The national benchmark test as a predictor of academic success in a cohort of medical students

Sfiso Mabizela
Lionel Green-Thompson

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG | CHSE CENTRE FOR HEALTH SCIENCE EDUCATION

Background

- The National Benchmark Test (NBT) is a selection test design to assess academic readiness of students starting university (Marnewick, 2012).
- Three domains
  - Academic Literacy (AL), Mathematics (MAT) and Quantitative Literacy (QA)
- NBT are used to select and recommend the level of support students will require (Van der Westuizen & Barlow-Jones, 2015).
- Five out of eight medical schools use NBT for selection (Van der Merwe, et al. 2016)
- The gap is linking the NBT to ongoing performance throughout the degree.

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG | CHSE CENTRE FOR HEALTH SCIENCE EDUCATION

Aims and objectives

- **Aim**
  - To explore the predictive capacity of the NBT in the first, third and sixth year of study for the MBBCh Programme while controlling for race and gender.
- **Objective**
  - To determine which among five predicting variables is or are the best predictor/s of academic success.

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG | CHSE CENTRE FOR HEALTH SCIENCE EDUCATION

Methods: Sample

- A total of 183 students were admitted in 2011
- All students took NBT
- Sample comprises of *n*=121 students who completed MBBCh in 2016

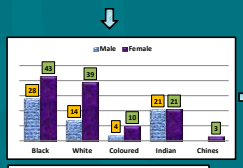


Figure 1: 2011 cohort admissions by race and gender

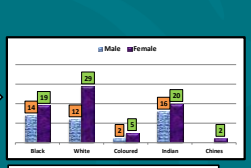


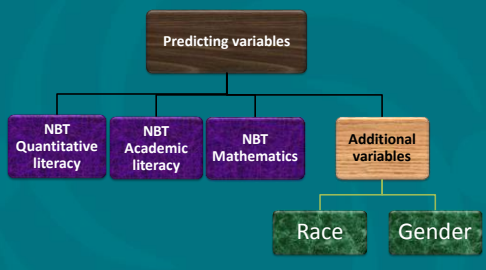
Figure 2: 2011- 2016 cohort graduates by race and gender

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG | CHSE CENTRE FOR HEALTH SCIENCE EDUCATION

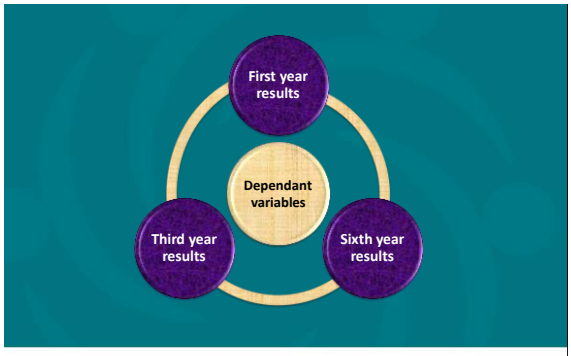
Methods: Research design

- Clusters bar charts were used to show demographics of the cohorts
- A hierarchical multiple regression was used to explore the predictive capacity of the NBT domains in students' academic success while controlling for gender and race as additional predicting variables.

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG | CHSE CENTRE FOR HEALTH SCIENCE EDUCATION



UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG | CHSE CENTRE FOR HEALTH SCIENCE EDUCATION



Methods: Hierarchical Multiple regression assumptions

- The stem and leaf plots appeared symmetrical signalling that all variables in the regression models were normally distributed.
- Visual inspection of normal probability plot of standardised residuals, scatterplots of standardised residuals against standardised predicted values showed that the assumptions of normality, linearity and homoscedasticity were met.
- Two univariate outliers were identified and removed.
- The critical value for Mahalanobis distance x^2 for $df = 5$ ($\alpha = 0.001$) of 20.52 for all cases in the data set was not exceeded.
- ANOVA confirmed the predictive utility of the models

Results: First year

- In model 1, NBT domains accounted for a statistically significant 35% of the variance in the academic success in the first years of study, $R^2 = .352$, F (3, 115) = 20.89, $p = .000$.
- In model 2, race and gender were added to the regression equation, and they collectively accounted for a significant 8% of the variability in the first year academic success, $R^2 = .360$, F (5, 113) = 12.78, $p = .000$.
- The effect size of the regression model was large ($f^2 = .56$)

Model		Unstandardized Coefficients	Standardised coefficients	Sig
		B	Beta	
1	NBT Mathematics	.139	.249	.004
	NBT Academic literacy	.247	.261	.003
	NBT Quantitative literacy	.166	.245	.010
2	NBT Mathematics	.162	.288	.002
	NBT Academic literacy	.229	.242	.010
	NBT Quantitative literacy	.183	.270	.006
	Race	-.446	-.074	.387
	Gender	1.158	.076	.352

