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HIV and adolescents

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The recent HSRC household survey reports that the HIV prevalence among adolescents and young people is declining (1). Although the decline is important, the focus needs to be on the fact that the reported HIV prevalence levels are still very high, together with alarmingly high levels of HIV incidence. Prevention methods have demonstrated effectiveness in reducing the risk of HIV acquisition among many of the most-at-risk populations, such as men who have sex with men, female sex workers and discordant HIV couples. More research is needed, however, into how HIV is spread among the adolescent population and how to decrease this spread (2).

Choices for Adolescent Methods of Prevention Studies in SA (CHAMPS) is an on-going study investigating the impact of a combination of HIV prevention methods on HIV incidence among adolescents in South Africa. Four pilot studies are being conducted to evaluate the implementation of various prevention methods, including medical male circumcision (MMC), pre-exposure prophylaxis (PrEP), antiretroviral-based vaginal microbicides (VM) and HIV voluntary counselling and testing (HVCT). Many of these methods have been shown to be effective in reducing the risk of HIV acquisition among different populations (3-6). The first pilot study has been completed. The focus was on the acceptability of MMC among adolescents, in the context of the practice of traditional male circumcision in South Africa. The second pilot study is currently underway, focussing on the feasibility and acceptability of PrEP, together with HVCT. The third pilot study is addressing the questions of which formulation of the VMs would be the most preferred choice of delivery among female adolescents, as well as the feasibility and acceptability of the VMs. The choices would include the ring formulation, a gel formulation, a daily-dose tablet formulation and an injectable formulation. The final pilot study aims to gauge the acceptability of a menu-approach, where adolescents are offered a range of prevention methods to choose from.

Qualitative focus group studies will be conducted during each of the pilot studies to address issues regarding the various products, assessing attitudes towards the products, and also to have discussions around the adherence to the prevention methods, and how this affects the efficacy of the products. A key component of the CHAMPS project is modelling and cost-effectiveness analysis. The

overall goal of the modelling exercises is to give continuous feedback into the designs of the pilot studies; to evaluate what the impact of an HIV prevention package on HIV incidence in adolescents participating in a hypothetical trial over a short period would be; and also to determine how this package would impact HIV incidence in the general population over a longer period of time. The latter analysis would take into account the extent to which adherence to the various prevention methods is sustained as adolescents enter into adulthood. The research that is being developed for my PhD thesis forms part of the modelling aspect of this study.

Mathematical and epidemiological models are vital in estimating the impact of different prevention methods under varying conditions and different scenarios (7). The main aim of the thesis is to investigate the impact of new HIV prevention methods (medical male circumcision, antiretroviral-based vaginal microbicides and pre-exposure prophylaxis), as well as HVCT, on HIV incidence in South African adolescents. We aim to do this by developing a stochastic individual-based model that will estimate the likely HIV incidence rates among adolescents.

At SACEMA's annual Research Days meeting, I presented one of my main objectives: to assess how the impact on HIV incidence might differ depending on how adolescents make decisions in the face of multiple prevention options. To address this issue, we intend developing an HIV risk scoring algorithm which will assist in advising adolescents on what impact different prevention methods (both biomedical and behavioural) could have on their risk of HIV infection. The algorithm would consist of three sections. The first would allow an individual to assess their current risk of being HIV infected based on some basic behaviour and demographic questions. This would be followed by a more detailed set of questions that would evaluate their risk of becoming HIV infected over one year. This calculation would be based on sexual behaviour over the last 12 months. Finally, using a similar model to the previous section, the individuals would now be allowed to re-evaluate their risk by opting for any of the biomedical and behavioural prevention methods. This risk scoring algorithm would then allow individuals to quantify the extent to which they can change their individual risk. The algorithm is currently being used to inform the design of an online application. The data

used in the analysis for the algorithm would help to estimate the parameters in the main stochastic model. We would also like to gauge the usefulness of the online application.

Other important objectives of the thesis include estimating the proportions of new HIV infections that are likely to be associated with secondary drug-resistance, by modelling the incidence of secondary drug resistance, which impacts the therapeutic aspect of HIV infection. Also, we aim to show how the short-term protective effect of the prevention methods may compare with the longer-term protective effect when reduced herpes simplex virus (HSV-2) acquisition is taken into account, by modelling the protective effect of the prevention methods against HSV-2.

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