Annex 1B. Sources of Cost-Effectiveness Analysis for Selected Infectious Disease Interventions

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Intervention	Source
Voluntary male circumcision	Fieno (2008); Kahn and others (2006); Kripke and others (2016); Njeumeli and others (2011)
Treat severe malaria with artesunate Africa & SE Asia	Lubell (2011); Lubell and others (2009)
Preventive chemotherapy for onchocerciasis	Keating and others (2014); Turner and others (2014)
Add syphilis screen to HIV screen/treat, LIC	Schackman and others (2007)
Preventive chemotherapy, lymphatic filariasis	Stone and others (2016)
Screen/treat for syphilis LIC	Terris-Prestholt and others (2003); Kuznik and others (2013); Kahn and others (2014)
Treat smear positive TB with' first line drugs LIC	Borgdorff and others (2002)
Detect & treat visceral leishmaniasis	Federici and others (2016)
Treat malaria with ACT (artemisinin combination therapy), Africa	Coleman and others (2004)
Preventive chemotherapy, schistosomiasis & STH	Lo and others (2015); Turner and others (2014)
PMTCT Option B HIV vs no treatment, Africa	Orlando and others (2010);
Intermittent preventive treatment malaria in infants, Africa	Conteh and others (2010); Ross and others (2011)
Hepatitis B vaccination	Griffiths and others (2005); Kim and others (2007); Prakash (2003)
Preventive chemotherapy for trachoma	Baltussen and others (2012); Baltussen and others (2005)
Intermittent preventive treatment malaria in pregnancy, Africa	Mbonye and others (2008)
Detect and treat leprosy	Renme and others (2006)
Indoor residual spraying for malaria, Africa	Yukich and others (2007)
Comprehensive management malaria (spray, nets, treat, Africa	Utzinger and others (2001)
Treat smear negative TB with first line drugs LIC	Borgdorff and others (2002)
Add Gene Xpert to smear to diagnose TB, LMIC	Vassall and others 2011
Supply insecticide-treated nets for malaria, Africa	Becker-Dreps and others (2009); Wiseman and others (2003); Hanson and others (2003)
Detect & treat human African trypanosomiasis	Sutherland and others 2015
Home presumptive treatment malaria, Africa	Nonvignon and others (2012)
Add syphilis screen to HIV screen/treat, UMIC	Owusi-Edusei and others (2014)
Scale up ART to all infected, South Africa	Alistar and others (2014); Granich and others (2012)
Treat TB w' second line drugs MIC	Fitzpatrick and others (2012)

Screen/treat for syphilis UMIC	Hong and others (2010); Owusi-Edusei and others (2014)
Eradicate yaws (detect & treat)	Fitzpatrick and others (2015); WHO (2015)
PMTCT Option A HIV vs no treatment, SE Asia	Hogan and others (2005)
BCC plus regulation, sex establishments LAC	Sweat and others (2006)
Vector control for dengue	Luz and others (2011); Suaya and others (2007)
Use Xpert to diagnose TB, MIC	Menzies and others (2012)
BCC alone, sex establishments, LAC	Sweat and others (2005)
Online sex education to prevent sexually transmitted infections, LAC	Chong and others (2013)
Vector control for dengue	Luz and others (2011); Suaya and others (2007)
Female condom S Af	Marseille and others (2008)
Use Xpert to diagnose TB, MIC	Menzies and others (2012)
PrEP during pregnancy + breastfeeding S Af	Price and others (2016)
Scale up ART to all infected lower-mid income Af	Marseille and others (2012)
PMTCT Option A (w' mass screen) vs no treatment, LAC	Aldridge and others (2009)
PrEP – Anti-retroviral therapy for non-infected partner, serodiscordant couples	Hallett and others (2011); Jewell and others (2015)
Hepatitis C treatment, UMICs	Chen and others (2016)

Note:
BCC – behavior change communication
LAC – Latin America and the Caribbean
LIC - low income country
LMIC - low and middle income country
Option A – provide single-drug regimen to HIV-positive women during pregnancy and breastfeeding, to reduce the risk of transmission to their babies
Option B – as for Option A, but using a two-drug regimen
Option B+ - As for Option B, but continued for life
PMTCT – elimination of mother to child transmission (of HIV)
PrEP – pre-exposure prophylaxis: antiretrovirals taken by non-infected individuals, to prevent infection with HIV
TB – Tuberculosis
UMIC – upper middle income country

References

Aldridge R. W., D. Iglesias, C. F. Caceres and J. J. Miranda. 2009. "Determining a Cost Effective Intervention Response to HIV/AIDS in Peru." *BMC Public Health* 9: 352. doi: 10.1186/1471-2458-9-352.