Results: Third year

- In model 1, NBT domains accounted for a statistically significant 24% of the variance in the academic success in the third year of study, $R^2 = .243$, F (3, 115) = 12.31, $p = .000$.
- In model 2, race and gender were added to the regression equation, and they collectively accounted for a significant 37% of the variability in the third year academic success, $R^2 = .280$, F (5, 113) = 8.77, $p = .000$.
- The effect size of the regression model was large ($f^2 = .38$)

Model		Unstandardized Coefficients	Standardized Coefficients	Sig.
		B	Beta	
1	NBT Mathematics	.050	.120	.199
	NBT Academic literacy	.248	.343	.000
	NBT Quantitative literacy	.068	.134	.189
2	NBT Mathematics	.061	.146	.143
	NBT Academic literacy	.174	.240	.021
	NBT Quantitative literacy	.096	.191	.067
	Race	.188	.042	.645
	Gender	2.347	.207	.021

Results: Sixth year

- In model 1, NBT domains accounted for a statistically significant 26% of the variance in the academic success in the final year of study, $R^2 = .268$, F (3, 115) = 14.03, $p = .000$.
- In model 2, when race and gender were added to the model, they collectively accounted for a significant 44% of the variability in the sixth year academic success, $R^2 = .312$, F (5, 113) = 10.24, $p = .000$.
- The effect size of the regression model was large ($f^2 = .45$).

Model		Unstandardized Coefficients	Standardized Coefficients	Sig.
		B	Beta	
1	NBT Mathematics	.026	.090	.325
	NBT Academic literacy	.173	.346	.000
	NBT Quantitative literacy	.065	.186	.065
2	NBT Mathematics	.038	.133	.171
	NBT Academic literacy	.119	.238	.011
	NBT Quantitative literacy	.088	.252	.014
	Race	.023	.008	.933
	Gender	1.822	.232	.008

Discussion

- Academic literacy was a constant predictor of success in the first, third and sixth year of study.
  - Why?
- Gender emerged as an important predictor of success:
  - Female students work more harder than male students (Stoet, Geary, 2015; Zhou, 2014).
  - More female admitted to the MBBCh programme (Spielmans & Julka, 2004)
- Social background plays a key role in students admission tests (Simmenroth-Nayda & Gorlich, 2015) and in academic performance (Subotzky & Prinsloo, 2011).
- Patterns of privilege: Of 119 successful students, 42 attended quintile five schools and 51 attended quintile 6 schools.

Limitations and Implications for future studies

- ❖ Only students with unimpeded academic progress were selected.
- ❖ Other possible predicting variables were not considered in the study
  - o Place of origin
  - o First generation students
  - o Financial assistance
- ❖ Reconsider our position regarding the social justice concept
  - o Develop and implement support for students according to the NBT performance levels results in which they were admitted with.
- ❖ Overrepresentation of students who attended quintile five and six schools.

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG | CHSE CENTRE FOR HEALTH SCIENCE EDUCATION

References

DeBerard, M. S., Spielmans, G., & Julka, D. (2004). Predictors of academic achievement and retention among college freshmen: A longitudinal study. *College student journal*, *38*(1), 66-80.

Marnewick, C. (2012). The mystery of student selection: are there any selection criteria?. *Educational Studies*, *38*(2), 123-137.

Simmenroth-Nayda, A., & Görlich, Y. (2015). Medical school admission test: advantages for students whose parents are medical doctors?. *BMC medical education*, *15*(1), 81.

Stoet, G., & Geary, D. C. (2015). Sex differences in academic achievement are not related to political, economic, or social equality. *Intelligence*, *48*, 137-151.

George Subotzky & Paul Prinsloo (2011): Turning the tide: a socio-critical model and framework for improving student success in open distance learning at the University of South Africa, *Distance Education, 32*(2), 177-193.

Van der Merwe, L. J., Van Zyl, G. J., St Clair Gibson, A., Viljoen, M., Iputo, J. E., Mammen, M., ... & Green-Thompson, L. (2016). South African medical schools: Current state of selection criteria and medical students' demographic profile. *SAMJ: South African Medical Journal*, *106*(1), 76-81.

Van der Westhuizen, D., & Barlow-Jones, G. (2015). High school mathematics marks as an admission criterion for entry into programming courses at a South African university. *The Independent Journal of Teaching and Learning*, *10*(1), 37-50.

Zhou, Y. X., Zhao, Z. T., Li, L., Wan, C. S., Peng, C. H., Yang, J., & Ou, C. Q. (2014). Predictors of first-year GPA of medical students: a longitudinal study of 1285 matriculates in China. *BMC medical education*, *14*(1), 87.

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG | CHSE CENTRE FOR HEALTH SCIENCE EDUCATION

Siyabonga

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG | CHSE CENTRE FOR HEALTH SCIENCE EDUCATION