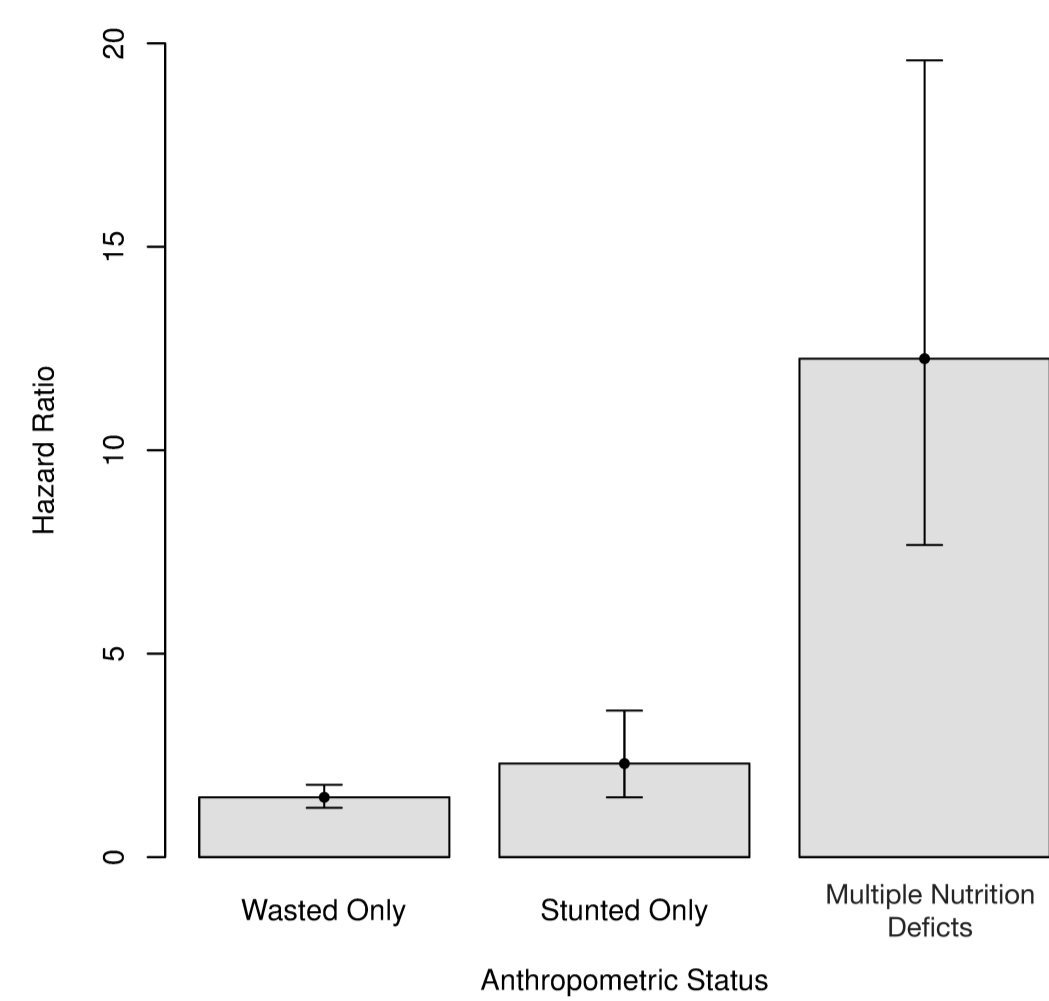


Children who are both wasted and stunted (**WaSt**) are also underweight and have a high risk of death

