AD322489

(6)

UNCLASSIFIED/LIMITED

DEFENSE TECHNICAL INFORMATION CENTER

UNCLASSIFIED/LIMITED

DEFENSE INFORMATION SYSTEMS AGENCY
DEFENSE TECHNICAL INFORMATION CENTER
8725 JOHN J. KINGMAN ROAD, SUITE 0944
FORT BELVOIR, VIRGINIA 22060-6218

UNCLASSIFIED/LIMITED

Policy on the Redistribution of DTIC-Supplied Information

As a condition for obtaining DTIC services, all information received from DTIC that is not clearly marked for public release will be used only to perform work under a U.S. Government contract or grant or for purposes specifically authorized by the U.S. Government agency that is sponsoring access. Further, the information will not be published for profit or in any manner offered for sale.

Non-compliance may result in termination of access and a requirement to return all information obtained from DTIC.

NOTICE

We are pleased to supply this document in response to your request.

The acquisition of technical reports, notes, memorandums, etc. is an active, ongoing program at the **Defense Technical Information Center (DTIC)** that depends, in part, on the efforts and interest of users and contributors.

Therefore, if you know of the existence of any significant reports, etc., that are not in the **DTIC** collection, we would appreciate receiving copies or information related to their sources and availability.

The appropriate regulations are Department of Defense Directive 5200.12, DoD Scientific and Technical Information Program, Department of Defense Directive 5230.24, Distribution Statements on Technical Documents, National Information Standards Organization (NISO) Standard Z39.18-1995, Scientific and Technical Reports - Elements, Organization and Design, Department of Defense 5200.1-R, Information Security Program Regulation.

Our **Acquisitions Branch, DTIC-OCA** will assist in resolving any questions you may have concerning documents to be submitted. Telephone numbers for the office are **(703)767-8040** or **DSN427-8040**. The **Reference and Retrieval Service Branch, DTIC-BRR**, will assist in document identification, ordering and related questions. Telephone numbers for the office are **(703)767-8274** or **DSN424-8274**.

DO NOT RETURN THIS DOCUMENT TO DTIC

EACH ACTIVITY IS RESPONSIBLE FOR DESTRUCTION OF THIS DOCUMENT ACCORDING TO APPLICABLE REGULATIONS.

UNCLASSIFIED/LIMITED

The Impact of Demographic Crisis on Russia's Future Economy

May 1999

Prepared by

Job C. Henning

S. Enders Wimbush

With Contributions from

Nicholas Eberstadt

Murray Feshbach

Vladimir Kontorovich

William Young

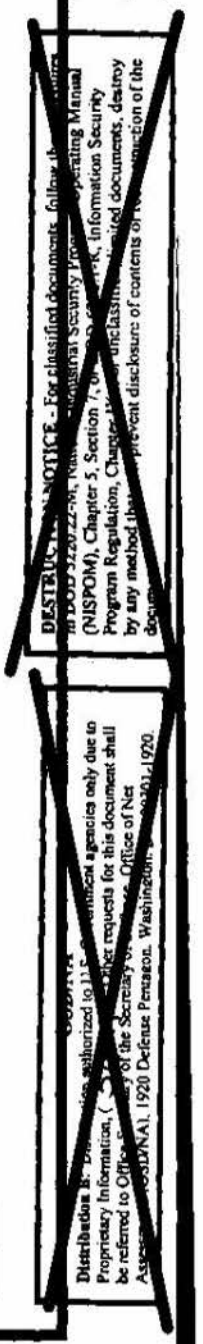
Advisor to the Secretary of Defense for Net Assessment

01-0851-04-8183-000

Contract #: DASW01-96-D-0002D.O.9

Hicks & Associates, Inc. 1710 Goodridge Drive Suite 1300 McLean, VA 22102 (703) 827-4728

The views, opinions, and/or findings contained in this report are those of the authors and should not be construed as an official Department of Defense position, policy or decision.



DESTRUCTION NOTICE - For classified documents, follow the ... Operating Manual (NISPOM), Chapter 5, Section ... Information Security Program Regulation, Chapter ... unclassified documents, destroy by any method that ... prevent disclosure of contents of the ... document.

Distribution ... agencies only due to Proprietary Information, ... other requests for this document shall be referred to Office ... of the Secretary of ... Office of Net Assessment, OSD/NA, 1920 Defense Pentagon, Washington, ... 1920.

20061003246

TABLE OF CONTENTS

APPENDICES

A. INTRODUCTION

Background

Russia's public infrastructure collapsed when the USSR disintegrated beginning in 1991. Since then little sustained economic growth has occurred, and little infrastructure has been rebuilt. Simultaneously, the Russia's society and economy entered a transitional phase of development in which liberalizing reforms were introduced and a rudimentary democratic system of governance and market economy began to emerge. Initially anticipated as a brief interlude before the restoration of public infrastructure and the revival of economic growth, original expectations appear to have been overly sanguine. Little growth has occurred, and little infrastructure has been rebuilt. Most recently in 1998, just at the point when most economists had predicted that the Russian economy would turn around, there has been a virtual collapse, with the Russian securities market losing over 70 percent of its value since the beginning of the year. This transition period has, in short, become a protracted period of turmoil, in which the process of reform has failed to usher in a new era of stability and prosperity.

