

IUSSP seminar on Trade-offs in Female Life Histories: Raising New Questions in an Integrative Framework

Bristol, United Kingdom, 23-25 July 2008

Organized by the IUSSP Scientific Panel on Evolutionary Perspectives in Demography
in collaboration with the University of Bristol

with financial support from the British Academy, the British Society for Population Studies
and the Galton Institute

The goal of this seminar was to bring together researchers from a variety of disciplines to explore female life history. Evolutionary biologists have developed life history theory to identify the trade-offs individuals must make in allocating resources between growth, reproduction and the maintenance of body condition. Demographers, anthropologists and other human scientists have increasingly focused on these trade-offs, in an attempt to understand the patterning of fertility, mortality, growth and aging across human populations. This 2nd meeting of the IUSSP Panel on Evolutionary Perspectives on Demography brought together 36 participants from the fields of demography, anthropology, physiology and biology to explore this issue.

Twenty-five papers were selected through a competitive call for papers and 4 additional papers were invited. Papers were presented in 4 plenary talks and 25 short presentations, grouped into 6 main themes. These themes represented both key stages in female life history (age at first birth; birth intervals and pregnancy; parental investment; and grandmotherhood) and the applications of such life history analyses (to the demographic transition; and theoretical models of life history). The 29 papers were very broad ranging, encompassing empirical research across the developed and developing world, and including the use of historical datasets; theoretical work on the mathematical modelling of life history traits; comparative work on primate life histories; conceptual and review papers synthesising previous work on life histories to generate new hypotheses; and the implications of such research for policy. A key theme to emerge from the seminar was the importance of getting the methodology right in explaining life history trade-offs. In particular, the difficulty of understanding variation in life history trade-offs given the problem of heterogeneity between women was much discussed. Here a dialogue between disciplines such as demography and evolutionary biology is important in furthering the field, since both can bring their expertise to bear on this complex issue. The importance of an integrated understanding of female life history for making policy decisions was also highlighted: without an in-depth understanding of *why* female life histories vary, it is extremely difficult to develop effective policy which aims to improve women's lives. A selection of these wide ranging papers will be published in a special issue of the *American Journal of Human Biology* next year, in order to provide an integrative framework for future research in this area.

The meeting was held at the University of Bristol, 23-25 July 2008. The organisers were Mhairi Gibson (local host) and Rebecca Sear, with help from the IUSSP Panel on Evolutionary Perspectives on Demography, particularly Monique Borgerhoff-Mulder and Ulrich Mueller. As well as the generous financial and administrative support offered by the IUSSP, this meeting received financial sponsorship from the British Academy, the British Society for Population Studies and the Galton Institute, and administrative support from BIRTHA (Bristol Institute for Research in the Humanities and Arts).

The first plenary of the workshop, given by Professor Kristen Hawkes from the University of Utah, set the tone for the workshop by exploring in detail the problem of how heterogeneity between women can obscure life history trade-offs. If women differ in their genetic endowment or in their access to resources, then life history trade-offs will occur across a range of trajectories. This will make it difficult to observe trade-offs at the population level. This plenary highlighted the importance of using appropriate methodologies to try and account for this problem, which in turn highlighted the necessity for interdisciplinary work in this area. Demographers are also concerned with the problem of heterogeneity and have been working in recent years to produce solutions. Anthropologists and evolutionary biologists must engage with and help to further these methodological advances, in order to advance their own research into life history theory.

After this opening, the workshop continued with a further three plenary talks and seven sessions of proffered papers. Four of the seven workshop sessions concerned key stages in female life history: age at first birth, pregnancy and birth intervals, parental investment and grandmotherhood. One session focussed exclusively on a particularly important life history trade-off, that between investment in reproduction and investment in somatic maintenance. The remaining two sessions concerned the applications of such life history analyses: how such work can shed light on the demographic transition, and how such research can be used to generate over-arching models of female life history.

The second plenary of the workshop began the debate over whether there is a trade-off between fertility and longevity. Professor Emily Grundy, from the Centre for Population Studies at the London School of Hygiene and Tropical Medicine, presented data from England & Wales, Norway and the US to show that the relationship between investment in reproduction and later life outcomes can differ even in industrialised countries with similarly low mortality and fertility rates. This plenary was neatly complemented by a paper which presented very similar analyses of historical data from Quebec and Utah. Alain Gagnon, of the University of Western Ontario, began by remarking that the Quebecois data has been used in three previous studies to show a positive relationship between fertility and longevity, a negative relationship, and no relationship at all. Again, this illustrates the importance of getting methodology right when analysing the tricky issue of life history trade-offs. Grazyna Jasienska, from Jagiellonian University, drew this session to a close by highlighting gaps in the existing literature on this relationship in the hope that focussing attention on such lacunae will stimulate research to close these gaps.

