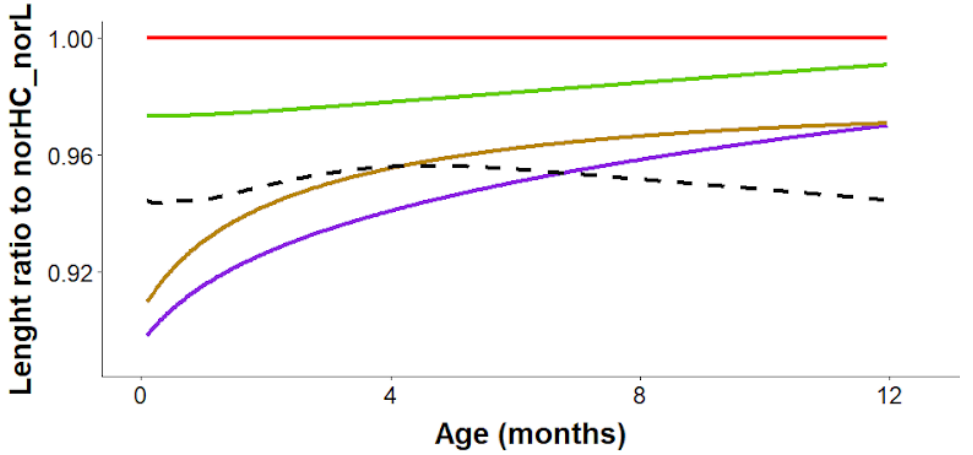

Growth Trajectories

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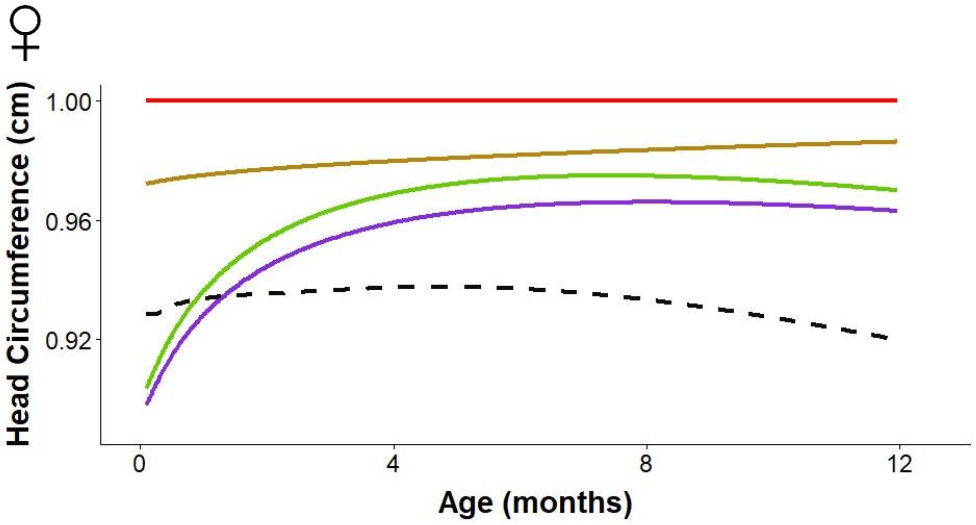