This prolonged transition has been accompanied by severe deformations to the demographic condition of the Russian population. Fertility rates have dropped off sharply, and mortality and morbidity rates have escalated rapidly, at least until very recently. These phenomena combined to create what many experts believe to be a demographic crisis in Russia, which is characterized by negative population growth, vast sections of the population afflicted with debilitating diseases, and short life expectancy.

Objective

This project attempts to determine, first, if current demographic problems will hamper Russia's efforts in the next two decades to develop a viable, growing economy, and if so how limiting an impediment demography might be; and, second, to determine the costs to Russia over this period of having a population that may be short-lived, unhealthy and, perhaps, experiencing a decline in intellectual capacity as the result of persistent environmental and health problems -- that is to say what kind of "carrying costs" might be associated with a population with these negative demographic characteristics.

The project was sponsored by the Advisor to the Secretary of Defense for Net Assessment (contract #: DASW01-96-D-0002 D.O. 9), and initiated by Hicks & Associates, Inc./SAIC in Spring 1998. The complete study is entitled "The Impact of Demographic Crisis on Russia's Future Economy" and is available from OSD/NA.

Overview of Conclusions

While the project does not provide total answers to all of the questions it sought to address, it does offer some important insights on the nature and potential long-term effects of Russia's demographic crisis. For example:

- Russia's population in 20 years will be smaller than it is today, and Russia as a state will figure no higher than ninth, and probably lower, in terms of relative total population.

- The health of Russia's working population is diminishing rapidly from trends that cannot be easily or quickly reversed. Russia's health profile today is not that of a developed country, but rather of a Third World country that is faring poorly. Epidemiological data imply the outlines of a severe crisis that is just beginning and which will grow increasingly worse, causing potentially severe disruptions in Russian economic performance for the next several decades and perhaps beyond.

- Nothing suggests that Russia has either the political will or financial resources to reverse or mitigate these trends. Currently virtually no investment is directed at slowing, let alone turning around, negative demographic trends, and given Russia's dire economic situation, it is hard to imagine from where or when such investment might take place. Even if economic growth can be generated in the near term—an unlikely prospect—growth and spending on health infrastructure will not significantly retard the principal contributors to Russia's demographic morbidity. The effects of the crisis will continue to be felt long after Russia has passed through the most damaging phase.

- The correspondence between health and productivity is strong. In light of its probable future health problems, Russia's economy in 20 years may be smaller relative to other countries than it is today.

- Russia's demographic situation may be historically unprecedented in its severity, that is no historical precedents suggest where it might end, how it might be remediated or its ultimate impact on Russia's future economy. In short, history gives us few signposts for understanding Russia's dilemma.

- Traditional economic models may significantly overstate prospects for recovery and, hence, the viability of Russia's economy in the next two decade, while current demographic models may significantly understate the negative results of Russia's demographic decline for the same reasons.

Structure of the Report

The project employed four different approaches to determine the impact of demographic crisis on Russia's future economy: an economic approach, an demographic approach, an epidemiological approach and a historical approach. This report is structured to provide several levels of detail of the four different approaches. The final report provides a summary and a more detailed overview of each approach and its findings and conclusions; an assessment of the findings of each of the approaches, based on discussions at one-day workshop with a group of native Russian academics from a range disciplines, including history, sociology, and political science; and a set of conclusions and indicators that might assist in identifying the particular ways in which demographic change is likely to influence economic growth in Russia. The complete papers and data for each of the analytical approaches – prepared by Nicholas Eberstadt (American Enterprise Institute), Vladimir Kontorovich (Haverford College), Murray Feshbach (Georgetown University) and William Young (Science Applications International Corporation) – and an article written by Nicholas Eberstadt are included as appendices.

B. SUMMARY

This project attempts to determine, first, if current demographic problems will hamper Russia's efforts in the next two decades to develop a viable, growing economy, and if so how limiting an impediment demography might be; and, second, to determine the costs to Russia over this period of having a population that may be short-lived, unhealthy and, perhaps, experiencing a decline in intellectual capacity as the result of persistent environmental and health problems -- that is to say what kind of "carrying costs" might be associated with a population with these negative demographic characteristics.

We approached these problems using four different kinds of analysis: economic, demographic, epidemiological and historical. Many current economic studies of Russian reform are based on common assumptions that predict if Russia can implement reform, it will enjoy economic growth. The economic approach used here is based on a simple model that uses a limited number of variables from readily available data, as well as other traditionally "non-economic factors" that might be expected to play a role in the equation for Russian economic growth. Using statistical regression analysis, a relationship is identified between current economic growth and current standards of health. A second regression analysis of past standards of health and current economic growth indicates that there is no distinguishable relationship. This approach lends support to the notion that economic growth precedes demographic stability and rising standards of public health. Put differently, health and demographic stability appear to be lagging, not leading indicators. Countries are able to provide better health services to their citizens as a consequence of economic growth, which promotes more productivity, but it is not clear that initial economic growth is greatly hampered by unfavorable trends in morbidity, natality or mortality. In fact, low standards of public health are often present during the take-off stage of economic growth.

The economic approach theorizes about how demography might be expected to affect or be affected by economic growth. It concludes that there is a non-linear relationship between economic growth and demography, making it very difficult, if not impossible, to definitively identify directions of causality and to forecast accurately the magnitude of the effect of any interaction between economic growth and demographic change. This section also concludes that any effect that demographic change will have on economic growth will be only marginal and perhaps even incidental. This is especially the case with Russia, where many other variables, such as political instability and financial reform, have a more direct and substantial bearing upon economic growth. According to this perspective, then, the demographic crisis in Russia should not be expected to affect economic growth meaningfully.