The third plenary, by Professor Gillian Bentley of the University of Durham, was a first-rate demonstration of integrative research. Gillian brought together demography, evolutionary biology and physiology in her research on the effects of developmental environment on female reproductive physiology. She and her group have used the natural experiment of migration to investigate the influence of developmental environment on female reproductive hormones, by comparing hormonal levels of Bangladeshi migrants from Sylhet (Bangladesh) to the UK, with those of women still residing in Sylhet and UK women. This physiological theme was picked up in the session on birth intervals and pregnancy, with papers by Virginia Vizthum, of the University of Indiana, and Claudia Valeggia, of the University of Pennsylvania, investigating the hormonal correlates of pregnancy loss and the resumption of post-partum fecundity respectively. Both papers involved small-scale studies of non-Western populations (a Bolivian agropastoralist community and an indigenous Argentinean population), in dramatic contrast to the large scale datasets used by Grundy and Gagnon,

demonstrating the diversity of evidence brought to bear on female life histories during the workshop.

Perhaps the most diverse session, however, in terms of empirical evidence was the session on parents and parental investment. In this four-paper session, Katherine Hinde, from UCLA, demonstrated sex-biased parental investment in rhesus macaques. David Lawson, from University College London, followed this with his analysis of the trade-off between wealth and family size in the large-scale, longitudinal UK database ALSPAC (Avon Longitudinal Study of Parents and Children). Eshetu Gurmu's paper (from the University of Addis Ababa) switched focus to the developing world, with his study of marital dissolution in Addis Ababa. Finally, Kai Pierre Willfuehr, from Giessen University, ended the session with his analysis of another historical dataset, this time from northern Germany. All studies highlighted the need to take context, particularly, though by no means exclusively, access to resources, into account when analysing parental investment decisions.

The final plenary, by Professor Beverly Strassmann of the University of Michigan, was a wide-ranging plenary which showcased Professor Strassmann's long-term anthropological research project among the Dogon in Mali. A number of different trade-offs were considered during this plenary, which also highlighted that women do not make life history decisions in isolation, but in the context of a partnership. Such partnerships may be characterised by sexual conflict. Conflict between partners may be particularly pronounced in this highly polygynous society, and much of Professor Strassmann's research has focuses on the implications of polygyny for women's life history strategies.

Perhaps two key themes dominated the workshop, one methodological, one with both empirical and theoretical implications. Already discussed is the emergence of a consensus that researchers across disciplines must unite to develop rigorous methodology to analyse life history trade-offs. This issue was discussed at several points during the workshop in the context of moving forward our understanding of female life history trade-offs by appropriately controlling for heterogeneity between women. Ruth Mace's (University College London) paper, on contraceptive uptake in the Gambia, emphasised how interactions between demographers and anthropologists have already improved the methods for investigating life history trade-offs. Anthropologists are now increasingly making use of statistical methods such as event history analysis, which can incorporate time varying covariates. Such techniques are vitally important for interpreting the dynamic processes that occur during the life course.

The other theme that emerged was the importance of kin in female life histories. A number of empirical papers demonstrated the key importance of relatives in female life history, including Donna Leonetti's (University of Washington) analysis of first births in two Indian communities, Monique Borgerhoff Mulder's (UC Davis) paper on contraceptive use in rural Tanzania, Brooke Scelza's (UCLA) paper on grandmaternal investment in Martu Aborigines, Australia and David Coall's (University of Basel) paper on grandparental investment in modern Switzerland. Papers by Meredith Reiches (Harvard University), Jonathan Wells (Institute of Child Health, University College London) and Lesley Newson (University of Exeter) all explored the theoretical implications of the importance of kin. Reiches's paper considered how female life history trade-offs would be better understood in the context of 'pooled energy budgets', that is the energy budgets of not just the woman herself but all her relatives, including her partner, who may be contributing to her reproductive effort. Wells's paper discussed the importance of kin in the context of genomic imprinting, and how this may

have influenced the evolution of female reproductive behaviour. Lesley Newson brought the influence of kin to bear on the puzzle of the demographic transition, and suggested that part of the explanation for low fertility in industrialised societies is a lack of kin support, given the evidence that kin provide both encouragement and practical support for raising children.

Much of the research presented at the workshop has important policy implications, touched upon by the presenters. For example, Alejandra Nunez-de-la-Mora's paper on the trade-off between immune defence and reproduction highlighted the need to take a holistic approach to development, since a reduction in disease prevalence may inadvertently lead to an increase in fecundity. One paper focussed exclusively on the implications of such life history research for policy-makers. Sarah Johns, from the University of Kent at Canterbury, demonstrated how an integrative understanding of female life history trade-offs can be used to inform policy surrounding teenage motherhood, a subject of some concern to the UK government, as well as a number of other industrialised countries. She suggested that teenage motherhood is a rational strategy in the context of social marginalisation and low life expectancies. Therefore policies targeted solely at improving adolescent's knowledge of contraception are unlikely to result in substantial decreases in the instance of teenage pregnancy, without also tackling social inequality and poverty.

