Report on the First International Conference on Economics and Human Biology, Tuebingen, July 11-14, 2002

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Organized by Joerg Baten (Tuebingen) and John Komlos (Munich) and financially supported by the German Science Foundation (DFG), the conference was held at the medieval castle Hohentuebingen located on a steep hill in the center of Tuebingen, an old university town in Southern Germany. Participants came from more than twenty nations and from a large number of disciplines such as economic history, transition and development economics, biological and physical anthropology, demography, nutritional science, public health, and sociology. The various linkages between economic processes and human biology –, covering all (inhabited) continents– and without temporal limitations were the center of attention.

About one third of the papers pertained to anthropometric history, with a large geographic and temporal stratification. Mean Stature of a population was used as an indicator of net nutritional intake, since the human body responds with growth retardation to diseases and low food intake during childhood and adolescence. The measure, hence, reflects one component of the "biological standard of living".

John Komlos initiated the conference with a presentation on the anthropometric history of early modern France. On the basis of a sample of archival military records he constructed a series of average male adult heights of the French population from (birth years) 1670 to 1765, controlling for the recruitment practices of the military. The spatial patterns in these early data match those published for 19th century France quite well, and the time trend in human stature resembles those that obtained in other European countries. The very substantial increase in average stature of 3.8 cm between 1694 and 1706 may be a result of improving climatic conditions after the "little ice age." Surprisingly, the French revolution was not preceded or accompanied by particularly adverse nutritional circumstances, compared to other European countries. However, social differences were remarkable: Members of the socio-economic elite at that time were about 7 cm taller than the average population.

Laurent Heyberger (Strasbourg) then examined the correlation between wheat prices and the percentage of French conscripts exempted from the military service due to low stature in the first half of the 19th century. He stressed the importance of wheat in the diet of Frenchmen and found that increases in wheat prices resulted in an increase in exemptions. A clear spatial pattern was observed: People in the northern departments were the tallest, whereas those

living in the center were the shortest, indicating a great inequality in nutritional terms. Over time, however, a spatial convergence of heights occurred.

George Alter (Indiana) also used military conscription lists for his study, "Stature in Transition: A Micro-level Study from Nineteenth-century Belgium." He focused on height differences among occupational groups to assess losers and winners of industrialization. Before 1850 day laborers were exceptionally short (160 cm). In contrast, artisans and skilled industrial workers were about 166 cm, while students averaged almost 170 cm. After 1850, most of the groups made progress, but the largest increases tended to occur among those who were the shortest at the beginning of the century. The convergence of heights indicate that benefits of industrialization were spreading down to the poorer strata of the society.

Deborah Oxley (Sydney) analyzed height records of Irish female convicts transported to Australia. In assessing the "Living Standard of Women in Pre-famine Ireland" she found distinct differences between the Irish provinces, as well as a decrease in heights reflecting the economic decline after the end of the Napoleonic Wars and the union with Britain.

"Can development be hazardous to your health?" asked **Michael Haines** (Colgate) in his investigation of the mid-19th century downturn in average physical stature in the USA, England, and the Netherlands. Since the development of real income per capita, real wages, and relative food prices cannot completely explain the internationally similar pattern in heights, he suggested to consider the development of urban infrastructure and commercialization with the associated spread of diseases and thus mortality as important (latent) explanatory factors for the biological standard of living.

Vincent Tassenaar (Groningen) used time series data on Dutch heights of the late 19th and early 20th century to investigate their relationship to nutritional intake. He used the Baxter-King filter to remove the trend in both series, and thereafter analyzed the lag structure of the cyclical components of the series. The results indicate that the contribution of nutrition to Dutch heights at certain ages was not constant over the cohorts under consideration.

The birth year orthodoxy, which associates final mean height to environmental conditions during the first year, was challenged by **Sebastian Coll** (Santander, Spain). In his paper "When is Human Height Determined? An Exploration in the Lag Pattern of Height's Determinants", he estimated correlation coefficients between age specific mortality rates and final stature of Spanish men born in the first half of the 20th century. Interestingly, the relative size of the coefficients does closely match the typical pattern in age related growth.