The demographic approach to the crisis offers a different perspective on the data. While the economic model holds variables constant, the demographic approach attempts to identify how key variables may change over the period of inquiry, altering the types of forecasts that the economic model projects. Some changes in key variables, such as life expectancy rates, are found to have only negligible effects on the population parameters over the next two decades, thus not significantly altering the forecasts made by the economic model. In other areas, such as in the remediation of the causes of the crisis, the demographic model attempts to demonstrate that the economic model's forecasts are not plausible. Whereas the economic model predicts that rising economic growth—and subsequent public spending—will continue to reduce and eliminate these causes, the demographic model argues that the principle contributors to the mortality crisis—cardiovascular disease and external causes—will not be easily remediated by new spending on public infrastructure.

This changes the potential structure of the population in 2020. Finally, the demographic model identifies reasons why comparative analysis in the case of the Russian demographic crisis is of limited value, because the protracted nature of the crisis, the quality of life, and the age-standardized structure of the crisis all combine to make this crisis unique and less a candidate for rapid recovery than other historical instances. Because of the baseline comparisons used by the economic model in the regression analyses, this argument in the demographic model undermines, or at least qualifies, the validity of the economic model's findings.

The demographic approach also suggests that the concentration of the economic approach on the Russian social and economic system as a single homogenous unit obscures important variables, for example, the diverse impact of the demographic crisis on Russia's regions. This variation could have different impacts on economic growth in a way that an inquiry focused nation-wide would not apprehend.

The epidemiological approach offers no formal model. Rather, it tracks the growing volume of data from Russian and Western sources that characterize the morbidity of the Russian population and the long-term health consequences of this morbidity. Just as the demographic model critiqued the economic model on the value of comparative analysis, the epidemiological approach also makes the point that the Russian demographic crisis is unique from other historical precedents and is not comparable to these precedents in many ways. Unlike both the economic and demographic models, the epidemiological approach argues that—measurement problems notwithstanding—the qualitative dimension of public health is essential to understanding the Russian demographic crisis, both because the qualitative dimension reveals a potential decline in the productive capacity of the future work force and because it may contribute to excess mortality rates of the future work force. This approach identifies a range of qualitative factors, not reflected in life expectancy rates, that throw doubt on the more positive predictions of the economic approach. It notes, for example, the growing and accelerating seriousness of sexually transmitted diseases, poor nutrition, iodine deficiency, iron deficiency anemia, heavy metals pollution, rubella, and pesticides as causes of Russian demographic decline. Whereas the economic approach concludes that the demographic crisis is largely over, the epidemiological approach suggests that trends in morbidity that are currently evident are likely to continue to affect large parts of Russia's population. Moreover, few preventative or corrective measures have been taken by the Russian government, which is in no position to allocate significant resources to public health, and virtually no barriers to transmission are currently in place, making it likely that these trends could become even worse. The epidemiological approach notes, more than either of the other two approaches, the potential for a vicious circle between the demographic crisis and the Russian economy, as each impedes the other from improvement. Therefore, without knowing exactly how these negative trends will interact and influence future demography, we may anticipate that the demographic crisis will continue, and that the effects of this crisis on the economy will grow worse before the underlying conditions can be eliminated or remediated.

The demographic and epidemiological approaches suggest that the somewhat mechanistic optimism of the economic model needs to be qualified or discounted in the Russian case. Both of the former identify ways in which the economic model may underestimate both the dimensions of the factors causing the demographic crisis and the impact of the current demographic crisis on future economic growth. The historical approach uses a broadly inductive method to explore if and how demographic crises in states that have suffered profound social trauma (e.g., war) have affected efforts to recover economically. We have been unable to identify a clearly analogous historical

precedent, although the case of Spain after its civil war may come closest. Of the four cases that were chosen -- Germany and Japan after WWII, Spain after its civil war, and Korea 1945-73 -- each contains elements that reflect aspects of the Russian situation, but none of the cases individually adequately reflects the gravity of what Russia is experiencing.

C. Methodological Approaches

C.1 Economic Approach

Dimensions of the Crisis

The economic approach measures the dimensions of the demographic crisis, noting that its model uses life expectancy variables as proxies for human capital. It is assumed that other health-related factors will coincide with these life expectancy rates adequately enough to justify the use of this proxy. The use of this proxy avoids the difficulty of obtaining qualitative data on morbidity patterns and varying health standards, and at the same time makes use of data that is readily available and comparable across case studies in different countries and time periods.

The crisis is characterized by a fall in life expectancy at birth by 6.1 years between 1988 and 1994. Death rates of working age males increased by 50 – 100 percent in this period. Although the economic approach considers that these dimensions are severe, it argues that mortality rates are already improving, with male life expectancy regaining 47 percent and female life expectancy regaining 58 percent by 1997 of their last respective pre-crisis peak. The economic approach argues that traditional demographic forecasts have underestimated the speed of the recovery in Russia, with pessimistic 20 year projects already being reached within three years. Using these arguments, the economic approach makes the assumption that the mortality crisis in Russia has already peaked and will begin to reverse.