Alistar, S. S., P. M. Grant and E. Bendavid. 2014. "Comparative Effectiveness and Cost-Effectiveness of Antiretroviral Therapy and Pre-Exposure Prophylaxis for HIV Prevention in South Africa." *BMC Medicine* 12 (46): 11.

Baltussen, R. and A. Smith. 2012. "Cost effectiveness of strategies to combat vision and hearing loss in sub-Saharan Africa and South East Asia: mathematical modelling study." *The British Medical Journal* 344:e615–e615.

Baltussen, R. M. P. M., M. Sylla, K. D. Frick and S. P. Mariotti. 2005. "Cost-effectiveness of trachoma control in seven world regions." *Ophthalmic Epidemiology* 12(2):91–101.

Becker-Dreps, S. I., A. K. Biddle, A. Pettifor, G. Musuamba, D. N. Imbie, S. Meshnick and F. Behets. 2009 "Cost-effectiveness of adding bed net distribution for malaria prevention to antenatal services in Kinshasa, Democratic Republic of the Congo." *American Journal of Tropical Medicine and Hygiene* 81(3):496-502.

Borgdorff, M. W., K. Floyd and J. F. Broekmans. 2002. "Interventions to reduce tuberculosis mortality and transmission in low- and middle-income countries." *Bulletin of the WHO* 80(2): 217-227.

Chen G.-F., L. Wei, J. Chen, Z-P. Duan, X.-G. Dou, Q. Xie, and others. 2016. "Will Sofosbuvir/Ledipasvir (Harvoni) Be Cost-Effective and Affordable for Chinese Patients Infected with Hepatitis C Virus? An Economic Analysis Using Real-World Data." *PLoS ONE* 11(6): e0155934. doi:10.1371/journal.pone.0155934

Chong, A., M. Gonzalez-Navarro, D. Karlan and M. Valdivia. 2013. "Effectiveness and Spillovers of Online Sex Education: Evidence from a Randomized Evaluation in Colombian Public Schools." *Working Paper 18776, National Bureau of Economic Research, Cambridge, MA.* http://www.nber.org/papers/w18776.

Coleman, P. G., C. Morel, S. Shillcutt, C. Goodman and A. J. Mills. 2004. "A threshold analysis of the cost-effectiveness of artemisinin-based combination therapies in sub-saharan Africa." *American Journal of Tropical Medicine and Hygiene* 71:196-204.

Conteh, L., E. Patouillard, M. Kweku, R. Legood, B. Greenwood and D. Chandramohan. 2010. "Cost effectiveness of seasonal intermittent preventive treatment using amodiaquine & artesunate or sulphadoxine-pyrimethamine in Ghanaian children." *PloS One* 5:e12223.

Federici, C. C. Fitzpatrick, A. Be-Nazir, F. Meheus and D. Dagne. The cost-effectiveness of a comprehensive programme to eliminate visceral leishmaniasis in Bangladesh. Draft, 2016.

Fieno, J.V. 2008. "Costing adult male circumcision in high HIV prevalence, low circumcision rate countries." *AIDS Care* 20(5): 515-520.

Fitzpatrick C., K. Asiedu and J. Jannin J. 2014. "Where the Road Ends, Yaws Begins? The Cost-effectiveness of Eradication versus More Roads". *PLoS Neglected Tropical Diseases* 8(9):e3165

Fitzpatrick, M. C. and K. Floyd. 2012. "A systematic review of the cost and cost effectiveness of treatment for multidrug-resistant tuberculosis." *Pharmacoeconomics* 30(1): 63-80.

Gomez G.B., A. Borquez, K.K. Case, A. Wheelock, A. Vassall and C. Hankins. 2013. "The cost and impact of scaling up pre-exposure prophylaxis for HIV prevention: a systematic review of cost-effectiveness modelling studies." *PLoS Medicine.* 10(3):e1001401.

Granich, R., J. G. Kahn, R. Bennett, C. B. Holmes and others. 2012. "Expanding ART for Treatment and Prevention of HIV in South Africa: Estimated Cost and Cost-Effectiveness 2011–2050." *PLoS One* 7 (2): e30216.