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Department of Archaeology and Anthropology
22 – 25 July 2008

Programme of Events

For further details about the sessions, please see:
<http://www.iussp.org/Activities/biol/call08.php>

Tuesday, 22 July:

- 17:00 - 19:00 Registration, Department of Archaeology and Anthropology
43 Woodland Road, Bristol, BS8 1UU
- 19:00 Drinks at the Hawthorns (across from the Department)
- 20:00 Dinner at Café Rouge, 85 Park Street, BS1 5PJ

Wednesday, 23 July:

- 8:30 - 8:50 Registration, Department of Archaeology and Anthropology
- 8:50 - 9:00 Welcome and Introduction
- 9:00 - 10:00 **Plenary: Kristen Hawkes**
Vital rates in human & chimpanzee populations: how within species variation complicates cross-species comparisons.
- 10:00 - 10:30 Coffee
- 10:30 - 12:30 **Session: Contraception and the Demographic Transition**
Chair: Rebecca Sear
- Monique Borgerhoff Mulder
Women's Fertility Preferences and Family Planning: Tradeoffs, Biased Cultural Transmission, or Men?
- Ruth Mace
Social Influences on the Decision to Start Using Contraception: a Study From Rural Gambia
- Mary Shenk
Causes and Consequences of the Demographic Transition in Urban South India: Transitions in Total Fertility and Age of First Reproduction

Lesley Newson
Cultural versus Reproductive Success: Why Does Economic Development Bring New Trade-offs for Women at all Stages of Life?

12:30 - 14:00 Lunch

14:00 - 15:30 **Session: Age at First Birth**
Chair: Grazyna Jasienska

Karen Kramer
Early First Birth among Pumé Foragers. Implications of a Pooled Energy Budget to Life History Tradeoffs

Donna Leonetti
Age at First Reproduction in the Context of Differing Kinship Ecologies

Sarah Johns
Teenage Pregnancy and Motherhood: How Might Evolutionary Theory Inform Policy?

15:30 - 16:00 Coffee

16:00 - 17:30 **Session: Birth Intervals and Pregnancy**
Chair: Barry Bogin

Virginia Vitzthum
Modulation of Reproductive Investment during Early Pregnancy

Claudia Valeggia
Interactions Between Metabolic and Reproductive Functions in the Resumption of Postpartum Fecundity

Daryl Shanley
A Mathematical Modelling Framework for the Study of Optimal Interbirth Intervals

19:30 Dinner at Pizza Express, 2-10 Regents Street

Thursday, 24 July:

9:00 - 10:00 **Plenary: Emily Grundy**
Biology or Sociology? What Can We Learn From Associations Between Reproductive Histories and Later Life Mortality in Contemporary European Populations

10:00 - 10:30 Coffee

10:30 - 12:30

Session: Parents and Parental Investment

Chair: Tom Dickins

Katherine Hinde

Lactational Performance in Primiparous and Multiparous Rhesus Macaques: Milk Energy Density and Milk Yield

David Lawson

Trade-offs in Modern Parenting: a Longitudinal Study of Sibling Competition for Parental Investment

Kai Pierre Willfuehr

Is There a Trade-off Between Early Versus Late Survival? Long-term Consequences of Early Parental Loss in the 18th to 19th Century Krummhörn Population

Eshetu Gurmu

Determinants of Marital Dissolution in Addis Ababa (Ethiopia)

12:30 - 14:00

Lunch

14:00 - 16:00

Session: Fertility, Somatic Maintenance and Survival

Chair: Virginia Vitzthum

Alejandra Nunez-de-la-Mora

Trade-offs Between Growth, Maintenance and Reproduction in Human Female Life History: What Do We Know?

Iлона Nenko

Relationship Between Fertility and Body Size and Shape: An Empirical Test of the Covert Maternal Depletion Syndrome Hypothesis

Alain Gagnon

Are There Trade-offs Between Fertility and Survival to Old Ages? Evidence From Three Large Historical Demographic Databases

Grazyna Jasienska

Reproduction and Lifespan: Overall Energy Budgets, Trade-offs, Intergenerational Costs and Costs Neglected by Research

16:00 - 16:30

Coffee

16:30 - 17:30

Plenary: Gillian Bentley

Developmental and Environmental Trade-offs in Female Fecundity

19:30

Dinner at Rajmoni Indian Restaurant, 88 Queens Road

Friday, 25 July:

