



**Erasmus University Rotterdam, the Netherlands**  
**CSC PhD 2015 Project Description**

<b>Department:</b>	<b>Department of Public Health, Erasmus MC, University Medical Center Rotterdam, The Netherlands</b>
<b>Project Title:</b>	<b>Mathematical modeling of HIV spread and control in populations of men who have sex with men in migrant cities of China</b>
<b>Abstract:</b>	<p>HIV in China is to a large extent concentrated in traditional high-risk groups. In particular men who have sex with men (MSM) have shown a steadily increasing HIV prevalence, and sex between men is now the main route of HIV transmission in China (Zhang <i>et al.</i> 2013). Especially the big migrant cities, such as Shanghai and Shenzhen, have relatively large populations of MSM.</p> <p>Shenzhen CDC has several years of experience with studying HIV spread and control among MSM, including male sex workers, so-called 'money boys' (MB). This resulted in an important series of international publications (e.g. Cai <i>et al.</i> 2010; Tan <i>et al.</i> 2013; Zhao <i>et al.</i> 2012, 2014a, 2014b). These studies are based on two different sampling methods, respondent-driven sampling and time-location sampling, which have recently been compared on their effectiveness (Zhao <i>et al.</i> 2014b). Also, much is known about the critical role of the venues where MSM meet in Shenzhen, such as bars, saunas, parks and dorm-based venues (Zhao <i>et al.</i> 2014a).</p> <p>Mathematical models have proven to be very useful in the evaluation of health programs (Garnett <i>et al.</i> 2011). There are several models for HIV amongst MSM, which have recently been reviewed (Punyacharoensin <i>et al.</i> 2011). However, these models mainly focus on the situation in the US or Europe, and they all do not account for strong migration and venue-based behaviors.</p> <p>We search for a mathematically skilled PhD-student who will develop and apply a deterministic model (i.e. using differential equations) of HIV spread and control in MSM populations in China. The model should represent an open urban population with high levels of migration, and it should account for an important role of MB and venues. The data from Shenzhen CDC will be available to serve as input to the model.</p> <p>The results of the PhD study will be of direct relevance to HIV control in Shenzhen and possibly other migrant cities in China. The modeling may also help to identify gaps in our knowledge and thereby topics for new data collection. Furthermore, the deterministic MSM model will be included in an existing larger modeling framework, using individual-based simulation,</p>



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	<p>developed at Erasmus MC (Hontelez <i>et al.</i> 2013). This may help to study the consequences of HIV control among MSM for the general population.</p> <p><i>References:</i></p> <p>Cai WD, Zhao J, Zhao JK, <i>et al.</i> (2010). HIV prevalence and related risk factors among male sex workers in Shenzhen, China: results from a time-location sampling survey. <i>Sex Transm Infect.</i> <b>86</b>: 15-20.</p> <p>Cai R, Zhao J, Cai W, Chen L, Richardus JH, de Vlas SJ (2014). HIV risk and preventing behaviors in men who have sex with men and women: a respondent-driven sampling study in Shenzhen, China. <i>AIDS Behav.</i> <b>18</b>: 1560-8.</p> <p>Garnett GP, Cousens S, Hallett TB, Steketee R, Walker N (2011). Mathematical models in the evaluation of health programmes. <i>Lancet.</i> <b>378</b>: 515-25.</p> <p>Hontelez JA, Lurie MN, Bärnighausen T, <i>et al.</i> Elimination of HIV in South Africa through expanded access to antiretroviral therapy: a model comparison study. <i>PLoS Med.</i> 2013; 10: e1001534</p> <p>Punyacharoensin N, Edmunds WJ, De Angelis D, White RG (2011). Mathematical models for the study of HIV spread and control amongst men who have sex with men. <i>Eur J Epidemiol.</i> <b>26</b>: 695-709.</p> <p>Tan J, Cai R, Lu Z, Cheng J, de Vlas SJ, Richardus JH (2013). Joint marketing as a framework for targeting men who have sex with men in China: a pilot intervention study. <i>AIDS Educ Prev.</i> <b>25</b>: 102-11.</p> <p>Zhang L, Chow EP, Jing J, <i>et al.</i> (2013). HIV prevalence in China: integration of surveillance data and a systematic review. <i>Lancet Infect Dis.</i> <b>13</b>: 955-63.</p> <p>Zhao J, Cai WD, Gan YX, <i>et al.</i> (2012). A comparison of HIV infection and related risk factors between money boys and noncommercial men who have sex with men in Shenzhen, China. <i>Sex Transm Dis.</i> <b>39</b>: 942-8.</p> <p>Zhao J, Chen L, Cai WD, <i>et al.</i> (2014a). HIV infection and sexual behaviors among non-commercial men who have sex with men at different venues. <i>Arch Sex Behav.</i> <b>43</b>: 801-9.</p> <p>Zhao J, Cai R, Chen L, <i>et al.</i> (2014b). A comparison between respondent-driven sampling and time-location sampling among men who have sex with men in Shenzhen, China. <i>Arch Sex Behav.</i> [Epub ahead of print].</p>
<b>Requirements of candidate:</b>	<p><u>Mathematical biology</u> or any other background with a strong <u>mathematical component</u>, such as epidemiology, biomedical sciences, biostatistics or econometrics. Experience with <u>deterministic modeling</u> and <u>advanced data analysis</u> is essential.</p> <p>Master degree: Yes          IELTS Grade: 7.0 (<i>minimal 6.0 per component</i>)          or          TOEFL: 100 (<i>minimal 20 per component</i>)</p>