Griffiths, U.K., G. Hutton, E. Das Doares Pascoal. 2005. "The cost-effectiveness of introducing hepatitis B vaccine into infant immunization services in Mozambique." *Health Policy and Planning* 20: 50-9.

Hallett TB, Baeten JM, Heffron R, Barnabas R, de Bruyn G, and others. (2011) Optimal uses of antiretrovirals for prevention in HIV-1 serodiscordant heterosexual couples in South Africa: a modelling study. PLoS Med 8:e1001123. doi:10.1371/journal.pmed.1001123

Hanson, K., K . N. Kikumbih, J. Armstrong Schellenberg, H. Mponda, R. Nathan, S. Lake and others. 2003. "Cost-effectiveness of social marketing of insecticide-treated nets for malaria control in the United Republic of Tanzania." *Bulletin of the World Health Organization* 81(4): 267-276.

Hogan, D. R., R. Baltussen, C. Hayashi, J. A. Lauer and J. A. Salomon. 2005. "Cost Effectiveness Analysis of Strategies to Combat HIV/AIDS in Developing Countries." *British Medical Journal* 331 (7530): 1431–37.

Hong, F. C., J. B. Liu, T. J. Feng, X. L. Liu, P. Pan and others. 2010. "Congenital Syphilis: An Economic Evaluation of a Prevention Program in China." *Sexually Transmitted Diseases* 37 (1): 26–31.

Jewell B.L, I. Cremin, M. Pickles, C. Celum, J. M. Baeten, S. Delany-Moretlwe, et al. 2015. "Estimating the Cost-Effectiveness of Pre-Exposure Prophylaxis to Reduce HIV-1 and HSV-2 Incidence in HIV-Serodiscordant Couples in South Africa." *PLoS ONE* 10(1): e0115511. doi:10.1371/journal.pone.0115511.

Kahn, J. G., A. Jiwani, G. B. Gomez, S. J. Hawkes, H. W. Chesson and others. 2014. "The Cost and Cost-Effectiveness of Scaling up Screening and Treatment of Syphilis in Pregnancy: A Model." *PLoS One* 9: e87510.

Kahn, J. G., E. Marseille, B. Auvert. 2006. "Cost-Effectiveness of Male Circumcision for HIV Prevention in a South African Setting." *PLoS Medicine* 3(12): e517. doi:10.1371/journal.pmed.0030517.

Keating, J., J. O. Yukich, S. Mollenkopf and F. Tediosi. 2014. "Lymphatic filariasis and onchocerciasis prevention, treatment, and control costs across diverse settings: A systematic review." *Acta Tropica* 135(1):86–95.

Kim, S.-Y., J. A. Salomon and S. J. Goldie. 2007. "Economic evaluation of hepatitis B vaccination in low-income countries: using cost-effectiveness affordability curves." *Bulletin of the World Health Organization* 85: 833-42.

Kripke, K., F. Chimbwandira, Z. Mwandi, F. Matchere, M. Schnure, J. Reed J, et al. 2016. "Voluntary Medical Male Circumcision for HIV Prevention in Malawi: Modeling the Impact and Cost of Focusing the Program by Client Age and Geography." *PLoS ONE* 11(7): e0156521. doi:10.1371/journal.pone.0156521.

Kuznik, A., M. Lamorde, A. Nyabigambo and Y. C. Manabe. 2013. "Antenatal Syphilis Screening Using Point-of-Care Testing in Sub-Saharan African Countries: A Cost-Effectiveness Analysis." *PLoS Medicine* 10 (11): e1001545.

Kuznik, A., M. Lamorde, S. Hermans, B. Castelnuovo, B. Auerbach and others. 2012. "Evaluating the Cost-Effectiveness of Combination Antiretroviral Therapy for the Prevention of Mother-to-Child Transmission of HIV in Uganda." *Bulletin of the World Health Organization* 90 (8): 595–603.

Lo, N. C., I. I. Bogoch, B. G. Blackburn, G. Raso, E. K. N'Goran, J. T. Coulibaly, and others. 2015. "Comparison of community-wide, integrated mass drug administration strategies for schistosomiasis and soil-transmitted helminthiasis: a cost-effectiveness modelling study." *Lancet Global Health* 3(10):e629–38.