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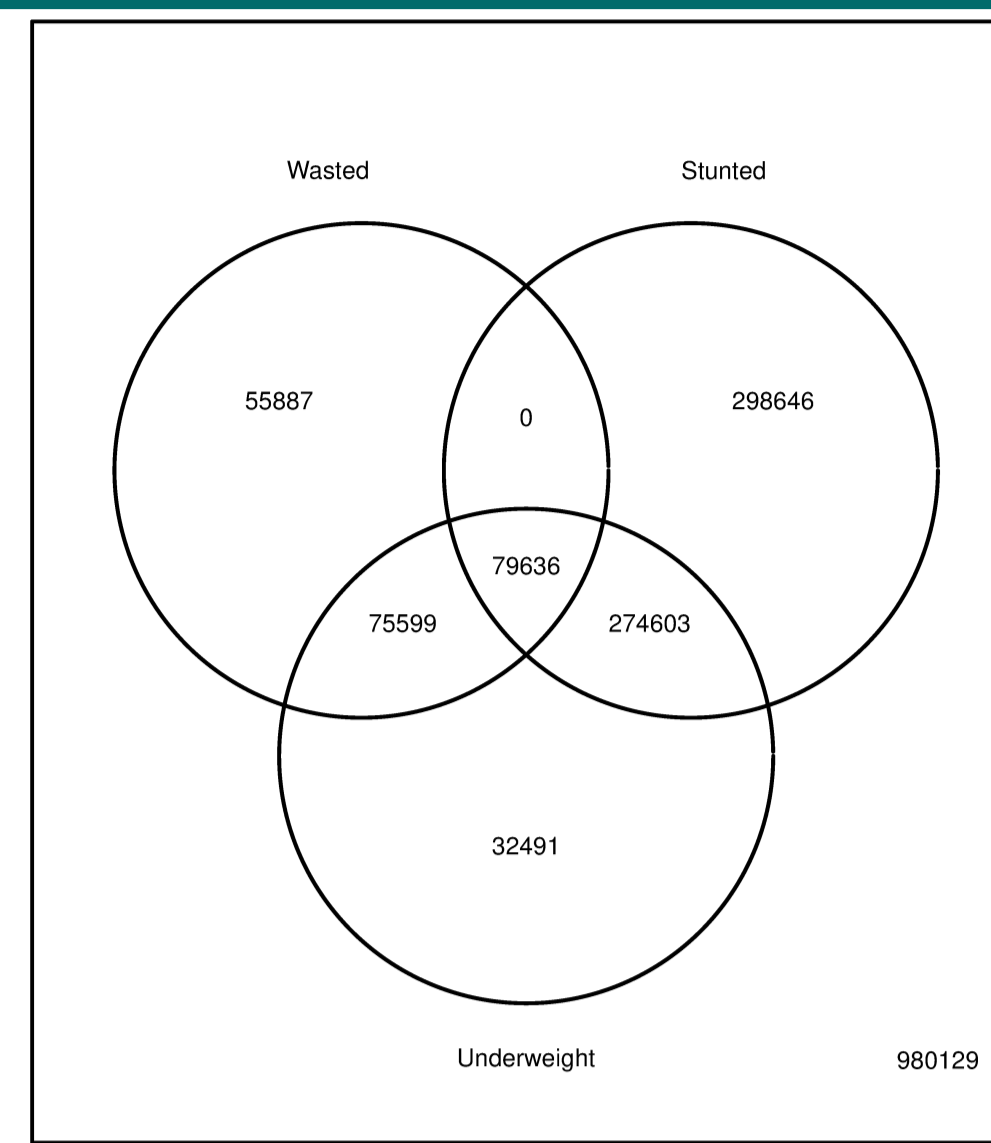
¹Brixton Health, ²ENN, ³MRC Elsie Widdowson Laboratory, ⁴Action Against Hunger USA, ⁵LSHTM, ⁶No Wasted Lives (AHH-UK), ⁷University of Tampere, ⁸University of Copenhagen

① Multiple Nutrition Deficits (MND) and Mortality (McDonald CM et al., 2013)



Children with WHZ < -2 and HAZ < -2 and WAZ < -2 (MND) have a high mortality risk.