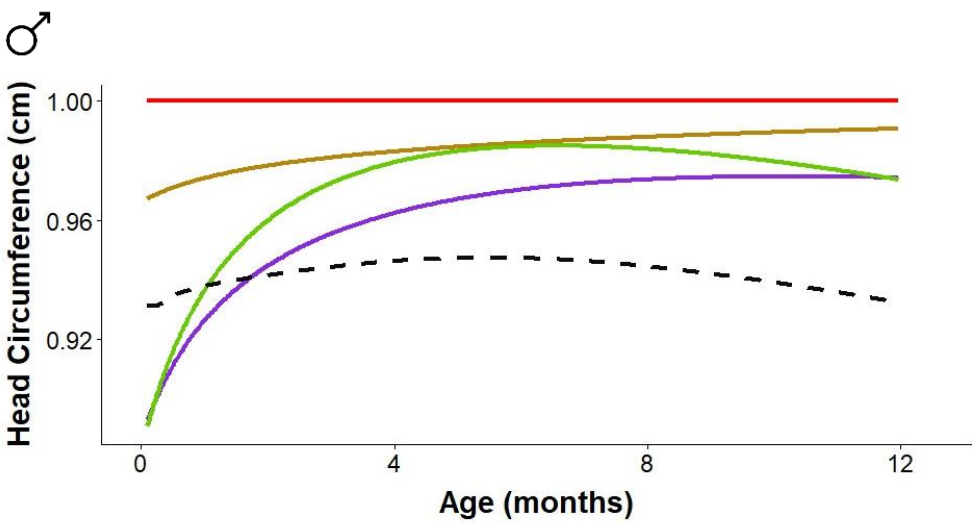

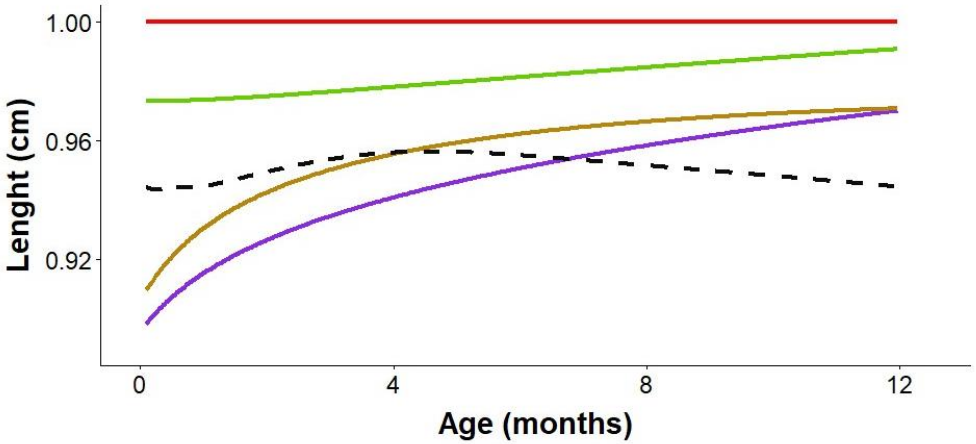

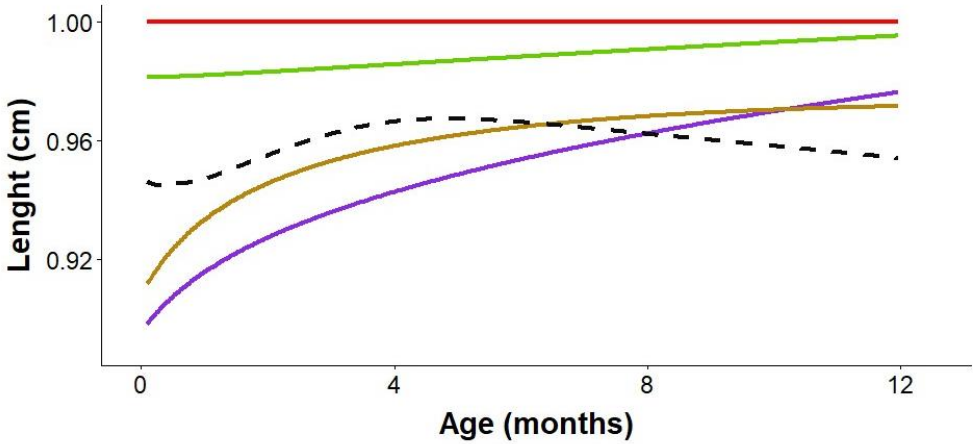

Growth Trajectories

NorHC_NorL | LowHC_NorL
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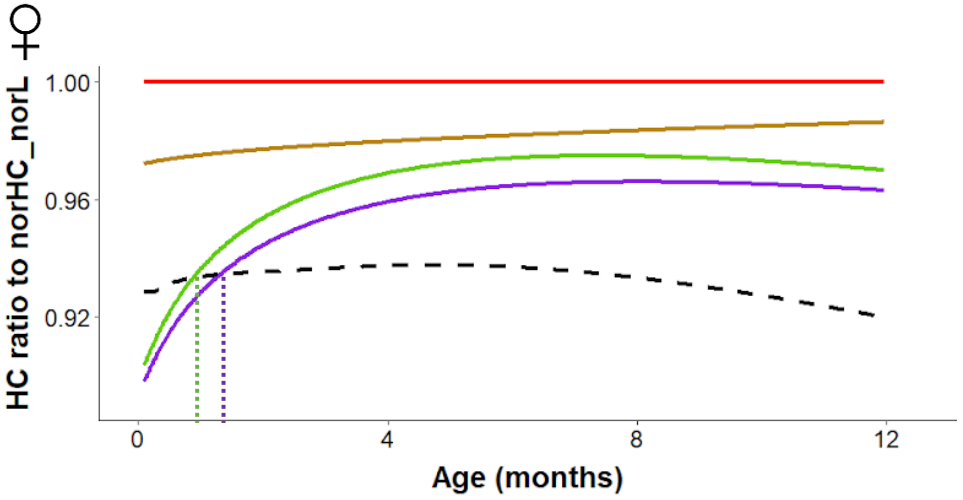