The economic approach notes that the Russian demographic crisis is not a specifically Russian problem, but a problem that has been experienced by all post-Communist countries to differing extents. Although the intensity and longevity of the Russian crisis far surpasses those of other roughly comparable central European examples, the economic approach argues that the nature of the Russian crisis is essentially the same.

Causes of the Crisis

The economic approach analyzes the driving forces behind the Russian demographic crisis. By disaggregating the increases in mortality rates according to causes of death, the economic approach reveals that the crisis is being driven by cardiovascular diseases (contributing 36 percent) and external causes (38 percent).

Surprisingly, cancer plays a small role in the mortality increase, accounting for under one percent of the total excess mortality. This approach makes the assumption that cancer is the only likely manifestation of environmental pollution, and therefore rules out the possibility that environmental factors have played any significant role in this crisis. Although it is admitted that radioactivity presents dangerous problems to local populations throughout Russia in specific areas, it is noted that these concentrations of radioactivity are in low-population centers and therefore do not significantly affect nation-wide mortality rates.

Given this structure of the mortality rates, the approach concludes that the causes of the crisis are not related to environmental or public health factors, but are a direct result of the social turmoil that followed the end of the Soviet Union and the transition to a market economy. In no way does this

approach explain the demographic crisis as a cause of the current economic crisis. Only after the economic crisis had begun did the demographic crisis occur.

Because the economic approach adopts a positive bias, for reasons that are exogenous to this model, about the prospects for future economic growth, it concludes that the transition period will soon come to an end and the stress and social turmoil characterizing the transition period will cease, thereby reducing mortality rates and reversing the demographic crisis.

Political Dimensions of the Crisis

The economic approach notes that life expectancy has not been a political issue in Russian voting habits, as revealed by polling data, and suggests that this issue is not now likely to register with voters as the nadir of the crisis as already passed. Using an historical perspective, the economic approach notes that Russian people never have had a long life expectancy and that it would be unusual if the Russian people suddenly began to demand improvements in life expectancy through their political process. At the same time, it is acknowledged that economists are ill-equipped to measure a social phenomenon like rising voter expectations, and without further sociological research it would be hard to rule out the possibility that this issue could in the future enter the political process. Currently, though, there are so many immediate issues more directly related to survival to which voters pay more attention that the issue of life expectancy has low priority.

"Carrying Costs"

According to this approach, the demographic crisis does not entail any "carrying cost" for society. This conclusion contradicts the intuition that a relatively short-lived, sickly population imposes costs on a society. The metaphor of "carrying cost" is appealing, because it derives from individual experience. An individual paying for health care out of his or her own resources incurs higher costs when he or she is ill rather than healthy. However, this relationship does not necessarily hold across individuals. Richer individuals typically spend more on prevention than poorer individuals spend on cures. In such an instance, the "carrying cost" of health would then turn out to be greater than that of disease.

In the case of the Russian population, there is a differentiation in mortality rates across income brackets. The impoverished and lower income brackets have suffered the most, accounting for the majority of the increase in mortality rates, while the very high income brackets account for much less of this increase. Using mortality rates as a proxy for general health conditions we can infer that these poorer sectors of society experience the worst health conditions. Precisely because these sectors of society are poor, they will consequently be able to spend very little on themselves to remediate their bad health.

Furthermore, because public health has not emerged as a political issue, the political process has not allocated spending to restore the public health system. Therefore, because the public sector has not prioritized the public health system for public spending, bad health conditions will not necessarily impose a direct "carrying cost" upon the society.

Finally, as this approach demonstrates below, a condition of bad health is not incompatible with economic growth. Judging from a range of statistics, economic growth has occurred out of similar circumstances elsewhere in different time periods. In fact, life expectancy in Russia is already higher than it was in the past in most other countries that have since experienced rapid growth.

Economic Implications of the Demographic Crisis

This approach predicts that the demographic crisis does not present an obstacle for future economic growth. Using extensive statistical correlations, the economic approach demonstrates how current levels of health and current levels of productivity are heavily correlated. However, by doing another set of correlations between past levels of health and current levels of productivity, this approach reveals the absence of significant correlation. On the basis of these tests, the approach argues that the direction of causality runs from rising productivity to rising standards of health, and not the other way around. That is, economic growth is the cause of better standards of health; standards of health do not determine economic growth.

With this model of the relationship between economic growth and standards of health, the economic approach makes the argument that in the case of the Russian demographic crisis, poor standards of health do not necessarily present a concern for future economic growth. Given the statistic indicators, poor standards of health are not inconsistent with subsequent economic growth. In fact, Russia's standards of health, while poor, are better than the standards of many modern industrial countries were during the period of industrialization. In theory, at least, Russia's demographic crisis could continue or even worsen, and it would still not be inconsistent with the possibility of future economic growth. For example, American life expectancy fell from 1790 to 1850, but there were no declines in GDP to parallel these decreased health conditions. British life expectancy fell drastically from 1830 to 1850, and there was not only no commensurate economic decline, but there was a period of very rapid economic growth during and following this demographic crisis. On the other hand, neither are relatively high standards of health a recipe for economic success. In Sri Lanka, for the example, life expectancy began to rise, but productivity did not follow.