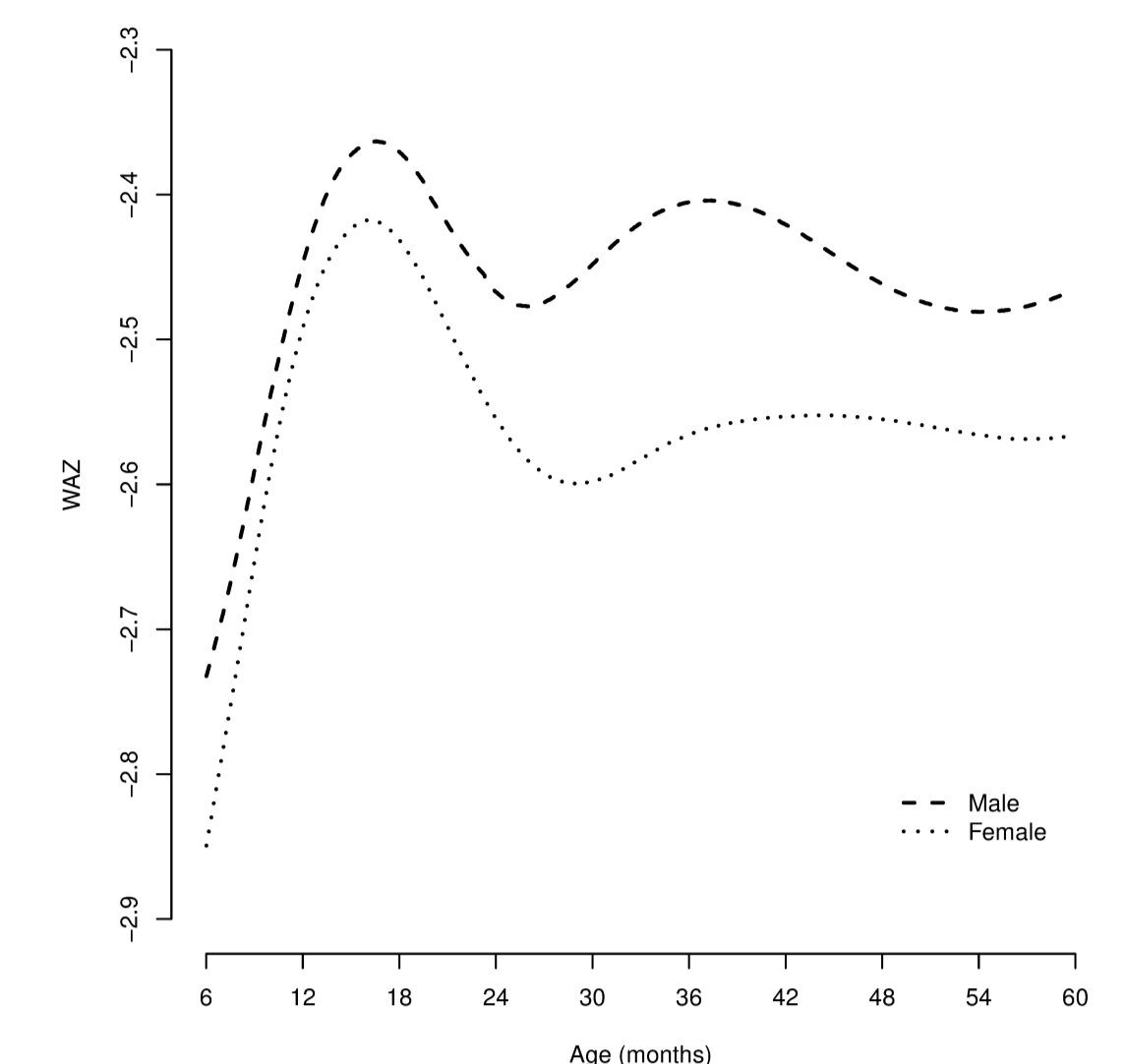
② Multiple Nutrition Deficits – Graphical View (1,796,991 children; 2,426 surveys; 51 countries)



MND is the same as concurrent WHZ < -2 and HAZ < -2 (**WaSt**). So **WaSt** children have the same high mortality risk.