In their paper "Autarchy, Market Disintegration, and Health: The Mortality and Nutritional Crisis in Germany During the Early Years of the Nazi Regime, 1933-1937", **Joerg Baten** and

Andrea Wagner (Munich) analyzed the hidden costs of a totalitarian regime. They presented evidence that morbidity and mortality increased in almost all age groups. Moreover, heights of German school children stagnated. This pattern was unique to Germany as compared to the UK, for instance. In addition, the prevalence of diseases related to nutritional deficiencies increased, affecting especially the food importing area in Northern Germany as well as larger cities. They concluded on the basis of this evidence that the autarchy policies of the Nazi Regime and the market disintegration due to price fixing were the main causes of this adverse developments. Similarly, **Uwe Jäger** and **Konrad Zellner** (both, Jena, Germany) found a decreasing body weight in schoolchildren from Jena between 1932 and 1944 and a reduction in body height of girls only.

An overview of secular trends in human stature in different countries was provided by **Tim J. Cole** (Institute of Child Health, London). He argued that the increase in stature is due to more rapid growth after birth, since average stature at birth was more or less stable over the past century.

Anthropometric evidence may not only be obtained from archival records but also from skeletal remains. **Nikola Koepke** (Tuebingen) presented data on the biological standard of living for the provinces of Germania and Raetia under Roman occupation in the first to the fourth century AD. She collected published estimates on body height and age at death of both males and females for her meta study, and found a gradual deterioration of these indicators. Moreover, the population was on average about 2 cm taller than in the 19th century in that region, and gender differences were less pronounced than in modern times.

With a similar methodology, **Richard Steckel** (Ohio State) closed the chronological gap with evidence on the net-nutritional history of Northern Europe over the past millennium. He found that average male heights declined by 6.4 cm between the early Middle Ages and the 17th/18th centuries. Possible explanations for this phenomenon include the worsening of climatic conditions, urbanization and commercialization accompanied by the spread of diseases. Human physical stature in Europe did not recover to 11th century stature levels until the early 20th century.

Christopher Knuesel and **Marianne Schweich** (both Bradford, UK) focused on "Bio-Cultural Effects on Stature and Body Proportions in European Archaeological Populations". Female body proportions are generally less variable through time, and, therefore, apparently more buffered against adverse social conditions and biological stressors.

The experience of transition and developing countries was another central issue discussed at the conference. **Liu Shiyung** (Academia Sinica, Taiwan) presented a paper on Taiwan's

anthropometric history in times of Japanese colonialism, 1895-1945. Using anthropometric data from various archival sources, he demonstrated that the population of Taiwan experienced height gains among the birth cohorts of the 1920s and 1930s, attributable to the Japanese promotion of health and infrastructure development. In contrast, **Stephen Morgan** (Melbourne) reported a decline in physical stature among both males and females in mainland China during the same period.

Alexander Moradi examined the cross-sectional and temporal variation in heights of Sub-Sahara African women born between 1950 and 1980. The stagnating and decreasing heights after the mid 1960s suggest that almost the whole region went through a nutritional or health crisis. He found economic failure and a decreasing protein supply to be the main determinants of this development, and, surprisingly, a robust negative effect of a country's openness to trade on the biological standard of living.

In his paper on childhood undernutrition in Malawi, Tanzania, and Zambia, **Stephan Klasen** (Munich) presented an innovative Bayesian regression framework, allowing for the estimation of nonlinear functions of metrical covariates and for spatial smoothing of residual information on a map of the districts of the three countries. It was suggested that such an analytical tool can help identify omitted – but spatially correlated – variables (such as malaria incidence in the present case), and it may also be useful for regional policy targeting. The presented estimation results indicate particularly adverse nutritional conditions in a belt ranging from Southern Tanzania to Northeastern Zambia.

Ayal Khimi (Hebrew University, Israel) turned to a micro level approach and analyzed subjective and anthropometric measures of health in a sample of 583 Southern Ethiopian households. The results indicate a positive impact of per capita wealth on health, while inequality has a detrimental effect. There is also evidence that nutrition inequality within the household induces a re-allocation of resources towards the more poorly nourished.

Alan Martina (Australian National University) analyzed factors influencing height for age of Philippine children in two villages. Among significant determinants were the age of children, spacing between births, parental education, household income, quality of housing and access to a refrigerator.