The economic approach anticipates that productivity will rise naturally, for other reasons unrelated to demography, and that as productivity rises, the demographic crisis, which according to this model has already ended, will rapidly reverse. This approach describes a possible nonlinear relationship that may exist between standards of health and productivity in that once productivity has begun to cause standards of health to improve, the rising standards of health may in turn fuel the increase in productivity.

Finally, this approach concludes its estimation of the minimal impact of the demographic crisis on future economic growth with a qualitative case study analysis of Russian budgetary priorities. This approach predicts that the Russian economy will see very few budgetary resources allocated out of the economy—that is, away from being directly employed in productive processes—towards remediation of the crisis for two principle reasons. First, the standards of living and general health conditions have been historically very low in Russia. Life expectancy rates in Russia have generally been depressed below levels enjoyed by countries with comparable GDPs and population sizes. With historic expectations set so low, it is difficult to imagine that they would suddenly rise and the polity would demand a disproportionately greater amount of budgetary resources be allocated towards improving standards of health. Second—on a related issue and as noted above—standards of health have not become a political issue in the Russian political process over the recent period of economic transition. Now that it appears the demographic crisis has bottomed out, it is even less likely that voters and interest groups will suddenly demand that health conditions be addressed with significant budgetary allocations. Therefore, in addition to the model based on statistical correlation, which indicates current Russian demographic trends are not inconsistent with future economic growth, the economic approach also argues that qualitative dimensions of the Russian political

process also mitigate against the possibility of the demographic crisis having adverse effects on future economic growth.

C.2 Demographic Approach

The demographic approach attempts to discern the impact of the demographic crisis on future economic growth. The demographic approach accepts the model established by the economic approach as a point of departure. Although the demographic approach sees the strong possibility that Russia will experience substantial economic growth by 2020, it also identifies many reasons why Russia may not necessarily be able to achieve this growth. Critiquing the foundation of the economic model, which is based on a comparative analysis with other countries, the demographic approach highlights the unusual characteristics of the Russian demographic crisis that set this crisis apart from other historical precedents. The demographic approach addresses the ongoing "transition" period that continues to plague Russia, the chronic nature of the health and mortality problems facing Russia, and the deterioration over time of the Russian cohort-based mortality schedules. The demographic approach notes that the health parameters for the 2020 workforce have largely been set already and, judging from key data, these parameters are not good.

Estimation of Total Working Population in 2020

In estimating the total working population in 2020, the demographic approach explores two different assumptions. First, it entertains the assumption adopted by the economic approach, which is that the demographic crisis has bottomed out and that now life expectancy in Russia will rise. Second, it investigates the alternative assumption that has not been considered that life expectancy in Russia will remain low through much of the period leading up to 2020. The counter-intuitive conclusion drawn from this exercise is that both assumptions generate similar total populations in 2020. The second assumption results in a mere 4 percent decline from the total population estimated using the first assumption. The only important difference is that the second assumption would result in a significantly larger level of pensioners in the total population than would follow from the first assumption. The demographic approach concludes that the two different assumptions only have a small impact on the total 2020 working force population, and, therefore, life expectancy will not necessarily lower Russian economic growth potential within the parameters of this study.

In addition to estimating the total working population in 2020, the demographic approach attempted to also estimate the quality of health of this working population—a measure that might further offer the opportunity of analyzing the interplay between health levels and economic performance. After considerable effort, this approach reluctantly concluded that such newly developed techniques proposing to quantify "health status" are unworkable and could generate unreliable or even misleading results.

The Harvard School of Health's "Disability Adjusted Life Year" (DALY) is a synthetic measure for the health of a population that combines actually measured mortality with an estimated figure representing the "mortality equivalent" of the illnesses and disabilities afflicting the population in question. DALY is plagued by the difficulty of obtaining accurate information on the actual incidence and severity of the entire range of illnesses and disabilities besetting a given population and by the difficulty of scaling these illnesses or disabilities so that they may be measured in "mortality equivalents." While DALY is a useful heuristic device, the demographic approach was unable to reproduce its results

The REVES technique builds contingent life tables for a variety of health statuses, based upon the calculated probability of surviving from one given age to the next without suffering from the negative health outcome under consideration. While the data is available for this technique, the interpretation of the calculations is subjective, limiting comparability between countries.

Uniqueness of Russian Case

The demographic approach acknowledges the validity of looking at statistical analyses of other historical precedents in attempting to determine the prospective impact of the Russian demographic crisis on economic growth. At the same time, however, the demographic approach points to how the Russian demographic crisis differs from the demographic crises that occurred in the historical precedents that generated the data used by the economic approach.

Data was taken from mid-nineteenth century Britain and mid-nineteenth century United States. At this time, both countries were entering a stage of rapid industrialization.
First, rising mortality rates were very closely connected to rapid urbanization that occurred simultaneously with industrialization. That is, the very cause of rising mortality is the effect of economic growth. Second, the labor demands for an early-industrializing economy are much different than they are for both the type of economy found in Russia today and the type of global economy in which Russia is situated. In the 19th century heavy labor would have been in greater demand, with less emphasis on education, skill, concentration, and precision. In a post-industrial economy, there is much greater emphasis on education and skill. The workforce has to be able to perform more specialized functions. Poor health could more easily impair a workforce in the performance of these specialized functions. Third, the social environment during the 19th century permitted and accepted different standards of living than will be accepted at the end of the 20th century and into the 21st century. Britain and the US in the 19th century had societies that permitted labor conditions that would be considered egregious in comparison with contemporary standards. In a 20th century world society, even in Russia where social standards are generally very low, labor conditions will be subject to some degree of social criticism and social pressure. This criticism and pressure will be translated into political response at some point. A potential example includes the striking miners in Russia; protesting working conditions and payment arrears, these miners are demonstrating, blocking trains, and holding up economic activity. To settle the issue, the Russian government will be obligated to make some budgetary allocations to redress the situation. In a 19th century economy, either the workers' grievances would have been unheard or suppressed.