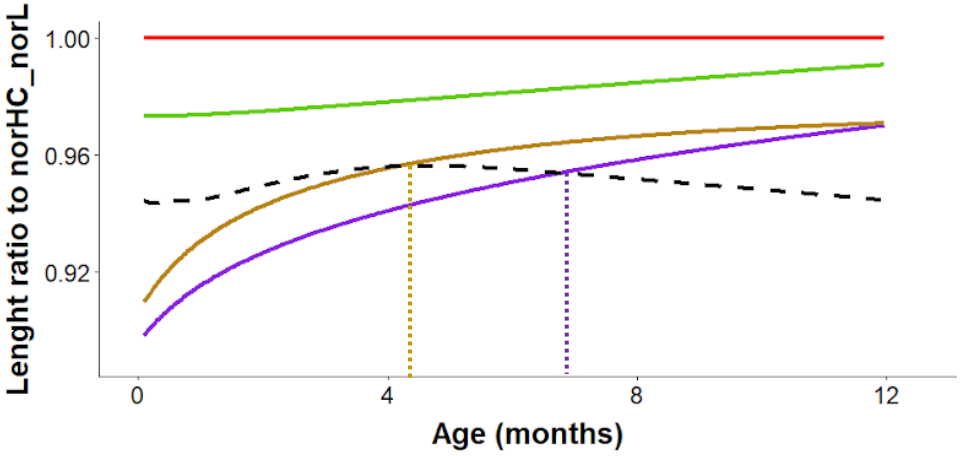

	LowHC Normal BL	Normal HC Low BL	Low HC Low BL
	Months (days)	Months (days)	Months (days)
F			
HC	0.89 (27)		1.31 (40)
BL		4.19 (129)	6.78 (206)
M			
HC	1.05 (32)		1.74 (53)
BL		6.45 (190)	7.97 (242)

Conclusion and Implications

Low z-score in both HC and BL at birth

LowHC_LowBL ⟶ HC mean recovery > BL Mean recovery

Low z-score in only one variable at birth

HC mean recovery of LowHC_NorBL > BL mean recovery of NorHC_LowBL

RESEARCH ARTICLE

AMERICAN JOURNAL OF BIOLOGICAL ANTHROPOLOGY
The Official Journal of the American Association of Biological Anthropologists

WILEY

Head circumference at birth and postnatal growth trajectory in vulnerable groups from Argentina

Tomás González Garello[1] | Jimena Barbeito-Andrés[2] | Adriana Pérez[1] | Gerardo Cueto[1] | Pablo Nuñez[1] | Noelia Bonfili[2] | Paula Gonzalez[2]