Lubell, Y., A. Riewpaiboon, A. M. Dondorp, L. von Seidlein, O. A. Mokuolu, M. Nansumba and others. 2011. "Cost-effectiveness of parenteral artesunate for treating children with severe malaria in sub-Saharan Africa." *Bulletin of the World Health Organization* 89: 504-512.

Lubell, Y., S. Yeung, A. M. Dondorp, N. P. Day, F. Nosten and others. 2009. "Cost-Effectiveness of Artesunate for the Treatment of Severe Malaria." *Tropical Medicine and International Health* 14 (3): 332–37.

Luz, P. M., T. Vanni, J. Medlock, A. D. Paltiel and A. P. Galvani. 2011. "Dengue vector control strategies in an urban setting: an economic modelling assessment." *Lancet* 377(9778):1673–80.

Marseille, E. and J.G. Kahn. 2008. Smarter Programming of the Female Condom**:** Increasing Its Impact on HIV Prevention in the Developing World. FSG Social Impact Advisors. Available at http://www.issuelab.org/resources/1691/1691.pdf. Accessed March 23, 2017.

Marseille E., M. J Giganti, A. Mwango, A. Chisembele-Taylor, L. Mulenga L, M. Over, et al. 2012. "Taking ART to Scale: Determinants of the Cost and Cost-Effectiveness of Antiretroviral Therapy in 45 Clinical Sites in Zambia." *PLoS ONE* 7(12): e51993. doi:10.1371/journal.pone.0051993;

Mbonye, A. K., K. S. Hansen, I. C. Bygbjerg and P. Magnussen. 2008 "Intermittent preventive treatment of malaria in pregnancy: the incremental cost-effectiveness of a new delivery system in Uganda". *Transactions of the Royal Society of Tropical Medicine and Hygiene* 102: 685-693.

Menzies, N. A., T. Cohen, H.H. Lin, M. Murray and J.A. Salomon. 2012. "Population health impact and cost-effectiveness of tuberculosis diagnosis with Xpert MTB/RIF: a dynamic simulation and economic evaluation." *PLoS medicine* 9(11): e1001347.

Mvundura M., N. Nundy, M. Kilbourne-Brook and P. S. Coffey. 2015. "Estimating the hypothetical dual health impact and cost-effectiveness of the Woman's Condom in selected sub-Saharan African countries." *International Journal of Women's Health.* 7: 271-7.

Njeuhmeli, E., S. Forsythe, J. Reed, M. Opuni, L. Bollinger, N. Heard, et al. .2011. "Voluntary Medical Male Circumcision: Modeling the Impact and Cost of Expanding Male Circumcision for HIV Prevention in Eastern and Southern Africa." *PLoS Medicine* 8(11): e1001132. doi:10.1371/journal.pmed.1001132.

Nonvignon, J., M. A. Chinbuah, M. Gyapong, M. Abbey, E. Awini and others. 2012. "Is Home Management of Fevers a Cost-Effective Way of Reducing Under-Five Mortality in Africa? The Case of a Rural Ghanaian District." *Tropical Medicine and International Health* 17 (8): 951–57.

Orlando, S., M. C. Marazzi, S. Mancinelli, G. Liotta, S. Ceffa and others. 2010. "Cost-Effectiveness of Using HAART in Prevention of Mother-to-Child Transmission in the DREAM-Project Malawi." *Journal of Acquired Immune Deficiency Syndromes* 55 (5): 631–14.

Owusu-Edusei, K. Jr., G. Tao, T. L. Gift, A. Wang, L. Wang and others. 2014. "Cost-Effectiveness of Integrated Routine Offering of Prenatal HIV and Syphilis Screening in China." *Sexually Transmitted Diseases* 41 (2): 103–10.

Prakash, C., 2003. "Crucial factors that influence Cost-effectiveness of Universal Hepatitis B Immunization in India." *International Journal of Health Technology Assessment in Health Care* 19: 28-40

Price, J. T., S. B. Wheeler, L. Stranix-Chibanda, S. G. Hosek, D. H. Watts, G. K. Siberry et al. 2016. "Cost-Effectiveness of Pre-exposure HIV Prophylaxis During Pregnancy and Breastfeeding in Sub-Saharan Africa". *Journal of Acquired Immune Deficiency Syndromes* 72(Supp):S145–S153.