The structure of the demographic crisis in Russia also makes it a unique case. Using age standardized death rates for the working age population (25 – 64 years old), the demographic approach discovered that Russia in 1994 ranked twice as high as Japan did in 1950. These age standardized death rates indicate that, while overall Russian mortality rates are similar to other historical precedents, the structure of the Russian demographic crisis may make this incident less predisposed towards economic recovery than these other precedents. With a greater concentration of mortality increases located in the productive sector of the population—and subsequently with a greater proportion of the total population in unproductive sectors of the population (childhood or retirement)—Russian productivity will decrease, while economically unproductive spending will increase, thus potentially impeding economic growth.

Furthermore, the structure of contemporary Russian mortality rates indicates that the demographic crisis in Russia differs so significantly from other historical precedents that a meaningful comparison

is not possible . From 1987 to 1994 the age-standardized mortality rates for Russia's men jumped by over 40 percent. Contrary to popular impression, the disaggregation of this increase in mortality rates reveals that, unlike other historical precedents, the breakdown of public infrastructure is not immediately nor directly responsible for the Russian demographic crisis. In fact, infectious and parasitic diseases are essentially incidental to the crisis, accounting for less than two percent of the mortality upsurge. Surprisingly, cancer plays a small role in the mortality increase, accounting for under one percent of the total. The two categories that contributed the most to the mortality increase are cardiovascular disease, 36 percent, and "external causes", 38 percent, (e.g., alcohol-related incidents, murder, and suicide). Unlike the historical precedents, a reconstruction of the public infrastructure, while certain to benefit the condition of public health in Russia, will not single-handedly bring an end to the mortality crisis. Cardiovascular conditions tend to be cumulative, in the sense that they are influenced by past health insults over a lifetime, and worsened by social factors like shock or stress. External causes tend to be heavily influenced by behavioral and lifestyle factors. The fact that together cardiovascular disease and external causes account for nearly 75 percent of the total increase in mortality rates in Russia indicate that the current demographic crisis is linked to a history of negative health conditions that have been exacerbated by contemporary social conditions.

Driven by these types of causes, the Russian demographic crisis is unlikely to experience a quick reversal. Medical interventions to reduce cardiovascular deaths are intensive and expensive. Due to the chronic nature of cardiovascular problems, moreover, a strategy to reduce cardiovascular mortality—even if completely embraced, adequately funded and competently implemented—will show results only gradually over time. As has been demonstrated by the protracted period of transition, a normalization of the Russian economy and society has proven to be much more elusive than anticipated and is not now on the immediately foreseeable horizon. Without a social and economic normalization, not only will cardiovascular risks remain high, but deaths from external causes are also unlikely to decrease. An effective campaign to reduce death from external causes would also require massive behavioral changes on the part of the Russian population—especially a radical drop in the prevalence of heavy drinking. While this would by no means be impossible to achieve, it would presuppose that the Russian government pursues a very different set of policies toward hard spirits from the ones it embraces today. Given the Russian budget's heavy current dependence upon revenues from sales of vodka, altering the country's alcohol policy would seem all the more challenging. Therefore, it can be inferred that the Russian demographic crisis is not likely to see a rapid amelioration, and depending upon future social and economic conditions, could actually increase in magnitude if the situation deteriorates.

At best, the demographic approach predicts the possibility of a gradual return to previous levels of life expectancy in Russia, but this best-case scenario—a scenario much worse than the best-case scenario envisioned by the economic approach—would only be possible if Russia began immediately designing and implementing health intervention strategies and if these strategies had a significant impact. This best-case scenario also assumes that a number of looming diseases, such as AIDS and environmentally-induced illnesses, will never attain epidemic proportions.

By questioning the economic approach's assumptions about the nature of the data from the Russian demographic crisis and the tractability of this crisis, the demographic approach qualifies the validity of comparing the Russian case to other historical precedents and, subsequently, undermines the basis for arguing that the Russian case should not be expected to negatively affect economic growth.

C.3 Epidemiological Approach

The epidemiological approach takes a different perspective on the Russian demographic crisis. Whereas the economic approach looked at the crisis as a phenomena that had already bottomed out and would not affect economic growth potential, and the demographic approach pointed to aspects of the crisis which may make it unique and less likely to quickly disappear, the epidemiological approach provides a general survey of the landscape and suggests that the crisis is very grave and will have as of yet unforeseeable effects on future Russian economic growth.

