OMB No. 0925-0001 and 0925-0002 (Rev. 10/15 Approved Through 10/31/2018)

BIOGRAPHICAL SKETCH

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NAME: Aryeh David STEIN

eRA COMMONS USER NAME (credential, e.g., agency login): aryehstein

POSITION TITLE: Professor, Hubert Department of Global Health, Emory University

EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)

| INSTITUTION AND LOCATION | DEGREE  (if applicable) | Completion Date  MM/YYYY | FIELD OF STUDY |
| --- | --- | --- | --- |
| Queen Elizabeth College, University of London, London UK | B.Sc. (with High Honors) | 06/1984 | Nutrition |
| Columbia University, New York NY, USA | MPH | 05/1989 | Epidemiology |
| Columbia University, New York NY, USA | Ph.D. | 05/1992 | Epidemiology |

**A. Personal Statement**

I am a life-course epidemiologist with over 25 years of research experience in intergenerational studies of the growth and physical and cognitive development of children as they develop into adults. My work is centered around the paradigm that specific prenatal or early postnatal exposures shape susceptibility and resilience to later exposures, and that careful examination of the interaction between the earlier and later exposures will advance our understanding of the development of health and well-being over the life course. My expertise is in longitudinal research, especially in prospective, repeated-measures studies of human growth and development over the life-course. I have continued to make substantive methodological contributions both to understanding the scope and role of measurement error in nutritional assessment and in self-reported behavioral risk factors, and to innovative design of epidemiologic studies over the life course, whether these focus on the analysis of existing data or new field work. Repeatedly, I have demonstrated capacity to collaborate productively with diverse and dispersed research teams, to manage research activities where field work is conducted at remote locations, and to disseminate study results via peer-reviewed publication. I have published over 220 peer-reviewed papers.

**B. Positions and Honors**

Positions and Employment

1984 - 1986 **Provincial Nutritionist.** Department of Health, Simbu Province, Papua New Guinea.

1987 - 1992 **Teaching Assistant** / **Graduate Research Assistant.** Division of Epidemiology. Columbia University School of Public Health, New York NY.

1991 - 1992 **Epidemiologist / Data Analyst**. Behavioral Risk Factor Surveillance Section, Bureau of Health Statistics, Research and Evaluation Massachusetts Department of Public Health, Boston MA.

1992 **Epidemiologist**. Dutch Famine Birth Cohort Follow-up Study, Academisch Ziekenhuis bij de Universiteit van Amsterdam, Academisch Medisch Centrum, Amsterdam, Netherlands

1993 - 1998 **Assistant Professor**. Department of Epidemiology, College of Human Medicine. Michigan State University, East Lansing MI

1998 - **Associate** (1998-2012) and **Full** (from August 2012) **Professor**: Rollins School of Public Health; **Affiliated faculty**: Laney Graduate School of Arts and Sciences, Emory University, Atlanta GA.

2012 - **Honorary Senior Researcher** (2012-2015) and **Professor** (2015 – present), Developmental Pathways to Health Research Unit, University of the Witwatersrand, Johannesburg, South Africa

Selected Other Experience and Professional Memberships

2000 - 2014 **Director of Graduate Studies, Program Director, Recruiter**, Program in Nutrition and Health Science, Laney Graduate School of Arts and Sciences, Emory University

2008 - **Co-chair**, Institutional Review Board, Emory University

2016 - **Associate editor**: Journal of Nutrition

2007 - 2012 **Ad-hoc** and **chartered member**, SSPS Study Section, NIH

2012-present **Member**, Multiple ad-hoc NIH study sections

**C. Contributions to Science**

**Long-term consequences of prenatal exposure to famine**: The Dutch Hunger Winger of 1944-5, a 6-month period of acute food deprivation, provides a quasi-experimental setting in which the consequences in adult life of the stresses of famine in defined periods of gestation on the developing fetus can be examined. In a series of studies led by LH Lumey of Columbia University, I have studied individuals born before, during, or after the famine. I was central to the development of our innovative sibling-control design, in which an unexposed same-sex sibling is matched to a famine-exposed proband in order to provide tight control for social and genetic determinants of later health status. In over 25 papers since 1994, we examined the long-term consequences of famine exposure in specific periods of gestation on well-being, morbidity, and mortality.