What about India? **Ralph Shlomowitz** (Flinders University, Australia) compared height and weight data recorded in two surveys from the 1880s and the mid 20th century to adduce "Long Term Change in Indian Health". Mean height and BMI were relatively stable for the upper caste, but a deterioration could be observed for lower caste groups resulting in a widening disparity in health among socioeconomic groups.

Aravinda M. Guntupalli (International Institute for Population Sciences, India) drew the attention to the current "Health Status of Indian Women" and **Sonia Bhalotra** (University of Bristol) evaluated the benefits of the food subsidy carried by the public distribution system by doing a counterfactual: given the elasticities, what would be the effects on childhood malnutrition, if the subsidy would not exist? **Siddiq R. Osmani** (Belfast, UK) pointed out in "The Hidden Penalties of Gender Inequality: Fetal Origins of Ill-Health" that inequality may result, through undernourished mothers, in a high incidence of underweight infants, thereby endangering the survival and development of children of both sexes and thus impairing the interests of male as well as female children.

Recent developments of health in Russia were discussed by **Elena Andriouchina** (Moscow). She found evidence for a health crisis in the 1990s. The transition process, that will eventually lead to health improvements in the long run, apparently has a negative short-term impact on health. In the same context, **Elena Godina** (Moscow) described "Recent Secular Changes in Russia: (and asked) What do they mean?". In comparing various anthropometric measures of Russian children born in Moscow in the 1990s with those born two decades before she found, a recent stagnation in height for age as well as a decline in chest and arm circumference. Besides the decrease in sports activity she also suspected influence from psychological factors. **Alan Dangour** (London) analyzed micro level data from children born in the very poor Kasalinsk region of Kazakhstan in the 1990s, a period of relative instability in both economic and health indicators, he found most interestingly, while boys' anthropometric measures stagnated, those of girls declined significantly, arguably a result of rising gender discrimination in the household food allocation. In contrast, the secular upward trend apparently continues in Hungary as **Gyula Gyenis** (Budapest) and **Otto Eiben** (Budapest) showed.

Noël Cameron (Loughborough) turned to "Human Growth within Economic Transition in Developing Countries: The South African Experience". In using data on over 4,000 children enrolled in the (longitudinal) Birth to Ten birth-cohort study in 1990, he found that the growth of white children continues to exceed that of their non-white counterparts. Since differences that existed at birth and during infancy have not been diminished over time, he concluded, that the end of apartheid did not yet affect black children's growth pattern.

However, not only a too low energy intake, but also too much can be considered as a serious health problem. **Roberto Frisancho** (Ann Arbor) pointed to the increasing prevalence of obesity in the Third World. Extreme body weights can be found regardless of economic status. **Stanley J. Ulijaszek** (Oxford) then evaluated "Trends in Body Size, Diet and Food

Availability in the Cook Islands in the Second Half of the 20th Century". Based on three population surveys conducted in 1952, 1966 and 1996, he found a secular increase in height, but also in BMI. In 1996 approximately 55% among the females and males had a BMI greater than 30. Since fat intake declined over this period, the reduction in physical activity may be the driving force of this development. **Barry Bogin** and **Patricia K. Smith** had a similar focus on overweight when presenting their paper on the health of children in Maya immigrant families in the United States. Compared to Guatemala, life in the U.S. offers amenities such as better health access and clean running water. However, there are also less healthy lifestyle habits that could easily be adopted such as fast food consumption and excessive TV watching, resulting in physical inactivity. As a consequence, Maya children are taller in the United States but they are also more likely to become overweight. A possible way-out was presented by **Alok Bhargava** (Houston), who analyzed the behavioral response to dietary education programs among minority group women in the Southern USA. Using panel data with a treatment and control group, he showed that such education programs work, inducing more healthy food patterns. However, the degree of success depends significantly on the level of education, the concerns about health and the motivation of the program participants.

Another perspective on health and mortality was introduced by **Bernard Harris** and **Andrew Hinde** (both, Southampton). In "Sickness, Insurance and Health: Assessing Trends in Morbidity through Friendly Society Records", they analyzed the increasing morbidity in the second half of the 19th century. Little evidence was found for increasing age-specific morbidity. Rather, the shift in the age structure of the society's members as well as administrative changes were mainly responsible.

