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Demographic Surprises

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I am going to talk tonight about the role of "surprises" in demography. The term is rarely encountered in the social sciences but it is one that my mentor, Ansley Coale, used a great deal. The other term Ansley used with notable frequency was “implausible.”

Clearly, Ansley was a Bayesian. When some measurement was said to be implausible, it usually meant that the data were suspect. Ansley met a lot of suspicious data. Let's reserve the term "surprises" for observations that are properly measured but that are inconsistent with some prior expectation about how the world ought to look.

As a highly inductive, data-driven discipline, demography is really the only field in the social sciences that is permitted the luxury of surprises. In other fields, wedded to a positivist hypothesis-testing mode of inquiry, surprises are not publishable; they have to be buried. It's only when your hypothesis is confirmed, when there is no surprise, that you can proceed to tell the world about it. Sometimes a surprised investigator can rewrite his or her article to pretend he or she wasn't surprised, that results only confirm some hypothesis held all along. So they are forced to be either dull or dishonest. No wonder we chose demography!

Another advantage of demography is that the data we stare at are more abundant than those pertaining to other social phenomena and they touch on the most vital of human concerns, birth and death, sex and disease. These two features- availability and importance- are connected: the reason that we <u>have</u> so much data is that, starting with the clergy in Sweden who created the world's first national vital registration system 250 years ago, authorities recognized that the processes of birth and death framed all human affairs. Vital registration is the most democratic of all data systems. No other data system reaches into the household and gives each household member, man, woman and child, one vote every year. One of the most important developments in our field in recent years is the extension of these observational systems on a sample basis to developing countries.

So what has surprised analysts most about what the massive amount of demographic data reveal over the past several centuries? Obviously the answer depends crucially on what one expected to find. Expectations are not unitary but are widely distributed; that's why stock markets trade billions of dollars worth of equities each day. No one has done an inventory of demographic expectations, although we can partially rely on population projections to summarize the views of the demographic community.

I would say that the greatest demographic surprises have been reserved for those with a resolutely materialist view of human nature and human affairs. By this I refer to those who feature increasing one's consumption of goods and services as the overarching human goal, and to those who believe that national economic performance, by virtue of its implications for personal consumption, sets narrow limits on what can be achieved in the way of social well-being. Call such people "economists" for short. Since I was trained long ago in economics, I may be more sensitive than most of you to violations of the expectations and shortcomings of the paradigm.

What has been demographically most surprising from a strictly materialist perspective is that declines in fertility and mortality have been only weakly associated with rates and levels of economic development. A particular level of national income per capita in one period was

suddenly associated with much lower levels of mortality and fertility in the next. (SLIDE 1) This demonstration was made for life expectancy at birth in the first two-thirds of the 20th century, when it appears that 60-80% of the gains in life expectancy were associated with factors other than standards of living, with shifts in the curve rather than movements along it.

Amy Tsui has made a similar demonstration for fertility in the second half. She shows, among 78 developing countries, that the relationship between the national total fertility rate and various economic and social indicators shifted between 1972 and 1994. Controlling per capita income, urbanization, and other standard indicators, fertility was one-half child lower in 1994 than in 1972. If family planning efforts had expanded in a country, the decline was larger, up to a child and a half.

So demography has not been marching primarily to an economic drumbeat but has a rhythm that's largely its own. And that rhythm has been surprisingly rapid by other standards as well. Nico Keilman, in the latest issue of Population Studies, shows that United Nations population projections in the past 40 years have systematically underestimated the pace of both mortality decline and fertility decline. (SLIDE 2) The next slide shows the percentage error in various UN projections for Europe. The number of future 0-4 year-olds is systematically overestimated because projected declines in fertility are too slow. The numbers above age 65, on the other hand, have been systematically underestimated because projected declines in mortality have been too slow. The same tendencies are revealed for the world as a whole.

The fathers of demographic transition theory were partial materialists, but they were also eclectics who recognized that economic growth was being accompanied by other important social transformations: urbanization, changes in the roles of men and women, and secularization. These, too, had implications for fertility. Urbanization and greater opportunities for women raised the costs of children to parents, while secularization opened up possibilities for innovation in contraception.

But indicators of these broader attributes also proved to be feeble predictors of fertility decline. The ambitious European Fertility Project headquartered at Princeton showed that, once fertility decline had begun in provinces of Europe, it went smashing through all quantitative barriers that may, at an earlier date, have appeared to limit its extent.