1. ***Stein AD****, Kahn HD, Rundle A, Zybert PA, van der Pal–de Bruin K, Lumey LH. Anthropometric measures in middle age following exposure to famine during gestation: evidence from the Dutch Famine.* ***American Journal of Clinical Nutrition*** *2007;85:869-876*
2. *Heijmans BT, Tobi EW,* ***Stein AD****, Putter H, Blauw G-J, Susser ES, Slagboom PE, Lumey LH. Persistent epigenetic differences associated with prenatal exposure to famine in humans.* ***Proceedings of the National Academy of Sciences****. 2008;105:17046-17049*
3. *Tobi EW, Slieker RC,* ***Stein AD****, Suchiman HED, Slagboom PE, van Zwet EW, Heijmans BT, Lumey LH. Early gestation as the critical time-window for changes in the prenatal environment to affect the adult human blood methylome.* ***International Journal of Epidemiology****. 2015;44:1211-1223. doi: 10.1093/ije/dyv043*
4. *Ekamper P, van Poppel F,* ***Stein AD,*** *Bijwaard GE, Lumey LH. Prenatal famine exposure and adult mortality from cancer, cardiovascular disease, and selected other causes through age 63 years.* ***American Journal of Epidemiology****.* 2015;181:271-9. doi: 10.1093/aje/kwu288

**Long-term consequences of maternal and infant nutrition supplementation for human capital**: Famine exposure in industrial settings is rare, and the scenario of chronic undernutrition in low-income settings is much more common. With Reynaldo Martorell and many others, I have been investigating the long-term effects of exposure to a nutritional supplementation program implemented at the village level in Guatemala in the 1960’s. This study, the longest-running follow-up of a nutritional supplementation trial, has resulted in well over 200 published papers, many of which have been influential in the development of the ‘first 1000 days’ paradigm now underpinning much aid and development work. I serve as the current PI of the cohort. I was instrumental in developing the basic analytic framework used in our recent work, in which exposure to intervention for the ‘first 1000 days’ (conception to age 24 mo) is distinguished from exposure to the placebo or to the intervention at other ages by use of an adaptation of the double-difference methodology. Among over 35 co-authored publications emanating from this project since I joined Emory in 1998, I have led or supervised analyses of the impact of the supplementation on cognitive functioning in adulthood and on the impacts of the intervention on growth in the next generation, and am leading our current work on the long-term consequences for cardiometabolic risk.

1. ***Stein AD****, Barnhart HX, Wang M, Hoshen MB, Ologoudou K, Ramakrishnan U, Grajeda R, Ramirez-Zea M, Martorell R. Comparison of linear growth patterns in the first three years of life across two generations in Guatemala.* ***Pediatrics*** *2004;113(3.1):e270-e275*
2. ***Stein AD****, Wang M, DiGirolamo A, Grajeda R, Ramakrishnan U, Ramirez-Zea M, Yount K, Martorell R. Nutritional supplementation in early childhood, schooling, and intellectual functioning in adulthood: a prospective study in Guatemala.* ***Archives of Pediatric and Adolescent Medicine****. 2008;162:612-618*
3. *Behrman JR, Calderon MC, Preston S, Hoddinott J, Martorell R,* ***Stein AD****. Nutritional supplementation of girls influences the growth of their children: Prospective study in Guatemala.* ***American Journal of Clinical Nutrition****. 2009;90:1372-1379*
4. *Ford ND, Behrman JR, Hoddinott JF, Maluccio JA, Martorell R, Ramirez-Zea M,* ***Stein AD****. Exposure to improved nutrition from conception to age two years and adult cardiometabolic disease risk.* ***Lancet Global Health****. 2018; 6: e875–84. https://doi.org/10.1016/S2214-109X(18)30231-6*

**Patterns of child growth and adult human capital (COHORTS)**: Most of our understanding of the role of early-life experiences in adult human capital comes from high-income countries, and there are few prospective birth cohort studies in low- and middle-income countries in which study participants have reached adulthood. The COHORTS project involves a collaborative pooling of data from birth cohorts in Brazil, Guatemala, India, Philippines, and South Africa. I have been a co-investigator with the project since 2008 and currently serve as PI of a Bill and Melinda Gates Foundation-funded wave of fieldwork. I have contributed to the development of the core methodological approach to the study of growth patterns in this group, namely the use of conditional growth measures.