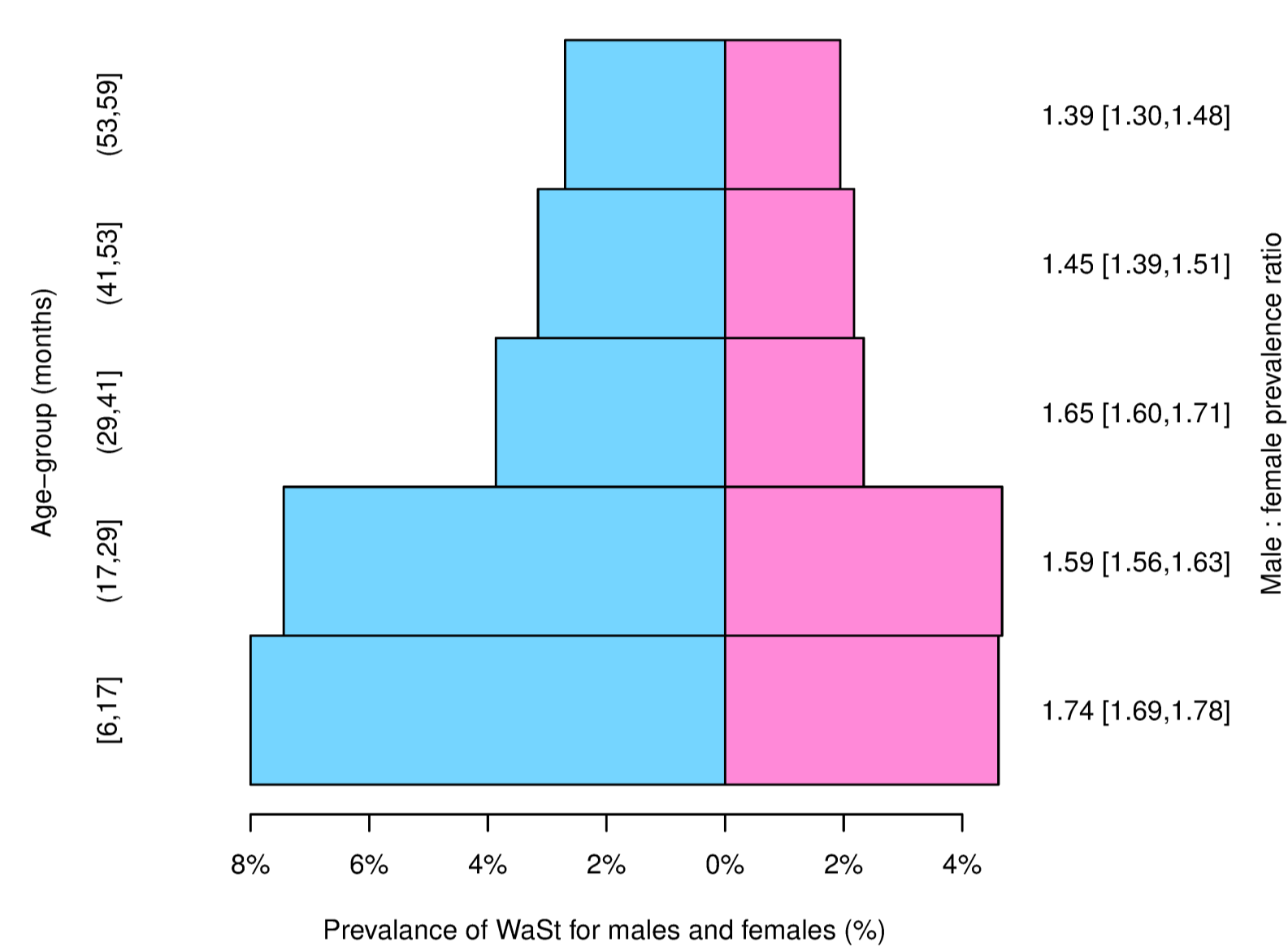
ALL children with **WaSt** have WAZ < -2.