The epidemiological approach focuses on the dual problems of declining birth rates and the extremely poor health of the younger generation. While this approach does not offer a conclusion *per se*, it does pose important questions about the actual magnitude of the demographic crisis and how this will affect population parameters; the potential for nonlinear growth of the crisis, should two or more factors interact with each other; and the quality of health of the younger generation and how this will impede their ability to function in society. In addition to posing these important questions, this approach also highlights the concept of a "vicious circle" in Russia between the demographic crisis and economic growth and political stabilization. The demographic crisis contributes to the political and economic crisis; the demographic crisis also cannot be really remediated unless political and economic stabilization takes place first. This "Catch-22" will be exceedingly difficult to resolve, and because of the circularity of cause and effect, the actual implications of the demographic crisis will be difficult to predict. Perhaps the most important result of this approach, however, is the important question: if current negative demographic indicators continue or worsen, as this approach concludes they are likely to do, will the Russian society and economy be able to cope with this crisis or will it impose unsustainable costs that will prevent recovery?

Population Size

The epidemiological approach disagrees with both the economic approach's conclusion that the demographic crisis is over and the demographic approach's projection of population size in 2020, arguing that there are many factors and trends that make it very possible that the crisis could continue or worsen and that the population size will actually be much smaller and that its health will be generally much worse than anticipated by the other approaches.

The report concentrates on the decline in birth rates. The other approaches did not address this issue in detail because of the 2020 end date for this study. At present, the majority of the future Russian workforce in 2020 is already born, making birth rates less relevant to this study. However, as noted above, this epidemiological approach attempts to provide this study with a general survey of the Russian demographic crisis. By emphasizing the directions in which key variables are moving in the crisis, instead of making a "snapshot" prediction of how things might look in 2020, the epidemiological approach offers a rich image of the crisis and incorporates the movement, dynamism, and ultimate unpredictability of this crisis and its effects.

A second justification that the epidemiological approach uses to argue that this study must look at the issue of births is related to the burden that excessive birth defects and gynecological diseases will pose on the economy of 2020. Although almost the entire working population of the Russian economy in 2020 is already born, the entire population which the economy in 2020 will have to support is not. If current levels of birth defects continue or worsen, this will produce a substantial

burden for the economy of 2020 in terms of increased health and social costs for child care. The epidemiological approach references a broad literature of statistics that portray the ways in which congenital birth defects are reducing the physical and mental competency of the population. A tertiary effect of sterility could also be a substantial reduction in the quality of health of the population of women in 2020, especially if the causes of sterility are untreated as they are likely to be. This could also impose a burden on the economy, as well as potentially contribute to excess mortality.

In addressing the decline in birth rates, the epidemiological approach notes the alarming rates of infertility among Russian couples. The other approaches consider that, even if declining birth rates are not relevant to this study, they are an expected phenomena, often experienced in countries during an economic transition when there is a great deal of uncertainty about employment and economic welfare and often found in countries that are moving towards a post-industrial economy. The epidemiological approach, on the other hand, notes that this is probably an unwarranted assumption, given the central contribution that rising rates of sterility—and not conscious individual choices – are making to this decline.

Sterility is being caused by a variety of environmental factors and gynecological and reproductive diseases. According to one estimate, the rate of infertility in Russia is as much as 20 percent of all couples, 5 times the world average. The epidemiological approach notes that gynecological disease has grown 300 percent among younger women since 1991. Syphilis alone, which can lead to sterility, grew to 450,000 new cases in 1997 (an official account that is greatly understated, but which is still 100 times the rate of the US). A range of other gynecological diseases are threatening both mother with sterility and child with both sterility and birth defects.

This report concludes that declining birth rates should not be ignored precisely because of the factors which are causing them to decline. Sterility and birth defects resulting in still-births will have long-term and unpredictable effects on the demographic crisis. Without treatment, something unlikely to be provided by the current public health system, these gynecological diseases will only growth worse.

The author of the epidemiological approach makes several arguments why most approaches underestimate the dimensions of the Russian demographic crisis and how this crisis will affect the size of the future population.

First, using a range of statistics, he argues that the current demographic crisis is not an isolated incident, but part of a much longer running trend dating from 1965. After World War II, the Soviet health care system improved rapidly, on par with other western countries until the mid-1960s, when it entered a period of stagnation. From 1965 onward, life expectancy rates indicate that health conditions entered a period of sustained decline. In the 1980s, the social policies of First Secretary Gorbachev—most notably his anti-alcohol campaign—played a role in slowing down this decline throughout much of the decade, but with the collapse of the Soviet Union in 1991 and the onset of the prolonged period of transition, this decline in health conditions returned. With this history of poor health conditions and with this steady decline in life expectancy, this article argues that the general population will continue to suffer from low life expectancies. Far from being an aberration, however, the epidemiological article argues that the health conditions and statistics characterizing the post-communist "transition period" may represent more a return to "business as usual" than a sudden and isolated crisis that will quickly and naturally disappear. This perspective generates the

possibility of far more pessimistic population estimates for 2020 than those produced by the economic and demographic approaches.

Second, in a related vein, the epidemiological approach argues that individual behavior and life styles are the prime factors driving cardiovascular disease—the leading cause of death and the leading increase in mortality rates -- over the long term. These behaviors continue uninterrupted. In fact, there is nothing to indicate that such factors as diets, alcohol consumption rates, and smoking have changed. After the brief reprieve achieved under Gorbachev through the anti-alcohol campaign, pernicious habits have returned to the usual rates that characterized the period from 1965 to 1980. Although such habits as alcohol consumption are unusually high during the post-communist crisis, even a "decline" to rates similar to those experienced before Gorbachev would continue to generate a high risk of cardiovascular disease in the population at large. Granted that in order for cardiovascular disease to contribute to excess mortality, past behavior would have to interact with other factors like stress or shock, but in the absence of any clear indicators that the Russian economy will rapidly and unequivocally emerge from crisis and stagnation, the intensity of such factors like stress and shock are simply unknown. Again, the epidemiological approach introduces a greater degree of uncertainty about 2020 population estimates than is described in the economic and demographic approaches.

