

BIOGRAPHICAL SKETCH

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NAME: CHI, BENJAMIN

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POSITION TITLE: Professor, Obstetrics and Gynecology

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Duke University, Durham, NC	BS	05/1995	Biology, History
Tulane University, New Orleans, LA	MD	06/1999	Medicine
London School of Hygiene and Tropical Medicine, London	MSc	05/2007	Epidemiology
Baylor College of Medicine, Houston, TX	Resident	06/2003	Obstetrics and Gynecology
University of Alabama at Birmingham, Birmingham, AL	Postdoctoral Fellow	07/2006	International Women's Health and Clinical Epidemiology

A. Personal Statement

A board-certified obstetrician-gynecologist, I lived full-time in Lusaka, Zambia for 12 years coordinating research and training initiatives. I moved to Chapel Hill in June 2015, but have ongoing projects in-country and retain strong collaborative ties with the University of Zambia, the Ministry of Health, and the Ministry of Community Development and Mother-Child Health. I was fortunate to have arrived in Zambia just before the launch of PEPFAR; as a result, my field training has included not only clinical trials and population epidemiology, but also leadership of large public health programs supported by CDC-PEPFAR. **Clinical trials** – I led a 400-participant randomized trial of adjunct tenofovir-emtricitabine to reduce antiretroviral drug resistance associated with peripartum nevirapine prophylaxis for the prevention of mother-to-child HIV transmission (PMTCT). I was co-investigator on the 600-participant IUD Study that assessed safety of the intrauterine device among HIV-infected postpartum women. For a decade, I led the Zambia clinical research site for the DAIDS-supported International Maternal Pediatric Adolescent AIDS Clinical Trials Group (IMPAACT), serving as site PI and protocol team member for P1060, P1068s, P1070, P1072, and 1077BF (PROMISE). From 2010 to 2013, I served as the obstetrics co-chair for the IMPAACT's scientific committee on HIV prevention, where I helped to guide the network's research portfolio in this important area. More recently, I have worked in the field of primary HIV prevention for pregnant women. I am protocol co-chair for IMPAACT 2009 (currently in protocol development), which will determine the pharmacokinetics, feasibility, and safety of daily emtricitabine-tenofovir for pre-exposure prophylaxis (PrEP) in pregnancy (<http://www.impaactnetwork.org/studies/IMPAACT2009.asp>). **Program implementation** – From 2007 to 2009, I served as PI for two large CDC cooperative agreements to deliver HIV health services in the Lusaka and Western Provinces of Zambia. This included programs for individual and couples HIV testing within communities (e.g., campaign-based, door-to-door), TB-HIV integration, antiretroviral drug surveillance in pregnancy, and cervical cancer screening. **Implementation research** – In addition, I have designed multiple studies within the context of PMTCT service expansion to understand the effectiveness of different health facility- or community-based interventions. I have been funded by the CDC, the Doris Duke Charitable Foundation, and the NIH for this work. I am PI for a NICHD-funded R01 study seeking to validate a survey methodology for reliably estimating HIV-free survival. I also completed an economic analysis of PrEP in pregnancy that showed the intervention to be highly cost-effective in sub-Saharan Africa. This is currently in press at the *Journal of Acquired Immune Deficiency Syndromes (JAIDS)*. **Mentoring** – I have an extensive track record in mentoring young investigators, including postdoctoral fellows and junior faculty. I am PI and Program Director for the UNC Global Women's Health Fellowship (T32) and the UJMT Fogarty Global Health Fellows Program (R25). I was recently awarded a K24

midcareer award to mentor young investigators in PMTCT implementation science, including HIV prevention in pregnancy.

B. Positions and Honors

Positions and Employment

2003 - 2006 Instructor, University of Alabama at Birmingham (UAB), Dept. of Ob-Gyn, Birmingham, AL
2005 - Honorary Lecturer, University of Zambia, Dept. of Ob-Gyn, Lusaka
2006 - 2010 Assistant Professor (tenure track), UAB Dept. of Ob-Gyn, Birmingham, AL
2010 - 2011 Associate Professor (tenure track), UAB Dept. of Ob-Gyn, Birmingham, AL
2012 - 2016 Associate Professor, University of North Carolina (UNC) Dept. of Ob-Gyn, Chapel Hill, NC
2016 - Professor, UNC Dept. of Ob-Gyn, Chapel Hill, NC