RESEARCH ARTICLE

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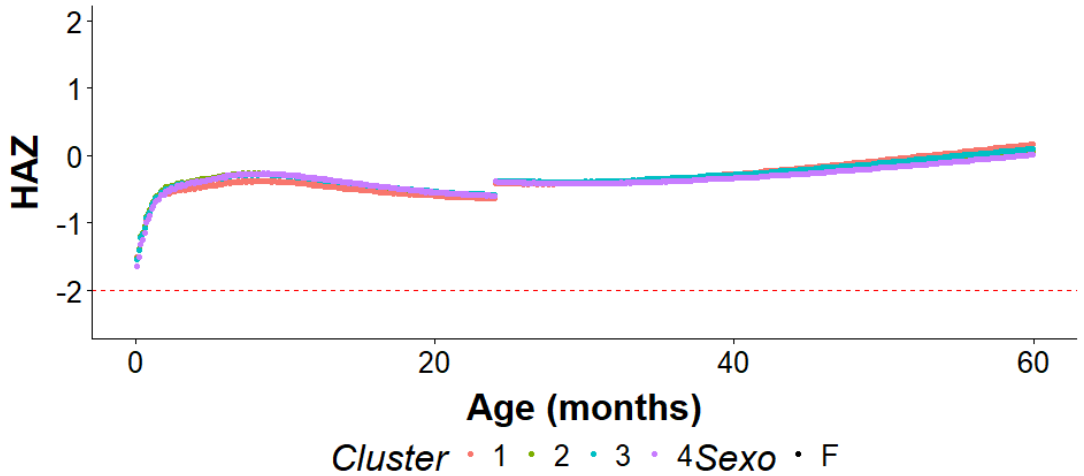
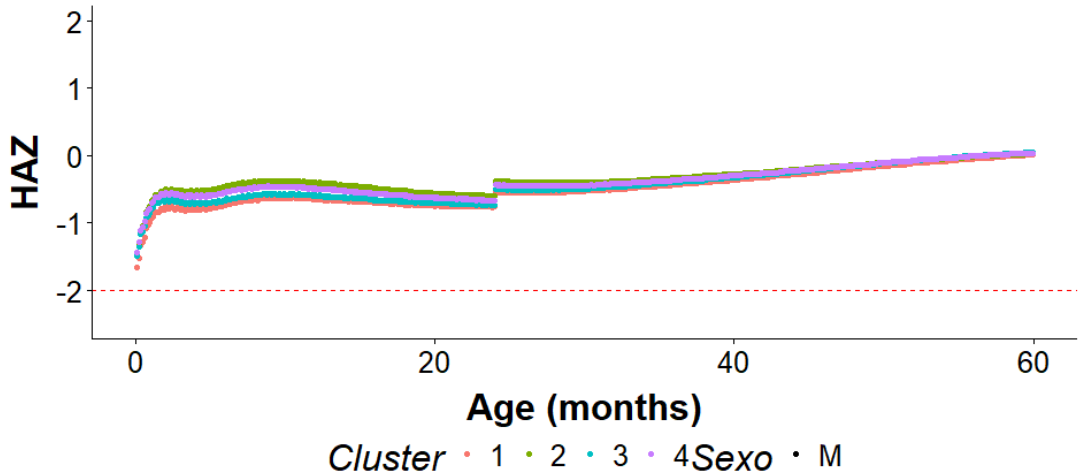
Head circumferenc[illegible]growth trajectory in vulnerable group[illegible]

Tomás González Garello[1] | [illegible]riana Pérez[1] | Gerardo Cueto[1] | Pablo N[illegible]Gonzalez[2]


HAZ
2
1
0
-1
-2
0
20
40
60
Age (months)
Cluster • 1 • 2 • 3 • 4Sexo • F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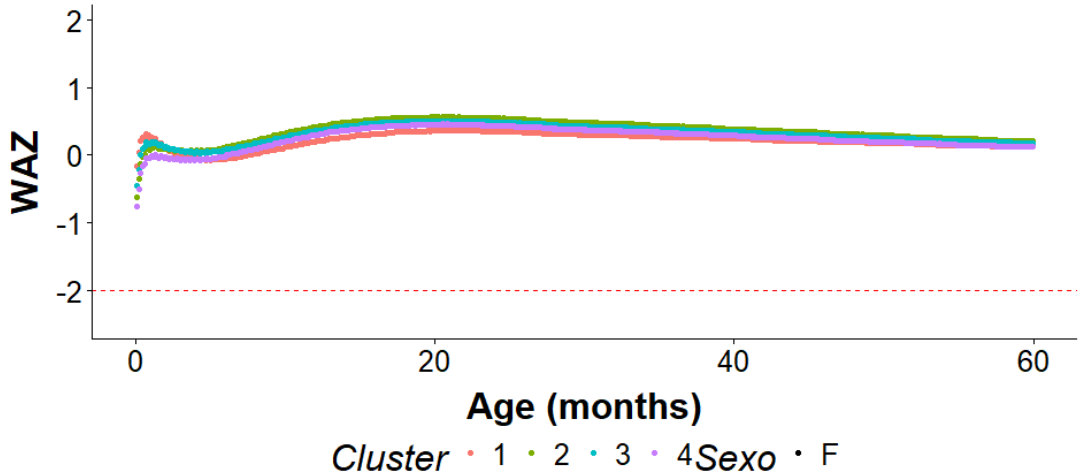
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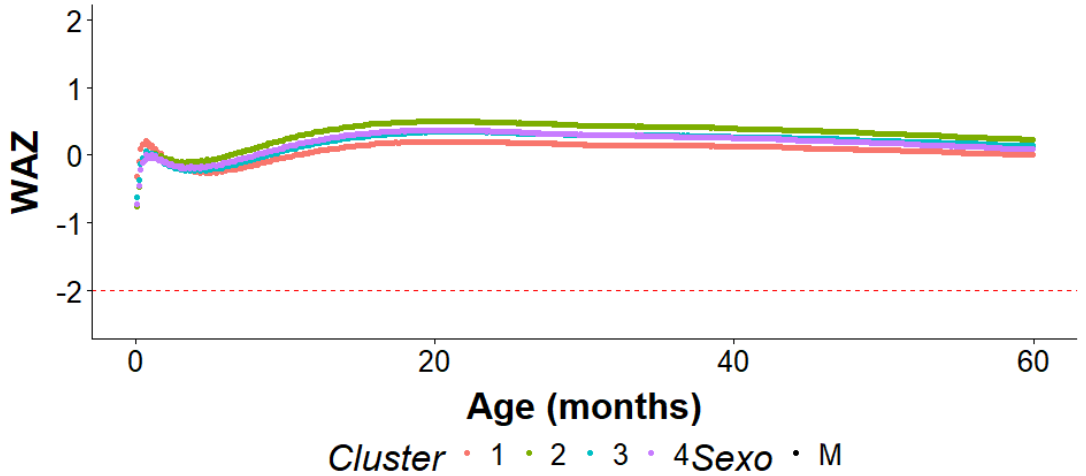
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Instituto del Cálculo (Pabellón 0 + Infinito)