③ According to the WHO Growth Standards



Children with both WHZ = -2 and HAZ = -2 (**WaSt**) have maximum WAZ of -2.36 (boys) or -2.42 (girls).

④ Who are these **WaSt** children? (1,796,991 children; 2,426 surveys; 51 countries)



All children are at risk of being **WaSt**.

Boys are at most risk.

M:F prevalence ratio = 1.63 (95% CI = 1.60; 1.65).

Younger children are more at risk of being **WaSt**.

⑤ Some summary statistics (1,796,991 children; 2,426 surveys; 51 countries)

Being wasted and being stunted are associated with each other. Odds Ratio = 1.40 (95% CI = 1.32; 1.49).

Summary Statistics				
Index	Subset	Median	p*	CLES**
WHZ	Wasted only	-2.47	< 0.0001	0.522 [0.519; 0.525]
	WaSt	-2.52		
HAZ	Stunted only	-2.81	< 0.0001	0.555 [0.554; 0.556]
	WaSt	-2.98		

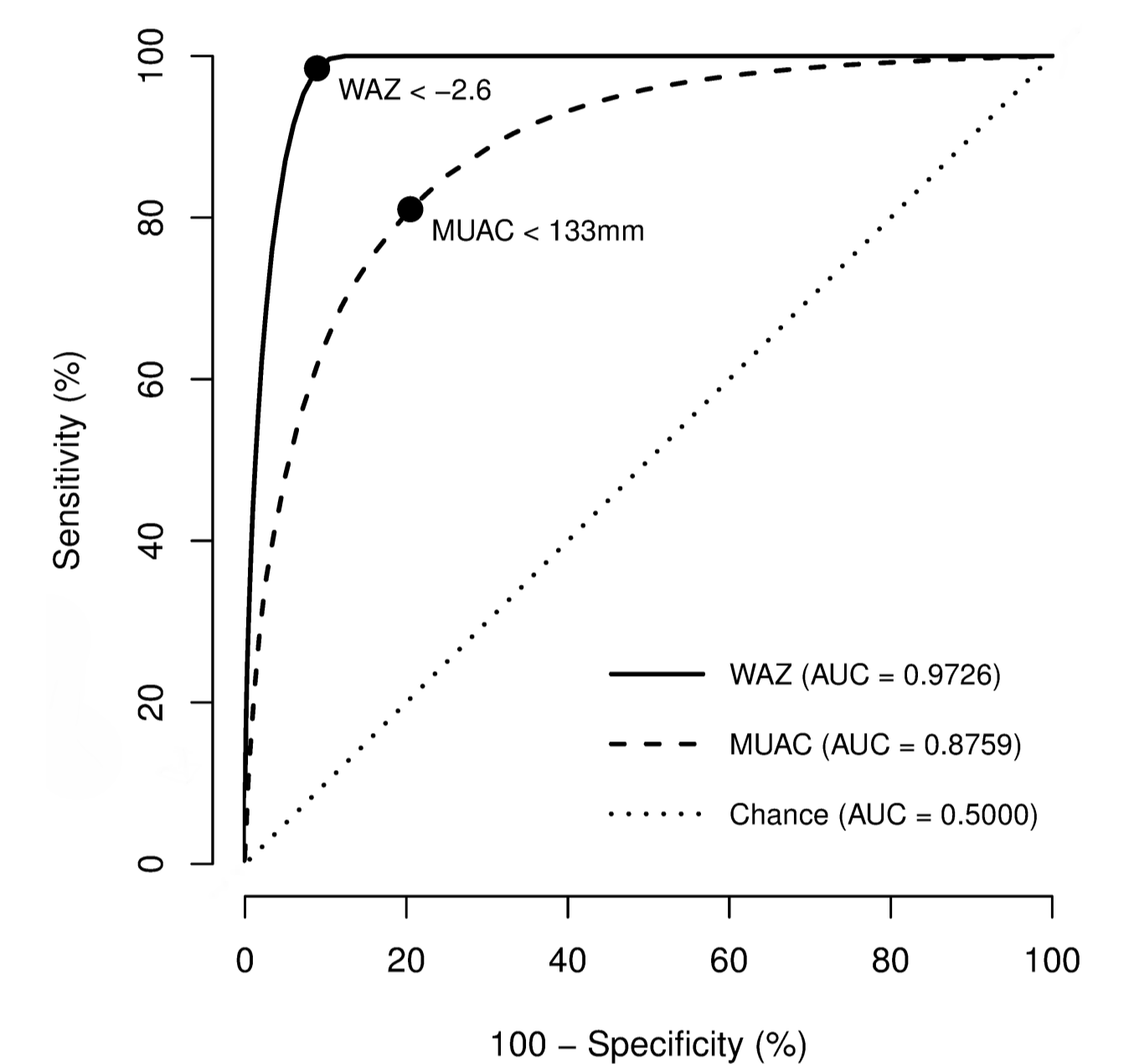
*p-value for Kruskal-Wallis rank-sum test (non-parametric one-way ANOVA)

