The role of social learning and wealth in the dynamics of renal failure in Kenya

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We present a model to investigate the effects of of social learning and wealth in the dynamics of Renal Failure in Kenya. The model captures the progression of Renal failure from mild sickness, to chronic disease to total renal failure that requires a transplant for the patient. The progression from mild to chronic disease is a function of social learning while the availability of a transplant organ is a function of wealth. Mathematical results reveal the existence of the disease free and endemic equilibrium whose existence and stability depends on the control reproduction number, $\mathcal{R}_c$. The disease persist when the $\mathcal{R}_c > 1$ and dies out when $\mathcal{R}_c < 1$. Control strategies like social learning are shown to be effective tools that reduce the rate of progression to chronic kidney disease and total renal failure, while government subsidies and health insurance cover averts death due to the disease as a transplant will be available when there are resources to pay for the same. We show that a combination of social learning and financial ability to pay for a transplant drastically reduces the number of sick individuals progressing to renal failure and also prevent death due to the disease.

[1] Rafael B. Fricks, Andrea Bobbio, Kishor S. Trivedi. *Reliability models of chronic kidney disease*, Reliability and Maintainability Symposium (RAMS), 2016 Annual.

[2] National Kidney Foundation, *K/DOQI Clinical Practice Guidelines for Chronic Kidney Disease: Evaluation, Classification and Stratification.*, Am J Kidney Dis **39** S1-S266, 2002(Supp 1).

3] M.K. Haroun, et al., *Risk Factors for Chronic Kidney Disease: A Prospective Study of 23,534 Men and Women in Washington County, Maryland,* J. Am. Soc. Nephrol. **14 5Nov)**, 2003 2934-2941.

[4] Johnson, R.J., Feehally, J., Floege, J, Comprehensive Clinical Nephrology, Elsevier/Saunders, Philadelphia, 2015

[5] United States Renal Data System,2014 annual data report: An overview of the epidemiology of kidney disease in the United States. National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases. MD Bethesda, 2014