1. *Adair LA, Fall CHD, Osmond CO,* ***Stein AD****, Martorell R, Ramirez-Zea M, Sachdev HS, Dahly DL, Bas I, Norris SA, Micklesfield L, Halal P, Victora CG, for the COHORTS group. Associations of linear growth and relative weight gain during early life with adult health and human capital in countries of low and middle income: findings from five birth cohort studies.* ***Lancet.*** *2013;382:525-34. doi: 10.1016/S0140-6736(13)60103-8.*
2. ***Stein AD****, Barros F, Bharghava S, Hao W, Horta B, Kuzawa C, Lee N, Martorell R, Ramji S, Stein A, Richter L, COHORTS investigators. Birth status, child growth and adult outcomes in low- and middle-income countries.* ***Journal of Pediatrics****. 2013 Dec;163(6):1740-1746.e4. doi: 10.1016/j.jpeds.2013.08.012.*
3. *Fall CHD, Sachdev HS, Osmond C, Mendez MCR, Victora C, Martorell R,* ***Stein AD****, Sinha S, Tandon N, Adair L, Bas I, Norris SA, Richter L, COHORTS group. Association between maternal age at childbirth and child and adult outcomes in the offspring: a prospective study in five low-income and middle-income countries (COHORTS collaboration).* ***Lancet Global Health****. 2015 2015;3:e366-77. pii: S2214-109X(15)00038-8. doi: 10.1016/S2214-109X(15)00038-8. PMID: 25999096*
4. *Richter LM, Orkin FM,* ***Stein AD****, Roman GD, Norris SA. Biological and social pathways to child growth at age 2 years: Evidence from birth cohorts in Brazil, India, the Philippines and South Africa (COHORTS).* ***Journal of Nutrition****. 2018 ;148:1364-1371. https://doi.org/10.1093/jn/nxy101*

**Birth to Twenty Plus: Multi-generational study of growth and development in South Africa:** This is a study, initiated in 1990, in which births in Johannesburg were recruited. Follow-up fieldwork has been conducted almost annually (most recently in 2017-9), and the study has become a platform for ancillary research. I have collaborated with the South African investigators since 2008. We have adapted methodologies for the analyses of longitudinal data, and conducted qualitative research to enhance the interpretation of study findings.

1. *Lundeen EA, Norris SA, Adair LS, Richter LM,* ***Stein AD****. Sex differences in obesity incidence: 20-year prospective cohort in South Africa.* ***Pediatric Obesity****. 2015 May 19. doi: 10.1111/ijpo.12039. [Epub ahead of print] PMID: 25988503*
2. *Lundeen EA, Norris SA, Martorell R, Suchdev PS, Mehta NK, Richter LM,* ***Stein AD****. Early life determinants of pubertal development in South African adolescents.* ***Journal of Nutrition.*** *2016 Mar;146(3):622-9. doi: 10.3945/jn.115.222000. Epub 2016 Feb 3. PMID: 26843589*
3. ***Stein AD****, Lundeen EA, Martorell R, Suchdev PS, Mehta NK, Richter LM, Norris SA.*[*Pubertal Development and Prepubertal Height and Weight Jointly Predict Young Adult Height and Body Mass Index in a Prospective Study in South Africa.*](https://www.ncbi.nlm.nih.gov/pubmed/27335138)***J Nutr****. 2016 Jul;146(7):1394-401. doi: 10.3945/jn.116.231076. Epub 2016 Jun 22. PMID: 27335138*
4. *Hanson SK, Munthali RJ, Lundeen EA, Richter LM, Norris SA,* ***Stein AD****. Stunting at 24 months is not related to incidence of overweight through young adulthood in an urban South African birth cohort.* ***Journal of Nutrition****. 2018 Jun 1;148(6):967-973. doi: 10.1093/jn/nxy061. PMID: 29767752*

Complete List of Published Work (>200 publications since 1990):

[http://www.ncbi.nlm.nih.gov/pubmed/?term=stein+ad+[au](http://www.ncbi.nlm.nih.gov/pubmed/?term=stein+ad+%5bau)]

**D. Research Support**

Ongoing research support

OPP1164115 PI: Aryeh D Stein 4/1/2017 – 12/31/2020

Bill and Melinda Gates Foundation

**Child Development and Adult Social and Human Capital: COHORTS**

*To provide evidence regarding the role of early-life cognitive potential in the development of adult cognitive and socioemotional achievement and social human capital in four cohorts in low and middle-income countries*

Role: PI

R01: HD075784 PI: Stein, Aryeh D. 4/10/2014 - 3/31/2021

National Institute of Health

**Early childhood nutrition and adult metabolomic and cardiometabolic profiles**

*To test the hypothesis that improvements in early-life nutrition can attenuate the development of risk through impacts on the metabolomic and cardiometabolic profile.*

Role: PI

## Completed Research Support in the last 3 years

OPP1135781 PI: Stein, Aryeh D. 7/24/2015 - 1/31/2017

Bill and Melinda Gates Foundation

**COHORTS contribution to Quantifying Healthy Birth, Growth and Development knowledge**

*To enhance the capacity of the Gates Foundation knowledge Integration initiative by sharing analyses and insights from the COHORTS collaboration.*

Role: PI

567200/10051438/1624 PI: Stein, Aryeh D. 6/1/2015 - 5/31/2016

University of Pennsylvania

**Growth recovery, schooling and cognitive achievement: Evidence from four cohorts**

*To analyze data from 4 cohorts in developing countries (Ethiopia, India, Peru and Vietnam) to assess the causes and consequences for child cognitive development of patterns of growth from age 1 y to age 12 y.*

Role: PI