Other Experience and Professional Memberships

2003 - 2015 Member, Technical Working Group for PMTCT and Pediatric HIV Treatment, Zambian Ministry of Health
2006 - Diplomate, American Board of Obstetrics and Gynecology
2008 - Fellow, American College of Obstetricians and Gynecologists
2010 - 2013 Obstetrics Co-Chair, PMTCT Scientific Committee, International Maternal Pediatric Adolescents AIDS Clinical Trials Group (IMPAACT)
2012 - 2013 Member, Maternal and Child Health Guideline Development Group, World Health Organization, Department of HIV/AIDS
2012 - 2014 Chief Scientific Officer, Centre for Infectious Disease Research in Zambia

Honors

2007 Finalist, Charles C. Shepard Science Award, U.S. Centers for Disease Control and Prevention

C. Contribution to Science

1. **Uptake and retention of PMTCT:** Despite considerable scientific and policy advances in PMTCT over the past decade, there remain important gaps in implementation. There is a growing literature around the “PMTCT cascade” (i.e., those steps an HIV-infected mother navigate to obtain maximal benefit from health services) and how it can be used to optimize program performance. I have analyzed cross-sectional surveillance data and community survey data to reconstruct the PMTCT cascade from the multi-center PEARL study. I have also focused on individual steps (e.g., regimen uptake) in the context of local pilot programs. This work has helped to establish new frameworks for monitoring and evaluation broadly, while identifying bottlenecks in local programs for clinical and public health interventions.
 - a. Chi BH, Fusco H, Sinkala M, Goldenberg RL, Stringer JS. Cost and enrollment implications of targeting different source population for an HIV treatment program. *J Acquir Immune Defic Syndr.* 2005 Nov 1;40(3):350-5. PubMed PMID: [16249711](#).
 - b. Chi BH, Chintu N, Lee A, Stringer EM, Sinkala M, Stringer JS. Expanded services for the prevention of mother-to-child HIV transmission: field acceptability of a pilot program in Lusaka, Zambia. *J Acquir Immune Defic Syndr.* 2007 May 1;45(1):125-7. PubMed PMID: [17460478](#).
 - c. Stringer EM, Ekouevi DK, Coetzee D, Tih PM, Creek TL, Stinson K, Giganti MJ, Welty TK, Chintu N, Chi BH, Wilfert CM, Shaffer N, Dabis F, Stringer JS. Coverage of nevirapine-based services to prevent mother-to-child HIV transmission in 4 African countries. *JAMA.* 2010 Jul 21;304(3):293-302. PubMed PMID: [20639563](#).
 - d. Chi BH, Tih PM, Zanolini A, Stinson K, Ekouevi DK, Coetzee D, Welty TK, Bweupe M, Shaffer N, Dabis F, Stringer EM, Stringer JS. Implementation and Operational Research: Reconstructing the PMTCT Cascade Using Cross-sectional Household Survey Data: The PEARL Study. *J Acquir Immune Defic Syndr.* 2015 Sep 1;70(1):e5-9. PubMed PMID: [26068722](#).