<p><b>Supervisor information:</b></p>	<p><b>Dr. Sake J. de Vlas</b> (Associate Professor of Modeling Infectious Diseases) Email address: <a href="mailto:s.devlas@erasmusmc.nl">s.devlas@erasmusmc.nl</a> Website: <a href="http://www.erasmusmc.nl/mgz/?lang=en">http://www.erasmusmc.nl/mgz/?lang=en</a></p> <p><i>Selected publications in the past 5 years about HIV and/or modeling:</i></p> <ul style="list-style-type: none"> <li>• Zhao J, Cai R, Chen L, Cai W, Yang Z, Richardus JH, de Vlas SJ. A comparison between respondent-driven sampling and time-location sampling among men who have sex with men in Shenzhen, China. <i>Arch Sex Behav</i>. <b>2014</b>; [Epub ahead of print].</li> <li>• Eaton JW, Menzies NA, Stover J, ..., de Vlas SJ, ..., Hallett TB. Health benefits, costs, and cost-effectiveness of earlier eligibility for adult antiretroviral therapy and expanded treatment coverage: a combined analysis of 12 mathematical models. <i>Lancet Glob Health</i>. <b>2014</b>; 2: e23-34.</li> <li>• Nagelkerke NJD, Arora P, Jha P, Williams B, McKinnon L, de Vlas SJ. The rise and fall of HIV in high prevalence countries: a challenge for mathematical modeling. <i>PLoS Comput Biol</i>. <b>2014</b>; 10: e1003459.</li> <li>• Cai R, Zhao J, Cai W, Chen L, Richardus JH, de Vlas SJ. HIV risk and preventing behaviors in men who have sex with men and women: a respondent-driven sampling study in Shenzhen, China. <i>AIDS Behav</i>. <b>2014</b>; 18: 1560-8.</li> <li>• Hontelez JAC, de Vlas SJ. Cost-effectiveness of HIV treatment as prevention in serodiscordant couples. <i>N Engl J Med</i>. <b>2014</b>; 370: 581-2.</li> <li>• Steen R, Hontelez JAC, Veraart A, White RG, de Vlas SJ. Looking upstream to prevent HIV transmission: can interventions with sex workers alter the course of HIV epidemics in Africa as they did in Asia? <i>AIDS</i>. <b>2014</b>; 28: 891-9.</li> <li>• Cai R, Richardus JH, Looman CL, de Vlas SJ. Trends in high-risk sexual behaviors among general population groups in China: A systematic review. <i>PLoS ONE</i>. <b>2013</b>; 8: e79320.</li> <li>• Cai R, Tan JG, Chen L, Richardus JH, de Vlas SJ. Prevalence and risk factors of syphilis infection among female sex workers in Shenzhen, China: an observational study (2009-2012). <i>Trop Med Int Health</i>. <b>2013</b>; 18: 1531-8.</li> <li>• Hontelez JA, Lurie MN, Bärnighausen T, Bakker R, Baltussen R, Tanser F, Hallett TB, Newell ML, de Vlas SJ. Elimination of HIV in South Africa through expanded access to antiretroviral therapy: a model comparison study. <i>PLoS Med</i>. <b>2013</b>; 10: e1001534.</li> <li>• Tan J, Cai R, Lu Z, Cheng J, de Vlas SJ, Richardus JH. Joint marketing as a framework for targeting men who have sex with men in China: a pilot intervention study. <i>AIDS Educ Prev</i>. <b>2013</b>; 25: 102-11.</li> <li>• Coffeng LE, Stolk WA, Zouré HGM, Veerman JL, Agblewonu KB, Murdoch ME, Noma M, Fobi G, Richardus JH, Bundy DAP, Habbema D, de Vlas SJ, Amazigo UV. African Programme For Onchocerciasis Control 1995-2015: model-estimated health impact and cost. <i>PLoS Negl Trop Dis</i>. <b>2013</b>; 7: e2032.</li> </ul>
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