**Common Language Effect Size (Probability of Superiority) statistic. The statistic estimates the probability that a random value drawn from the first group will be greater than a random value drawn from the second group. The null (i.e. no difference) value is 0.5.

WaSt children are more wasted than wasted only children.

WaSt children are more stunted than stunted only children.

⑥ Detecting **WaSt** with MUAC or WAZ (1,796,991 children; 2,426 surveys; 51 countries)



MUAC and WAZ used because demonstrably practicable in community and clinical settings with good coverage.

⑦ Anthropometry and Mortality (Cohort Data)

(14,307 children; 5,751 six month follow-up episodes; Niakhar, Senegal)

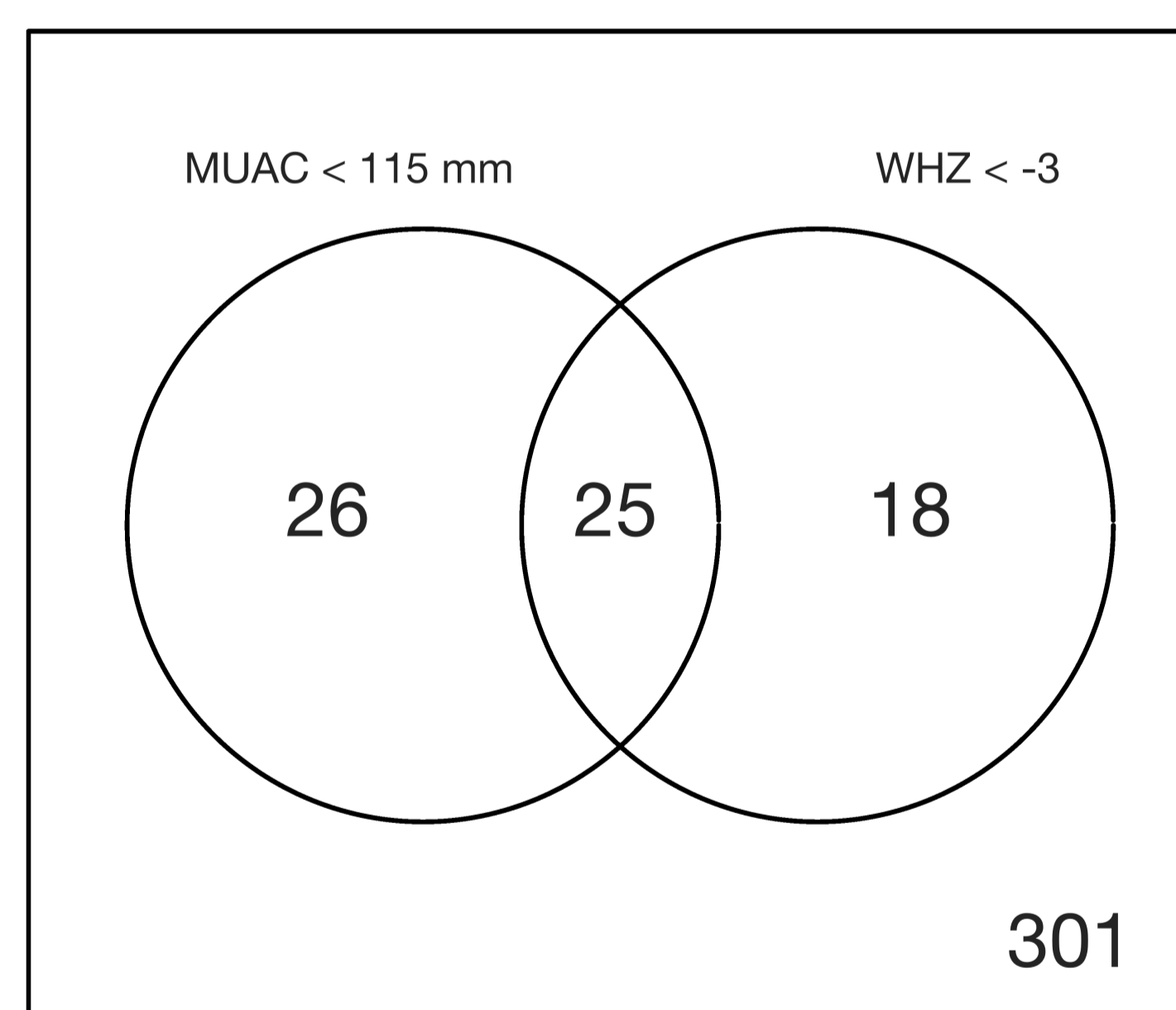
Anthropometric status	All variables		Significant variables	
	Odds Ratio	P	Odds Ratio	P
HAZ < -3	1.32 [0.93; 1.86]	0.1210	—	—
WAZ < -3	2.04 [1.37; 3.04]	0.0004	3.01 [2.33; 3.90]	< 0.0001
WHZ < -3	1.46 [0.95; 2.26]	0.0848	—	—
MUAC < 115 mm	2.13 [1.47; 3.09]	0.0001	2.53 [1.82; 3.53]	< 0.0001
WaSt	1.38 [0.91; 2.10]	0.1281	—	—

Significant variables are those remaining in the model after backwards stepwise elimination of non-significant associations.

In a multivariate analysis (logistic regression), WAZ and MUAC are independently associated with mortality within 6 months of measurement.