It was as though fertility decline had acquired a momentum of its own, perhaps because the behavior was diffusing from individual to individual. The fact that linguistic and ethnic boundaries seemed to act as firebreaks in this process, as summarized by Watkins and Coale, added force to the belief that some interpersonal process was at work. These findings have been replicated by Bongaarts and Watkins for developing countries. (SLIDE 3) The next slide is drawn from their work. It shows that the dates when fertility declines began in Latin America (defined as a decline of 10% in the total fertility rate) were very clustered in time but occurred at a highly disparate levels of development.

For the field, these truly were surprising findings and they have stimulated a good deal of contemporary work. This surprise has been widely announced, perhaps most provocatively by Clelland and Wilson, so by now <u>you</u> are doubtless not surprised. It's less widely recognized that a similar process of behavioral innovation was also at work in child mortality. Demographers and others sometimes seem to imply that declines in mortality were delivered to a population by governments and health authorities, that individual behavior was irrelevant. It's true that clean water can be delivered to urban populations and insecticides to rural populations without much collusion by individual households. But these efforts had very limited impacts and there is no question that the greatest part of the advance required individuals to participate actively in the process of improving survival chances within the household. This circumstance was clearly recognized by health officials a century ago, who said, in effect, we've done what we can to clean up the city but the rest is up to you, mothers. We'll tell you what needs to be done but your behavior is the key. (SLIDE 4) The next slide presents representative quotes, first from the leading U.S. study of infant mortality a century ago and the other from the leading British study.

And what needed to be done was arduous and demanding, repetitious and boring: implementing the many methods of disease prevention that were corollaries of the germ theory such as hand washing, boiling bottles, keeping food fresh, isolating sick children, and so on. The germ theory of disease moved the source of disease from the environment outside the home to the environment inside the home. It had the effect, in historian Nancy Tomes' words, of turning parents into "vigilant warriors against disease."

Parents clearly rose to the task, both privately and collectively. The large majority of progress in child mortality made since prehistoric times in western countries occurred in the first three decades of the 20th century- before the advent of any significant curative medicines and with only minimal help from preventative medicines. But science and governments did collude to give parents something extraordinarily valuable: information- information about how to keep their children alive. By 1940, the U.S. Children's Bureau publication Infant Care had sold 15 million copies, the largest sales in the history of the Government Printing Office. Progress was even faster in developing countries from the middle of the 20th century because science by then had more tools to offer. But again, these tools were not delivered to a passive audience, but required the collaboration of parents, at a minimum by getting a child within the reach of modern medicine. The importance of parenting practices relative to material circumstances is revealed vividly by statistical analysis of demographic surveys. In the large majority of countries, child mortality rates has been shown to be more responsive to the mother's education than to the father's, despite the fact that the father's education was more closely associated with household income.

The enormous progress in child mortality could not have occurred without extraordinarily powerful motivation to encourage child survival on the part of parents. Such motivation would not surprise Charles Darwin. Darwinian logic is quite simple: all human traits are present for one and only one reason: to facilitate reproduction. We are not designed to be happy, we are designed to reproduce. And successful reproduction requires not only access to a mate and sex, it requires raising children who themselves are able to find partners and raise successful children. This motivation has been so clear in fostering child survival that it scarcely receives comment in

the literature. But it is worth making explicit because it is also very pertinent to fertility motivations.

The germ theory made parenting more arduous and so did the great social transformation of the 19th and 20th centuries, especially the decline in agriculture. If parents were to raise healthy children who were themselves successful in raising children, they must first be kept alive. But they must also be equipped with new tools, acquired primarily outside the home. Children were to be prepared for an urban world, a world of written communications and precise calculations, a world where mastery of technique was central to success.

Many demographers have stressed the negatives here, the increased costs of children. But I think we have to get beneath this shorthand expression and ask what parents are actually trying to do in bearing and raising children. The cost of children has not in fact increased. For next to nothing, we could be raising the ill clothed, sickly, poorly educated kids of a century ago. What has risen are not the costs of children but expenditures on children. We spend more on them both because we can AND because it takes more investment for them to succeed. Such behavior is classically Darwinian. And Darwin, several steps removed, is being rediscovered by demographers paying careful attention to what parents are telling them.