John Murray (Toledo) analyzed European health insurance programs in the late 19th and early 20th century. His comparison between compulsory (Germany, Austria) and voluntary (France, Belgium) funds pointed to the relevance of problems related to information asymmetry.

In using data from two hospitals in Utrecht, **Peter Ward** (University of British Columbia) demonstrated that a decrease in perinatal mortality rates did not take place before 1940. Deaths in utero and within seven days after birth were mainly associated with low birth weights and delivery problems. He also showed a changes in personnel from traditional midwifes to medical doctors, especially when difficulties arose.

Jim Oeppen (Cambridge) explored the relationship between life expectancy and income in a large panel of countries. Global convergence of life expectancy was addressed in detail within a multilevel model that allows for the estimation of country-specific time and income effects.

The results suggest, that per capita income could be translated into life expectancy in Japan better than in the USA.

Diane Lauderdale (Chicago) presented her paper on economic correlates of bone mineral density (bmd) –a major determinant of osteoporotic fractures – in American women in the U.S., using the NHANES III data. She found a positive association of bmd with height as a measure of conditions during childhood, with education (but only for whites), but not for current income.

In her presentation, **Virginia J. Vitzthum** (National Science Foundation) argued, that ovulation depends on nutritional stress and, therefore, represents a self-regulating mechanism when additional children could not be sufficiently fed.

In "Economic Development and the Quality of Life of Children", **Marcelo Delajara** (Cordoba, Argentina) presented a theoretical model in which he derived from a household utility function the relationship between fertility, income growth, and the nutritional status of children. During the economic transition process towards modern economic growth according to his model, increasing fertility does initially offset the income effect, resulting in a nutritional deterioration, which is only reversed after a certain income threshold is passed.

David Meltzer (Chicago) focused on the role of declining urban mortality in promoting economic growth. Historically, mortality rates were higher in urban environments, in which, he stressed, human capital is generally most useful. Therefore, the epidemiological transition, that converted epidemic diseases of adulthood to endemic diseases of childhood created more favorable demographic conditions for human investments and fertility decline, which in turn contributed to economic development.

T. Paul Schultz (Yale) gave a lecture on the labor force participation of the elderly in Taiwan, jointly hosted by the conference and the Tuebingen Economics faculty. Taiwan provides an interesting case study due to the absence of tax schemes distorting the individual retirement decision. Schultz reported a positive association between health status and labor force participation, and health turns out to be an endogenous explanatory variable. According to estimation results, the introduction of a public health insurance program did not affect participation rates among the elderly substantially.

David Sahn (Cornell University) focused on heights of pre-school children in "Decomposing World Health Inequality." He compared the variability of heights in the healthy environment of OECD countries with those of the developing countries and concluded that 70% of world health inequality could be attributed to inequality within countries and only 30% to inequality between countries. Moreover, he did not find a strong correlation between income and health

inequality, which, he stressed, has an important policy implication: Reducing income inequality does not necessarily lead to a decline in health inequality.

Lee A. Craig (NC State) presented a paper on one great invention associated with human nutrition: mechanical refrigeration. Focusing on the experience in late-19th century USA, he estimated a 1.25 percent annual increase in per capita protein consumption attributable to the introduction of the new refrigerating technique. Using coefficient estimates published elsewhere, this effect could be translated into an increase in average stature of about .02 inches.

Marco Sunder (Munich, Germany) presented a paper on the biological standard of living of American children, reporting some intra-family gender effects on height for age. He also argued that anthropometric indicators are of relevance for chances in later life: e.g., height and weight were shown to influence the odds of having a first date among male and female teenagers.

"A New Paradigmatic Vision of Life" derived from bioeconomics was presented by **Mansour Mohammadian** (Madrid). He argued that the essence of economic theory and biology should be combined in order to analyze the conditions of "real" equilibria taking into account monetary aspects as well as sustainability of human behavior.

The conference offered also ample opportunities for discussion in a relaxed atmosphere, either during the joint meals in the "duke's room" of the castle, and at traditional restaurants where the attendees could enjoy the scenic views. Disagreements about some of the conclusions were put aside in the evenings, as all participants became enthusiastic supporters of Swabian food and German beer. The discussions continued on the day after the conference during an excursion to the nearby "Hohenzollern" castle, the ancestral seat of the Prussian kings. All participants were looking forward to the follow up meeting in the not-too-distant future.