- 9:00 - 10:00 **Plenary: Beverly Strassmann**
Menopause and the Trade-off Between Offspring Number and Offspring Quality
- 10:00 - 10:30 Coffee
- 10:30 - 12:30 **Session: Grandmothering and Allocare**
Chair: Monique Borgerhoff Mulder
- David Waynforth
Mothers' Decisions to Provide Direct Care to Their Infants Versus Using Daycare and Family-based Childcare: a Life-history Perspective with Data on British Mothers and Children
- Brooke Scelza
The Grandmaternal Niche: Critical caretaking among Martu Aborigines
- David Coall
Grandparental Investment: The Influence of Early Reproduction and Family Size
- Jonathan Wells
Cooperative Breeding and the Evolution of Flexibility in Female Reproductive Behaviour
- 12:30 - 14:00 Lunch
- 14:00 - 15:30 **Session: Models of Life History**
Chair: Mhairi Gibson
- Duncan Gillespie
When Fecundity Does Not Equal Fitness: Evidence of an Offspring Quantity-Quality Trade-off in Pre-industrial Humans
- Barry Bogin
Childhood, Adolescence, Fertility and the Variant Nature of Human Life History
- Meredith Reiche
Pooled Energy Budget and Human Life History
- 15:30 - 15:40 Closing Remarks
- 15:40 Coffee
- 17:00 Boat Trip with Mark Horton
A History of Bristol and Harbourside Tour
- 19:30 **Conference Dinner: Lockside Restaurant**

List of participants

Last Name	First Name	Email	Affiliation
Bogin	Barry	b.a.bogin@lboro.ac.uk	Loughborough University, UK
Borgerhoff Mulder	Monique	mborgerhoffmulder@ucdavis.edu	UC Davis, U.S.A
Coall	David	david.coall@unibas.ch	University of Basel, Switzerland
Gagnon	Alain	agagnon4@uwo.ca	U. of Western Ontario, Canada
Gillespie	Duncan	d.gillespie@sheffield.ac.uk	Sheffield Uni, U.K.
Gurmu	Eshetu	eshetu_gurmu@yahoo.com	Addis Ababa University, Ethiopia
Hinde	Katherine	kjhinde@ucla.edu	UCLA, USA
Jasienska	Grazyna	jasienska@post.harvard.edu	Jagellonian University, Poland
Johns	Sarah	s.e.johns@kent.ac.uk	University of Kent, UK
Kramer	Karen	kkramer@fas.harvard.edu	Harvard, USA
Lawson	David	d.lawson@ucl.ac.uk	UCL, UK
Leonetti	Donna	leonetti@u.washington.edu	Washington Uni, USA
Mace	Ruth	r.mace@ucl.ac.uk	UCL, UK
Nenko	Ilona	ilonanenko@wp.pl	Jagellonian University, Poland
Newson	Lesley	L.Newson@ex.ac.uk	UC Davis, U.S.A
Núñez-de la Mora	Alejandra	a.nunez@ucl.ac.uk	Mexico
Reiches	Meredith	mreiches@fas.harvard.edu	Harvard, USA
Scelza	Brooke	bscelza@u.washington.edu	Washington Uni, USA
Shanley	Daryl	daryl.shanley@ncl.ac.uk	Newcastle Uni, UK
Shenk	Mary	shenkm@missouri.edu	University of Missouri, USA
Valeggia	Claudia	valeggia@sas.upenn.edu	University of Pennsylvania USA
Vitzthum	Virginia j.	virginia_vitzthum@eva.mpg.de	Leipzig Max Planck, Germany
Waynforth	David	d.waynforth@uea.ac.uk	University of East Anglia, UK
Wells	Jonathan	j.wells@ich.ucl.ac.uk	UCL, UK
Willfuehr	Kai pierre	kai.p.willfuehr@phil.uni-giessen.de	University of Giessen, Germany
Plenaries			
Bentley	Gillian	g.r.bentley@durham.ac.uk	University of Durham UK
Grundy	Emily	Emily.Grundy@lshtm.ac.uk	London Sch. of Hygiene & Trop. Med.
Hawkes	Kristen	hawkes@anthro.utah.edu	University of Utah, USA
Strassmann	Beverly	bis@umich.edu	University of Michigan, USA
Co-organisers* (excluding Monique Borgerhoff Mulder)			
Mueller	Uli	ulrich.otto.mueller@t-online.de	University of Marburg, Germany
Sear	Rebecca	r.sear@lse.ac.uk	London School of Economics
Gibson	Mhairi	mhairi.gibson@bristol.ac.uk	University of Bristol

Non-speaking participants			
Dickins	Tom	t.dickins@uel.ac.uk	University of East London, UK
Student helpers			
Scott	Isabel	psxis@bristol.ac.uk	University of Bristol
Clech	Lucie	lucieclech@hotmail.com	University of Bristol
Clark	Andrew	a.p.clark@bristol.ac.uk	University of Bristol
Mathews	Paul	P.mathews@lse.ac.uk	London School of Economics