Grupo de Bioestadística Aplicada

Adriana Pérez, Gerardo Cueto, Soledad Fernández, Pablo Turjanski, Pablo Nuñez, Santiago Flaibani, Valentín Rozenblit

GBA
Grupo de Bioestadística Aplicada

Departamento de Ecología, Genética y Evolución (Pabellón 2)

Unidad Ejecutora de Estudios en Neurociencias y Sistemas Complejos

Paula González, Jimena Barbeito-Andrés, Noelia Bonfili

Study Design

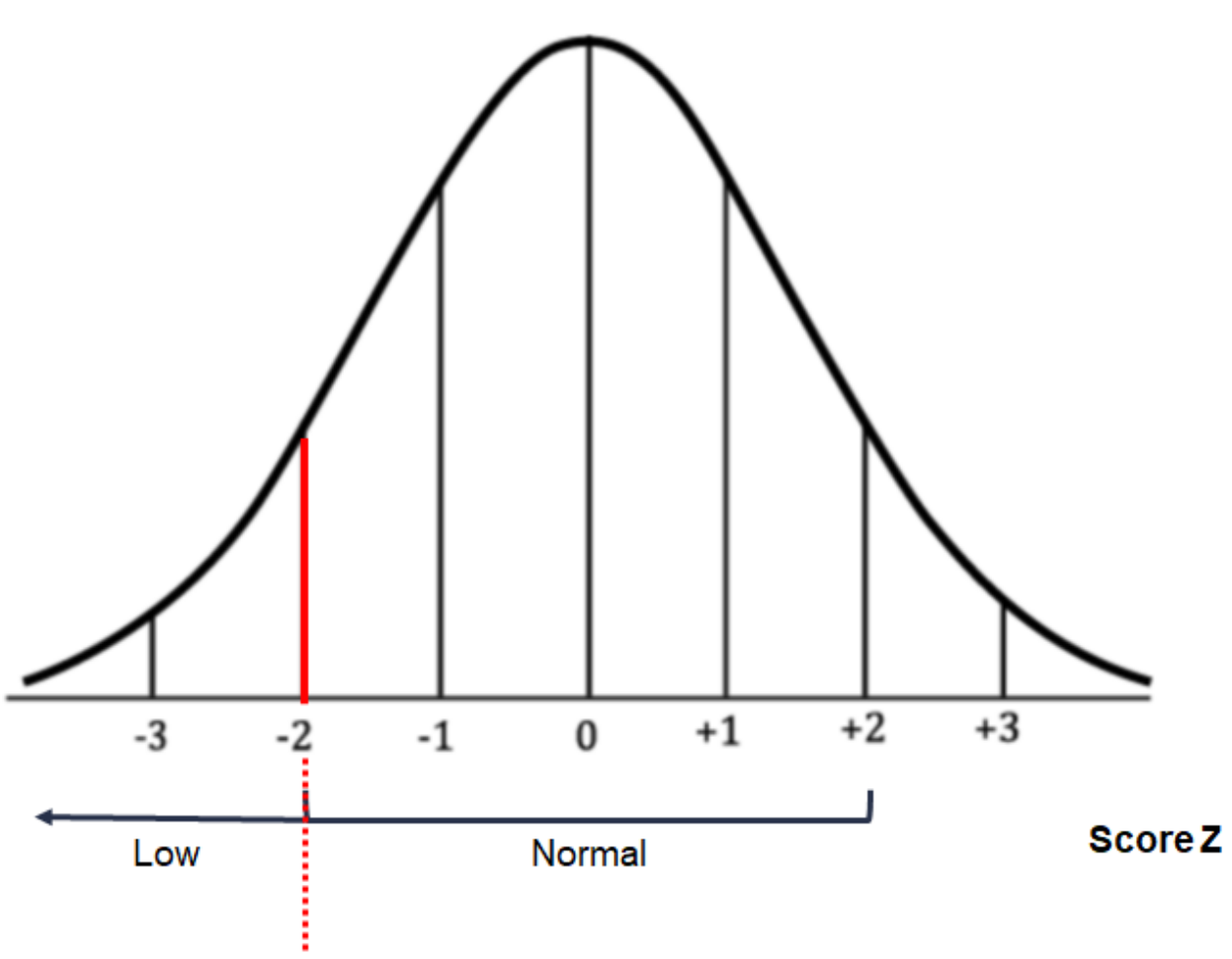
>6500 Public Health Care Centers

Approximately 4 million children and adolescents each year

Programa SUMAR

COBERTURA UNIVERSAL de SALUD

Growth Status



BL for Age Z-score at Birth

- Low
- Normal

HC for Age Z-score at Birth

- Low
- Normal

Growth Trajectories

$$E(y_i) = \beta_0 + \beta_1 * Age_i + \beta_2 * ln(Age_i + 1)$$

	Female				Male			
	norHC_norL	norHC_lowL	lowHC_norL	lowHC_lowL	norHC_norL	norHC_lowL	lowHC_norL	lowHC_lowL
HC								
β0	A 34.30 (0.05)	B 33.33 (0.05)	C 30.79 (0.09)	C 30.62 (0.1)	A 34.67 (0.05)	A 33.49 (0.05)	B 30.60 (0.1)	B 30.75 (0.1)
β1	A 0.23 (0.02)	A 0.25 (0.02)	B -0.023 (0.03)	B 0.016 (0.04)	A 0.17 (0.02)	A 0.17 (0.01)	B -0.22 (0.04)	C -0.015 (0.04)