2. **Public health impact of PMTCT services:** Despite unprecedented investments in PMTCT globally, there are still no consensus approaches for measuring population-level program impact. Many use clinic-based process and outcome indicators to assess effectiveness; however, such approaches have inherent selection biases and may not be reliable. In addition, they fail to measure the potential collateral benefits of PMTCT around childhood survival. As part of the CDC-funded PEARL study, we developed a community survey-based approach to measure population HIV-free survival and evaluated services in 4 African countries. I incorporated this methodology in my Doris Duke Clinical Scientist Award, where I assessed the individual- and population-level effectiveness of universal ART for PMTCT in Zambia's rural Kafue district. I am also PI of an R01 to validate this community survey approach, comparing its measures of HIV-free survival with that of longitudinal community-based cohorts of HIV-exposed infants (R01 HD075131).
 - a. Stringer JS, Stinson K, Tih PM, Giganti MJ, Ekouevi DK, Creek TL, Welty TK, Chi BH, Wilfert CM, Shaffer N, Stringer EM, Dabis F, Coetzee D. Measuring coverage in MNCH: population HIV-free survival among children under two years of age in four African countries. *PLoS Med.* 2013;10(5):e1001424. PubMed PMID: [23667341](#); PubMed Central PMCID: [PMC3646218](#).
 - b. Gartland MG, Chintu NT, Li MS, Lembalemba MK, Mulenga SN, Bweupe M, Musonda P, Stringer EM, Stringer JS, Chi BH. Field effectiveness of combination antiretroviral prophylaxis for the prevention of mother-to-child HIV transmission in rural Zambia. *AIDS.* 2013 May 15;27(8):1253-62. PubMed PMID: [23324656](#); PubMed Central PMCID: [PMC3836017](#).
 - c. Chi BH, Thirumurthy H, Stringer JS. Maximizing benefits of new strategies to prevent mother-to-child HIV transmission without harming existing services. *JAMA.* 2014 Jul 23-30;312(4):341-2. PubMed PMID: [25038348](#); PubMed Central PMCID: [PMC4289618](#).
 - d. Chi BH, Musonda P, Lembalemba MK, Chintu NT, Gartland MG, Mulenga SN, Bweupe M, Turnbull E, Stringer EM, Stringer JS. Universal combination antiretroviral regimens to prevent mother-to-child transmission of HIV in rural Zambia: a two-round cross-sectional study. *Bull World Health Organ.* 2014 Aug 1;92(8):582-92. PubMed PMID: [25177073](#); PubMed Central PMCID: [PMC4147407](#).
3. **Patient engagement in long-term HIV care:** HIV care and treatment programs have been brought to scale in many African settings, with literally millions initiating life-prolonging antiretroviral therapy. Patient attrition, however, has emerged as a major programmatic challenge. I have explored the extent of this problem, using epidemiologic methods to determine optimal definitions for loss to follow-up (LTFU) and to explore the potential contribution of early or undocumented mortality to this phenomenon. In addition, I have sought to identify patient characteristics associated with mortality and LTFU separately, and as combined outcome of "program failure." As PMTCT and ART services become more closely aligned (i.e., lifelong ART for HIV-infected pregnant women), such long-term outcomes will become increasingly relevant to PMTCT implementation.
 - a. Chi BH, Cantrell RA, Mwango A, Westfall AO, Mutale W, Limbada M, Mulenga LB, Vermund SH, Stringer JS. An empirical approach to defining loss to follow-up among patients enrolled in antiretroviral treatment programs. *Am J Epidemiol.* 2010 Apr 15;171(8):924-31. PubMed PMID: [20219765](#); PubMed Central PMCID: [PMC2850972](#).
 - b. Schöni-Affolter F, Keiser O, Mwango A, Stringer J, Ledergerber B, Mulenga L, Bucher HC, Westfall AO, Calmy A, Boule A, Chintu N, Egger M, Chi BH. Estimating loss to follow-up in HIV-infected patients on antiretroviral therapy: the effect of the competing risk of death in Zambia and Switzerland. *PLoS One.* 2011;6(12):e27919. PubMed PMID: [22205933](#); PubMed Central PMCID: [PMC3242760](#).
 - c. Chi BH, Yiannoutsos CT, Westfall AO, Newman JE, Zhou J, Cesar C, Brinkhof MW, Mwango A, Balestre E, Carriquiry G, Sirisanthana T, Mukumbi H, Martin JN, Grimsrud A, Bacon M, Thiebaut R. Universal definition of loss to follow-up in HIV treatment programs: a statistical analysis of 111 facilities in Africa, Asia, and Latin America. *PLoS Med.* 2011 Oct;8(10):e1001111. PubMed PMID: [22039357](#); PubMed Central PMCID: [PMC3201937](#).
 - d. Li MS, Musonda P, Gartland M, Mulenga PL, Mwango A, Stringer JS, Chi BH. Predictors of patient attrition according to different definitions for loss to follow-up: a comparative analysis from Lusaka, Zambia. *J Acquir Immune Defic Syndr.* 2013 Jul 1;63(3):e116-9. PubMed PMID: [23760096](#); PubMed Central PMCID: [PMC3682225](#).
4. **Adherence to antiretroviral therapy:** While many programs have expanded access to antiretroviral therapy (ART), including ours in Zambia, long-term adherence remains a concern. Studies have shown that, despite high levels of adherence earlier in the course of HIV treatment, this does not persist over time.

I studied ART adherence among adults in the Zambian public health program, through epidemiological analysis of our large programmatic databases. My work focused on metrics for adherence (e.g., medical possession ratio) and interventions might improve adherence (e.g., food supplementation). This work has extended into broader work around the HIV continuum of care, described separately in this section.