In an introduction to a forthcoming volume entitled Global Fertility Transition, John Casterline notes that "child quality considerations (especially schooling) are repeatedly emphasized as fundamental motivations for lowered fertility." Among the ethnographic studies consistent with this claim are John Knodel's interviews with Thai women and Susan Watkins' interviews with the Luo in Kenya. Philip Aries, in his magisterial study entitled Centuries of Childhood, concluded that aspirations for lineage mobility, especially through education, were the key to fertility decline in the West. Dirk van de Kaa reached a similar conclusion about "the first demographic transition." Peter McDonald's study of fertility decline in Australia argues elegantly that "women reduced their fertility in order to better pursue motherhood." Phil Morgan and Caroline Foster have recently made valuable contributions to the fertility literature that stress the primacy of psychogenic predispositions to child-rearing.

It is interesting to note that one of the fathers of demography transition theory, Frank Notestein, also featured this motivation prominently in his explanation of fertility declines in the West:

> "In short, under the impact of urban life, the social aim of perpetuating the family gave way progressively to that of promoting the health, education, and material welfare of the individual child; family limitation became widespread; and the end of the period of [population] growth came in sight" [Notestein, 1945:41 cited in Dyson 2001].

Concern with the well being of children is clearly capable of adding considerable speed to fertility declines. The life script of a couple halfway through its reproductive years is largely written, but that of their children is certainly not. Changes in the social environment that get projected onto a child receive a lifetime of weight in parental decisions. These decisions can be entirely "rational," even though the goal being pursued is primarily established by an emotional superstructure (but no more emotional in origin than the pleasure derived from good food, fast cars, and big houses, the "rational" motives acceptable in much rational choice literature).

Even migration gets into the act here. One of the main motives for migration to the city or elsewhere, as told by migrants around the world, is to give their children a better chance in life.

In short, parental concern with child well-being belongs at the heart of demography. It clearly fueled the revolution in child mortality and appears to be a powerful motive in family limitation as well. And it has the strongest of all theoretical justifications, following directly from Darwinian logic. In the unsentimental words of Steven Pinker, "Kind acts towards our children benefit copies of the genes that build a brain that inclines a person towards such acts."

Even economists have been forced by overwhelming evidence to take note. Gary Becker, father of the new home economics, hypothesized that parents cared not only about the number of

children but also about their quality. Later, he hypothesized that there was an altruist within the family, although he inexplicably made the altruist look more like a male than a female.

Perhaps the strongest evidence of the gratification that parents derive from their children is that the vast majority of individuals in highly developed economies continue to bear and raise them. The economic and material advantages of children are clearly negligible, if they ever existed, and social pressures to bear children are severely muted. But the majority of women in all countries continue to complete childbearing with at least two children. For strict materialists, this is perhaps the biggest surprise of all.

Let me now turn to a second and final set of important demographic surprises. These are reserved for those who stress the fixity of Nature and the frailty of human initiative in the face of it. Limitations imposed by the natural world are seen as impeding human progress and in some cases preventing it altogether, especially when population numbers press up against these limits.

An extreme version of this case was of course presented by Thomas Malthus. Productivity in agriculture could only inch ahead and was readily wiped out by the tremendous reproductivity of the human population. Later versions of the Malthusian model posited limitations of energy supplies and other natural resources as additional constraints on opportunities for economic growth. I think it's safe to say that most demographers 40 years ago were sympathetic to such arguments in one guise or another. The arguments were certainly influential in national and international policy circles, and the field has benefited from their persuasive power.

The experience of the 20th century, and especially the second half of the century, would seem to put the more extreme version of these fears to rest. World population grew by the unprecedented factor of 3.6 over the 20th century. But every indicator of human advance-literacy and school enrollments per capita income, political participation, infant mortality, and life expectancy at birth- was vastly higher at the end of the century than at the beginning. The century with the fastest population growth in human history also had the sharpest advances in

human welfare. If population growth were an overwhelmingly negative factor in human well being, these gains could not have occurred or could not have been sustained. Improvements in institutions and advances in technology were clearly more than sufficient to offset whatever hazards were posed by rapid population growth. Nor did any striking cross-sectional associations appear between rates of population growth and rates of change of other social indicators. Malthus died sometime late in the 20th century and I think we should issue him a proper Brazilian death certificate here at the dawn of the 21st.