β2	A 3.59 (0.08)	B 3.63 (0.08)	A 5.62 (0.14)	B 5.38 (0.16)	A 4.05 (0.08)	B 4.34 (0.08)	A 7.06 (0.19)	C 5.97 (0.18)
Length								
β0	A 48.62 (0.09)	B 44.06 (0.09)	C 47.33 (0.16)	D 43.56 (0.16)	A 49.22 (0.07)	B 44.70 (0.07)	C 48.30 (0.17)	D 44.09 (0.16)
β1	AB 0.93 (0.03)	A 0.84 (0.03)	B 1.05 (0.05)	B 1.03 (0.06)	A 0.86 (0.03)	B 0.75 (0.03)	A 0.96 (0.08)	A 1.02 (0.07)
β2	A 5.46 (0.12)	B 6.83 (0.11)	A 5.12 (0.21)	C 6.12 (0.22)	A 6.08 (0.12)	B 7.56 (0.12)	A 5.86 (0.29)	A 6.67 (0.28)

Growth Recovery

	LowHC Normal BL	Normal HC Low BL	Low HC Low BL
	Months (days)	Months (days)	Months (days)
F			
HC	0.89 (27)		1.31 (40)
BL		4.19 (129)	6.78 (206)
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Conclusion and Implications

- For individuals born with lowHC and lowL the mean recovery is faster in HC than in BL
- Considering individuals born with a low z-score in only one variable, the mean recovery is faster in HC in cases of low HC at birth than the BL mean recovery in low BL at birth cases
- In all groups, mean recovery is faster in female curves than in male curves.
- For both anthropometric variables, mean recovery is faster when the low z-score is manifested in only one of the two variables