Remme, J. H. F., P. Feenstra, P. R. Lever, A.C. Medici, C. M. Morel, M. Norma and others. 2006. "Tropical Diseases Targeted for Elimination: Chagas Disease, Lymphatic Filariasis, Onchocerciasis, and Leprosy". In: Jamison D.T., J.G. Breman, A. R. Measham, M. Claeson, D.B.Evans, P. Jha, A.R. Measham and A. Mills., editors. *Disease Control Priorities in Developing Countries*. 2nd edition. Washington (DC): World Bank; Chapter 22.

Robberstad, B. and B. Evjen-Olsen. 2010. "Preventing Mother to Child Transmission of HIV with Highly Active Antiretroviral Treatment in Tanzania—A Prospective Cost-Effectiveness Study." *Journal of Acquired Immune Deficiency Syndromes* 55 (3): 397–403.

Ross, A., N. Maire, E. Sicuri, T. Smith and L. Conteh. 2011. "Determinants of the cost-effectiveness of intermittent preventive treatment for malaria in infants and children." *PLoS One* 6 (4): e18391.

Schackman, B. R., C. P. Neukermans, S. N. Fontain, C. Nolte, P. Joseph and others. 2007. "Cost-Effectiveness of Rapid Syphilis Screening in Prenatal HIV Testing Programs in Haiti." *PLoS Medicine* 4 (5): e183.

Stone C.M., R. Kastner, P. Steinmann, N. Chitnis, M. Tanner and F.Tediosi F. 2016."Modelling the health impact and cost-effectiveness of lymphatic filariasis eradication under varying levels of mass drug administration scale-up and geographic coverage". *BMJ Global Health* 1:e000021. doi:10.1136/bmjgh-2015-000021

Suaya, J. A, D. S. Shepard, M.-S. Chang, M. Caram, S. Hoyer, D. Socheat and others. 2007. "Cost-Effectiveness of Annual Targeted Larviciding Campaigns in Cambodia against the Dengue Vector Aedes Aegypti." *Tropical Medicine & International Health* 12 (9): 1026–36.

Sutherland, C. S., J. Yukich, R. Goeree and F. Tediosi. 2015. "A Literature Review of Economic Evaluations for a Neglected Tropical Disease: Human African Trypanosomiasis ("Sleeping Sickness"). *PLoS Neglected Tropical Diseases* 9(2):e0003397.

Sweat, M., D. Kerrigan, L. Moreno, S. Rosario, B. Gomez and others. 2006. "Cost-Effectiveness of Environmental-Structural Communication Interventions for HIV Prevention in the Female Sex Industry in the Dominican Republic." *Journal of Health Communication* 11 (Suppl 2): 123–42

Terris-Prestholt, F., D. Watson-Jones, K. Mugeye, L. Kumaranayake, L. Ndeki and others. 2003. "Is Antenatal Syphilis Screening Still Cost Effective in Sub-Saharan Africa." *Sexually Transmitted Infections* 79 (5): 375–81.

Turner, H. C., M. Walker, T. S. Churcher, M. Y. Osei-Atweneboana, N.-K. Biritwum, A. Hopkins, and others. 2014 "Reaching the London Declaration on Neglected Tropical Diseases Goals for Onchocerciasis: An Economic Evaluation of Increasing the Frequency of Ivermectin Treatment in Africa." *Clinical Infectious Diseases* 59(7):923–32.

Utzinger, J., Y. Tozan and B. H. Singer. 2001. "Efficacy and cost-effectiveness of environmental management for malaria control". *Tropical Medicine and International Health* 6(9): 677-687.

Vassall, A., S. van Kampen, H. Sohn, J.S. Michael, K.R. John, S. den Boon and others. 2011. "Rapid diagnosis of tuberculosis with the Xpert MTB/RIF assay in high burden countries: a cost-effectiveness analysis." *PLoS medicine* 8(11): e1001120.

Wiseman, V., W. A. Hawley, R. O. Terkule, P. A. Phillips-Howard, J. M. Vulule, B. L. Nahlen and others. 2003. "The cost-effectiveness of permethrin-treated bed nets in an area of intense malaria transmission in western Kenya. *American Journal of Tropical Medicine and Hygiene.* 68 (Supp. 4): 161-167.

Yukich, J., F. Tediosi and C. Lengeler. 2007. "Operations, costs and cost-effectiveness of five-insecticide-treated programs (Eritrea, Malawi, Tanzania, Togo, Senegal) and two indoor residual spraying programs (Kwa-Zulu-Natal, Mozambique)." Basel: Swiss Tropical Institute, final draft