A second area where biology has been thought to place strict limits on human achievement is that of old age mortality. A century ago, many deaths at older ages were simply ascribed to senility or old age itself. The terminology reflected the assumption that breakdown was inevitable. A half-century ago, disease processes were much better recognized and distinctions were drawn between infectious and degenerative diseases or between exogenous and endogenous causes of death. The degenerative, endogenous processes were seen as intrinsic to the human species. Once the infectious, endogenous causes were removed, the "natural" human life table would be revealed.

Using this reasoning, Bourgeois-Pichat calculated in the 1950s that the maximum life expectancies to be achieved were 76 for men and 78 for women. In their 1968 population projections, the first to separately enumerate life expectancy, the United Nations set the limit to life expectancy, the value of life expectancy that could not be exceeded once it was reached, at 74.1 years. Japan has already shot six years beyond this limit.

The catalogue of projection errors is not limited to the UN. Many of the U.S. Census Bureau's mortality projections were outmoded as soon as they were issued. The value of life expectancy at birth in 2000 that was projected in 1973 had already been surpassed in 1975.

Nor does this kind of error necessarily cause us to change our ways. The U.S. Social Security Administration continues to assume that the pace of mortality decline in the 21st century

will be only half as fast as in the 20th, although Ron Lee has shown that the pace of change in the 20th century was remarkably constant.

Kannisto and Vaupel's careful reconstructions of old age mortality trends in Europe (SLIDE 5) reveal very steady and sizable advances, and no association between the level of mortality and its rate of change, an association that would suggest that we are close to bumping up against limits. (SLIDE 6) The next slide shows that declines in age- standardized death rates among states in the U.S. were no smaller for states that had the lowest mortality level to start with. (SLIDE 7) is John Wilmoth's time series of the highest ages at death recorded each year in Sweden- a series whose slope has actually increased in recent years.

Surely there must be some limits to life expectancy, just as solar energy must place some ultimate limit on food production. But the limits themselves are probably expanding with technological change, and we don't appear to be close enough to then to make the concept of natural limits useful in demographic analysis.

Let me try to pull this together in a very gingerly way. I think that some of the most important demographic surprises, some of the most important things that we've learned over the decades by careful attention to data and measurement, have had the effect of unleashing demography. That is to say, population processes appear to be less severely constrained either by nature or by economics than they once did. On the other hand, neither are they rootless and adrift. Rather, they are semi-autonomous, with a logic and momentum largely their own.

The internal logic of demography includes close connections between levels of child mortality and fertility, the enduring effect of childhood conditions on adult outcomes, the intergenerational transmission of health and status, the transmission of demographic experience across geographic, ethnic and class barriers, and, especially, the close connections between demographic knowledge and demographic behavior. Household's closest allies in their demographic behavior are science and the state, not machines and markets. And the engine

propelling this sector forward is nothing less than the Darwinian imperative for all species: to survive and reproduce.

As a critical and semi-autonomous sector of human society, population processes deserve semi-autonomous scholars who understand the sector and are well versed in its relationships. That's us. And as a critical and semi-autonomous sector of human society, population processes deserve to have their triumphs acknowledged. Tim Dyson has begun doing that in a thoughtful recent article about the contribution of population processes to improvements in human well being. Think of advances in women's status for starters.

And maybe demographers themselves deserve some credit for demographic advances. After all, economists get a great deal of credit for economic growth, even though few of them have done anything for an economy other than to recycle their large salaries. So think of John Hobcraft's central role in drafting the World Population Programme of Action in Cairo, or Jack Caldwell's claim that demographer and related specialists had a central role in "talking down" fertility rates in developing countries.

If any visitors from other disciplines have wandered in here tonight, let me assure them that not everything that happens in demography is surprising. One of the least surprising developments in all of the social sciences also belongs in the realm of demography. I refer to population aging. We thoroughly understand the components of this ponderous global process by virtue of the algebraic certitudes of formal demography- a wonderful refuge, incidentally, for those who don't like surprises. And we have convinced others that we know what we are doing- so much so that our predictions about the aging that will occur within three decades have created a sense of financial crisis in the U.S. and other advanced economies. This crisis is an awesome display of disciplinary power and we should relax and enjoy it to the fullest.

Now I have saved my best surprise for last. This is a short address and I am finished. Thank you for your attention.