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PROGRAMME & ABSTRACTS

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12.5 Poster Presentations

Model selection uncertainty and parameter estimation of nonlinear growth models

Rasheed Adeyemi

University of Cape Town

Abstract: This study is to discuss the application of nonlinear growth models to measure the growth data and the selection of best model for growth prediction among the competing candidate models. Six non-linear growth functions were fitted to the South African population data. The nonlinear distribution functions were first fitted using iterative method, so that the process is repeatedly optimized using a predefined stopping rule. The method requires specification of the starting values of the parameters to be estimated, making it more difficult than the linear models. The second objective is to explain and illustrate a method,which interface information theory and mathematical statistics for selection of an estimated best approximate model. An approximating AIC weight is proposed instead of raw AIC or BIC for model selection for the non-nested candidate models. For the population growth forecasts, it was found that empirical distributions performed well as traditional times series polynomial models. The measure of errors considered are based on the differences between the predicted and the actual annual growth rate. It was found out that that the the forecast inaccuracies of the models differ greatly. The accuracy of the simple time series models is better than the accuracy of more complex models.

Key words: Initial value, Nonlinear models, Parameter estimation, South Africa population

Estimating the force of infection from prevalence data: Infectious disease modelling

Yusentha Balakrishna[1,*] and Henry Mwambi[2]

[1]Medical Research Council, [2]University of KwaZulu-Natal

Abstract: By knowing the incidence of an infectious disease, we can ascertain the high risk factors of the disease as well as the effectiveness of awareness programmes and treatment strategies. Seven models formulated to estimate the force of infection were discussed and applied to age specific HIV prevalence data based on antenatal clinic attendees from the Vulindlela district in KwaZulu-Natal. The link between the survivor function, the prevalence and the force of infection was demonstrated and generalized linear model methodology was used to estimate the force of infection. Parametric and nonparametric force of infection models were fitted to data from 2009 to 2010. The best fitting model was thereafter applied to data from 2003 to 2010. Despite the general increase in HIV prevalence (from 54.07% in 2003 to 61.33% in 2010). the rate of new HIV infections was found to be decreasing. The results also showed that the age at which the force of infection peaked for each year increased from 16.5 years in 2003 to 18 years in 2010. Farrington's two parameter model for estimating the force of HIV infection was shown to be the most useful. The results obtained emphasised the importance of HIV awareness campaigns being targeted at the 15 to 19 year old age group. The results also suggested that using only prevalence as a measure of disease can be misleading and should rather be used in conjunction with incidence estimates to determine the success of intervention and control strategies.

Key words: Force of infection, HIV, Incidence, Prevalence data

13 List of Delegates

A		
Dr Franck Adekambi	University of Johannesburg	fadekambi@uj.ac.za
Mr Rasheed Adeyemi	University of Cape Town	adeyemira@yahoo.ca
Prof Marc Aerts	Hasselt University	marc.aerts@uhasselt.be
Mr Edmund Ahame	Nelson Mandela Metropolitan University	s207058655@nmmu.ac.za
Prof James Allison	Nort-West University	james.allison@nwu.ac.za
Dr Zerrin Aşan Greenacre	Anadolu University	zasan@anadolu.edu.tr
Dr Dawit Ayele	University of KwaZulu-Natal	ejigmul@yahoo.com
B		
Ms Zsuzsa Bakk	Tilburg Universty	z.bakk@uvt.nl
Ms Yusentha Balakrishna	Medical Research Council	4yusen@gmail.com
Ms Princess Ncedisa Bango	Department of Rural Development and Agrarian Reform	ncedisabango1@yahoo.com
Ms Jesca Batidzirai	University of KwaZulu-Natal	Batidzirai@ukzn.ac.za
Mr Jeremy Baxter	Rhodes University	j.baxter@ru.ac.za
Ms Michaela Beckley	Council for Scientific and Industrial Research/ University of Pretoria	michaelabeckley@gmail.com
Prof Andriëtte Bekker	University of Pretoria	andriette.bekker@up.ac.za
Mrs Dorette Bekker	Metropolitan Health Corporate	dbekker@mhg.co.za
Dr Tom Berning	Stellenbosch University	tberning@sun.ac.za
Mr Alexander Boateng	University of Limpopo	siralexboateng@gmail.com
Ms Michelle Botes	Lightstone/ University of Pretoria	michelleb@lightstone.co.za
Mr Warren Brettenny	Nelson Mandela Metropolitan University	warren.brettenny@nmmu.ac.za
Mr Stefan Britz	University of Cape Town	stefan.britz@uct.ac.za
Mrs Erin Bromley-Gans	Uti	Egans@go2uti.com
Mr Divan Aristo Burger	Quintiles	divan.burger@quintiles.com
Mr Jayde Butler	Juta	jbutler@juta.co.za
C		
Mr Frikkie Calitz	Agricultural Research Council	CalitzF@arc.agric.za
Mr Cornu Campher	ABSA/ University of the Witwatersrand	Cornu.Campher@absa.co.za
Mr Niladri Chakraborty	University of Pretoria	nldr_chkrbrty@yahoo.co.in
Mr Retius Chifurira	University of KwaZulu-Natal	chifurira@gmail.com
Dr Delson Chikobvu	University of the Free State	chikobvu@ufs.ac.za
Ms Tarisai Chimbwa	University of Pretoria	tariecee@gmail.com
Mr Knowledge Chinhamu	University of KwaZulu-Natal	chinhamu@ukzn.ac.za
Mr Amos Chinomona	Rhodes University	a.chinomona@ru.ac.za
Ms Mutsa Chinyamakobvu	Rhodes University	m.chinyamakobvu@ru.ac.za
Mr Raymond Chiruka	University of Fort Hare	rchiruka@ufh.ac.za
Mr Ignatious Chitekedza	Nelson Mandela Metropolitan University	Ignatious.Chitekedza@nmmu.ac.za
Mr Allan Clark	University of Cape Town	allan.clark@uct.ac.za
Ms Chantelle Clohessy	Nelson Mandela Metropolitan University	chantelle.clohessy2@nmmu.ac.za
Mrs Marike Cockeran	Nort-West University	marike.krugell@nwu.ac.za
Prof Willie Conradie	Stellenbosch University	wjc@sun.ac.za
Ms Ivona Contardo-Berning	Stellenbosch University	ivona@sun.ac.za
Dr Gretel Crafford	University of Pretoria	gretel.crafford@up.ac.za
Ms Tanita Cronje	University of Pretoria	tanita.cronje@up.ac.za
Prof Nico Crowther	University of Pretoria	nico.crowther@up.ac.za
D		
Mr Timotheus Darikwa	University of Limpopo	Timotheus.Darikwa@ul.ac.za
Dr Sonali Das	Council for Scientific and Industrial Research	sdas@csir.co.za
Prof Riaan de Jongh	North-West University	riaan.dejongh@nwu.ac.za
Dr Jacques de Klerk	North-West University	deklerkjacques@yahoo.co.uk
Mr Murray de Villiers	SAS	Murray.deVilliers@sas.com