- a. Reid SE, Mulenga LB, Folk WR, Tambatamba BC, Chi BH. Abandonment of antiretroviral therapy: a potential barrier to scale-up in sub-Saharan Africa. *S Afr Med J*. 2008 Jun;98(6):448, 450. PubMed PMID: [18683375](#); PubMed Central PMCID: [PMC3437649](#).
- b. Goldman JD, Cantrell RA, Mulenga LB, Tambatamba BC, Reid SE, Levy JW, Limbada M, Taylor A, Saag MS, Vermund SH, Stringer JS, Chi BH. Simple adherence assessments to predict virologic failure among HIV-infected adults with discordant immunologic and clinical responses to antiretroviral therapy. *AIDS Res Hum Retroviruses*. 2008 Aug;24(8):1031-5. PubMed PMID: [18724803](#); PubMed Central PMCID: [PMC2747786](#).
- c. Cantrell RA, Sinkala M, Megazinni K, Lawson-Marriott S, Washington S, Chi BH, Tambatamba-Chapula B, Levy J, Stringer EM, Mulenga L, Stringer JS. A pilot study of food supplementation to improve adherence to antiretroviral therapy among food-insecure adults in Lusaka, Zambia. *J Acquir Immune Defic Syndr*. 2008 Oct 1;49(2):190-5. PubMed PMID: [18769349](#); PubMed Central PMCID: [PMC3847664](#).
- d. Chi BH, Cantrell RA, Zulu I, Mulenga LB, Levy JW, Tambatamba BC, Reid S, Mwango A, Mwinga A, Bulterys M, Saag MS, Stringer JS. Adherence to first-line antiretroviral therapy affects non-virologic outcomes among patients on treatment for more than 12 months in Lusaka, Zambia. *Int J Epidemiol*. 2009 Jun;38(3):746-56. PubMed PMID: [19223334](#); PubMed Central PMCID: [PMC2689395](#).

Complete List of Published Work in My Bibliography:

<http://www.ncbi.nlm.nih.gov/myncbi/benjamin.chi.1/bibliography/46669996/public/?sort=date&direction=ascending>

D. Research Support

Ongoing Research Support

K24 AI120796-01A1

CHI, BENJAMIN H (PI)

02/03/16-1/31/2021

Mentoring new investigators in PMTCT implementation research

This award provides dedicated effort to mentor advanced trainees (including junior faculty and postdoctoral fellows) in PMTCT implementation research.

Role: PI

R25 TW009708-01A1, NIH/Fogarty

CHI, BENJAMIN H (PI)

05/18/15-04/30/18

The CIDRZ-UNZA eLearning Platform for Research Training

We will design, develop, and implement an “eLearning” course for data management and analysis, using newer technologies such as web-based interfaces and social media to enhance learning.

Role: PI

T32 HD075731-04, NIH/NICHD

CHI, BENJAMIN H (PI)

09/01/13-04/30/18

UNC Global Women's Health Fellowship

This fellowship provides dedicated support for postdoctoral fellows interested in global women's health research.

Role: PI

R25 TW009340-04, NIH/Fogarty

CHI, BENJAMIN H (PI)

04/04/12-07/31/17

Fogarty Global Health Fellows Coordinating Center

This program supports U.S. and foreign trainees for 11-month attachments at one of 25 research sites globally.

Role: PI

R01 HD075131-02, NIH/NIAID

CHI, BENJAMIN H (PI)

12/1/16-11/30/20

A dyad approach to combination HIV prevention in pregnancy for Zambia and Malawi

We seek to develop a combination HIV prevention strategy for pregnant women and their partners, populations at high risk for HIV acquisition in sub-Saharan Africa

Role: PI

Completed Research Support

R01 HD075131-02, NIH/NICHD

CHI, BENJAMIN H (PI)

09/25/12-07/31/16

Validation of a community survey methodology for measuring PMTCT impact

We seek to validate a community survey methodology for assessing population HIV-free survival, comparing it to "gold standard" estimates from a community-based cohort.

Role: PI

U2G PS001421-02, CDC

CHI, BENJAMIN H (PI)

04/01/09-03/31/14

EXPANSION OF ART, TB AND VCT PROGRAMS IN ZAMBIA

Role: PI

U2G PS000753-06, CDC

CHI, BENJAMIN H (PI)

09/30/07-01/31/13

EXPANDED ACCESS TO VCT IN THREE RURAL DISTRICTS OF ZAMBIA

Role: PI

K01 TW006670-01A1, NIH/Fogarty

CHI, BENJAMIN H (PI)

02/01/05-01/31/09

A Training Program in International Women's Health

Role: PI

2007061, Doris Duke Charitable Foundation

CHI, BENJAMIN H (PI)

08/01/07-01/31/12

Clinical Scientist Development Award

Role: PI