

Predicting Developmental Delays in Children: The Malaria Borth Cohort Study

Data Science Workshop

James Osei-Mensa

Thursday, March 20, 2025



BACKGROUND

- Developmental delays in children refer to when a child does not reach their developmental milestones at the expected times.
- WHO estimates that 8% of all children under 5 years have some type of developmental deficit (Global Research on Developmental Disabilities Collaborators 2018)
- Bello et al found 44.6% of 330 children with delays in various domains (Bello, Quartey, and Appiah 2013)
- Developmental milestones not checked routinely
- Early intervention has high impact



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- **Social and Emotional Development:** Delays in interacting with others, forming relationships, and managing emotions.



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- **Socioeconomic Factors:** Poverty, lack of access to healthcare
- **Parental Factors:** Parental mental health issues, lack of parental education



SURVEY INSTRUMENT

- Developmental Milestones Checklist III
- Domains surveyed
 - ▶ Gross motor
 - ▶ Fine motor
 - ▶ Language
- Children examined at yearly intervals from 12 months to 60 months



MODEL EVALUATION

Table 1: Performance metrics of different models. MSE refers to Mean Squared Error, and RMSE refers to Root Mean Squared Error.

Model	MSE (Train)	MSE (Test)	RMSE (Train)	RMSE (Test)
Ridge Regression	45.6690	51.7989	6.7537	7.1781
Support Vector Regression	25.6013	53.2237	5.0515	7.2675
Random Forest	6.8531	50.3259	2.6161	7.0750
Decision Tree	0	51.3561	0	7.1469
Multi Layer Perceptron	30.8844	50.6152	5.5532	7.0930



IMPORTANT PREDICTORS

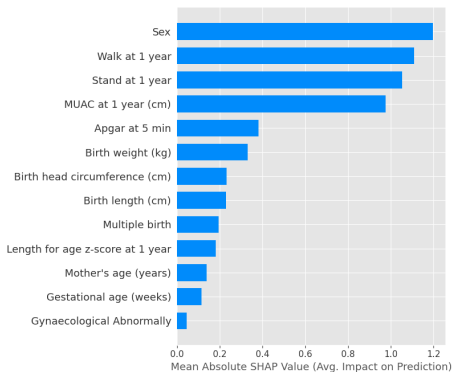


Figure 1: Key Clinical and Growth Factors Affecting Child Development

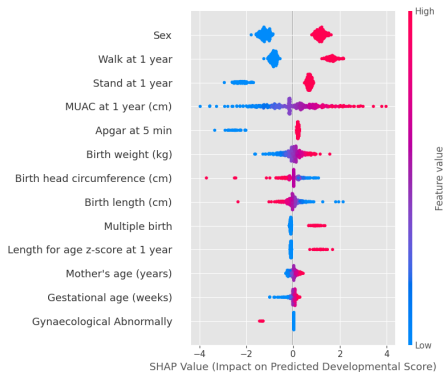


Figure 2: Impact of Clinical and Growth Factors on Developmental Scores



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- Large gaps between survey times



CONCLUSION

- Prediction model based on only 5 easily obtainable variables
- Variables in final model: Sex, Walking at 1 year, Standing at 1 year, Muac score at 1 year, Apgar score at 5 minutes
- The model can predict developmental score at an error margin of 6.9327
- The model, however, needs to be validated in a different cohort



REFERENCES

- Bello, Ajediran I., Jonathan NA Quartey, and Louisa A. Appiah. 2013. "Screening for Developmental Delay Among Children Attending a Rural Community Welfare Clinic in Ghana." *BMC Pediatrics* 13 (1): 119. <https://doi.org/10.1186/1471-2431-13-119>.
- Global Research on Developmental Disabilities Collaborators. 2018. "Developmental Disabilities Among Children Younger Than 5 Years in 195 Countries and Territories, 1990–2016: A Systematic Analysis for the Global Burden of Disease Study 2016 - ClinicalKey." *Lancet Global Health* 6 (10): e1100–1121.