⑧ WHZ does detect deaths

Deaths identified using MUAC < 115 and WHZ < -3 in the Niakhar cohort data

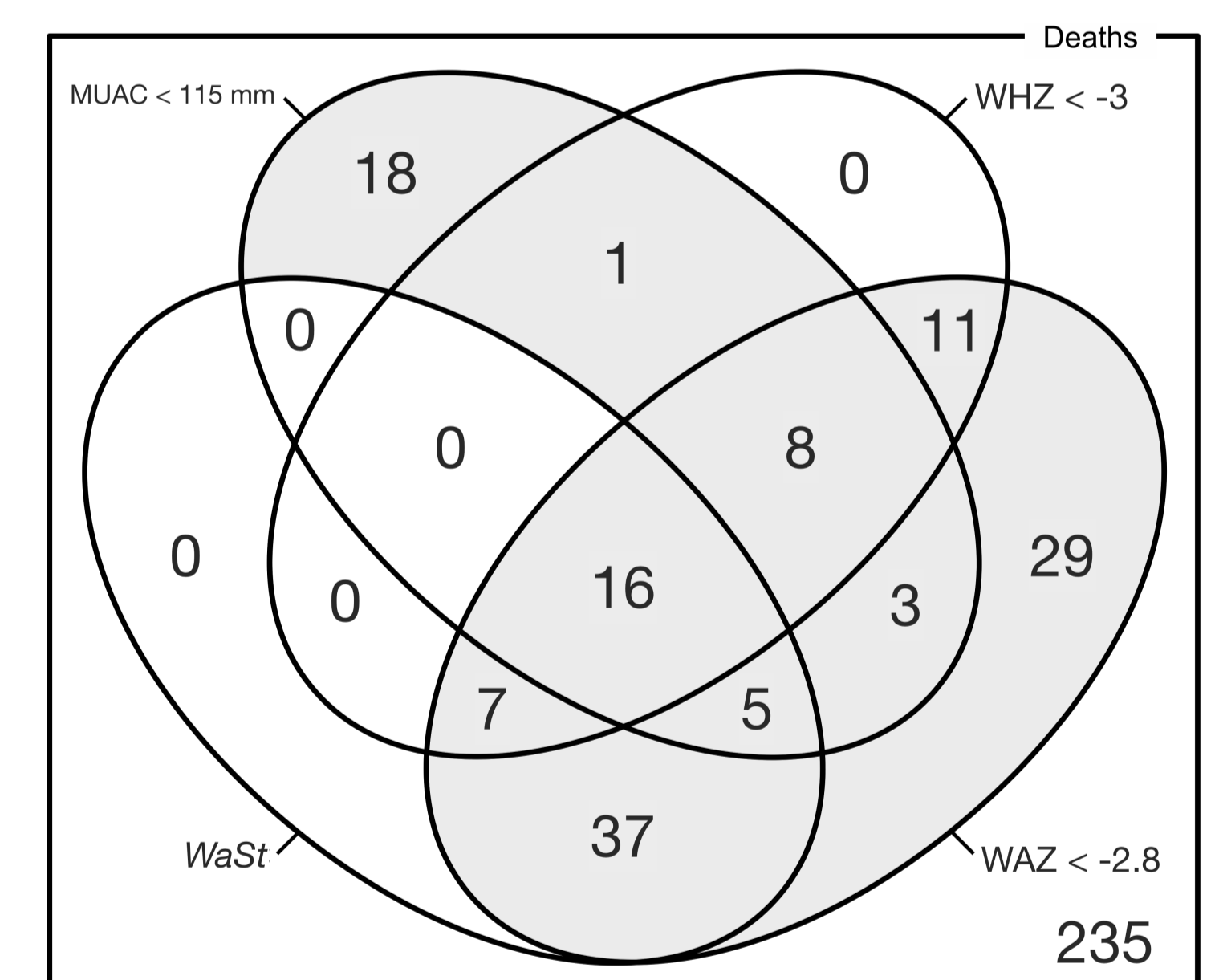


WHZ identifies extra children who will die if untreated.

Since WHZ is not independently associated with mortality it is likely that this is due to WHZ being associated with a factor other than MUAC (WAZ is a good candidate for this).

⑨ WAZ may do a better job

Deaths identified using various criteria in the Niakhar cohort data



MUAC < 115 mm and WAZ < -2.8 can detect all deaths associated with **WaSt** and WHZ < -3.

MUAC < 115 mm and WAZ < -3 can detect nearly all deaths associated with **WaSt** and WHZ < -3.

WAZ also detects extra children who will die if untreated.

Conclusions

- Children who are concurrently wasted and stunted (**WaSt**) are also underweight.
- Children with **WaSt** have a high risk of death.
- Younger children, younger boys in particular, have the highest risk of being **WaSt**.
- Being wasted (WHZ < -2) and being stunted (HAZ < -2) are associated with each other.
- **WaSt** children are more wasted than wasted only children.
- **WaSt** children are more stunted than stunted only children.
- **WaSt** children can be identified using WAZ.
- WAZ and MUAC (but **not** WHZ or HAZ or **WaSt**) are independently associated with mortality.
- A combination of MUAC and WAZ can identify all deaths associated with **WaSt** and WHZ.
- A combination of MUAC and WAZ could be used in programmes such as CMAM in order to identify and admit children at high risk of death. Further work is required to understand the implications for program caseloads.

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