Third, the epidemiological article argues that the impact of environmental degradation on current and future Russian demography is under-represented in the economic and demographic approaches. This under-representation potentially skews the population estimates for 2020 and the evaluation of the impact of the demography crisis on the economy.

On the one hand, the epidemiological approach argues that simply looking at cancer rates is an insufficient means of measuring the impact of environmental degradation on Russian demography. There are a range of other causes of death that could result from environmental degradation. Without controlling for these other causes of death, it is not possible to accurately measure the role of environmental degradation in the crisis, nor forecast the impact of this factor on the population in 2020. In addition to having a direct affect on mortality rates through precipitating causes of death that do not fit under the rubric of cancer, environmental degradation also may have a substantial indirect affect on mortality rates. For example, the epidemiological approach suggests that in a number of regions in Russia, the underlying etiology of illness from all environmental hazards may be as much as 50 percent. In the main report produced by the epidemiological approach, there is a section on heavy metals in the atmosphere, soil, and drinking water. This section highlights how such environmental degradation is responsible for mental retardation, nervous diseases, allergies, infectious diseases, bronchial pathologies, disruptions in mental and physiological development, and birth defects. Normal reporting standards on environmental degradation as a cause of death do not record these instances as related to environmental causes, and are therefore biased towards underreporting the impact of environmental degradation on demography. Both the economic and demographic approaches also omit the large burden that environmental degradation is likely to impose on society and the economy in terms of disabling or impairing large portions of the population.

On the other hand, the epidemiological approach argues that even if research is to look only at cancer as a means of identifying the impact of environmental degradation on Russian demography, it would be erroneous to use contemporary statistics in arguing that this degradation could not significantly affect the population size in 2020. The types of environmental degradation that would

cause cancer often have delayed effects. While it is true that environmental degradation has existed in Russia for many years and is therefore likely to have already influenced cancer rates, this perspective makes the assumption that the effects of environmental degradation are constant. This, in fact, may not be a reasonable assumption, given the disruptive forces at play in society during and immediately preceding the end of the Soviet Union. With the collapse of infrastructure and the sudden absence of adequate funding for the operation of the military, the rate of environmental degradation is likely to have experienced a sharp increase during this period. There is also reason to believe that environmental effects during the transition period are lower than they will be once industry begins to function again and rises to former levels of production. Ironically, industry has done less to pollute the environment during the transition period because it was operating at minimal levels. When production resumes, hazards will grow, unless the entire production system is revamped with environmentally sound equipment. Given the extreme costs of making industrial production environmentally sound, it is unlikely, in the press to commit the maximum amount of resources to investment in commercial infrastructure, that society will pay adequate attention to investing in environmentally friendly techniques. Further research would be required to test these hypotheses and to identify potential rates of increase in the negative effects of environmental degradation on demography.

Fourth, the epidemiological approach advocates that the role of infectious diseases is under-represented in the demographic approach's analysis. The demographic approach does not entertain the possibility that infectious disease could develop into epidemic proportions, thus potentially having a significant impact on the parameters of the total Russian population in 2020. Both the economic and demographic approaches rely upon contemporary data that indicates infectious diseases are contributing very little to the excess mortality rates. These approaches use this fact to argue that infectious diseases will not be able to seriously impact total population parameters in 2020.

The epidemiological approach, however, strongly disagrees with this perspective, noting that this argument requires that an assumption be made to hold the effects of infectious diseases constant between the present day and 2020. This assumption brings up the issue of nonlinearity, a subject that the conclusion of the epidemiological approach's main report broaches when it extrapolates on the "cumulative effect" of the factors contributing to the demographic crisis. The epidemiological approach states that, because these factors are occurring simultaneously, there is little evidence that would suggest that the effects of any of these factors can be held constant. In the case of infectious diseases, it is more likely that these factors will have a dynamic and nonlinear impact on total population parameters. The epidemiological approach notes that the breakdown in the public health infrastructure seems to be having a substantial effect on the spread of infectious diseases. Continued inadequacies in the public vaccination program produce avenues through which infectious disease could spread rapidly to unforeseen proportions. This is a point that is also clearly made in the epidemiological approach's main report, in which the enormous amount of cases of Rubella—170,000 in 1996—is cited as evidence of a total breakdown in vaccination programs and the immediate dangers that such breakdowns present.

Other factors that might effect the impact of infectious diseases on total population parameters include the spread of HIV and of tuberculosis. It is generally acknowledged that HIV as a cause of death is underrepresented in contemporary reporting. Often HIV may be an underlying factor that is not diagnosed as the primary cause death. Without the public education programs that have been implemented in the West, it is unlikely that Russia will be able to wield the same degree of control

over the spread of HIV. While even according to worst-case scenarios, the spread of HIV alone will not dramatically alter the total population parameters for 2020, if HIV combines with other highly infectious diseases, such as tuberculosis, the effects could conceivably be large.

Both in the article and in the main report the epidemiological approach also notes that the role of tuberculosis in Russian mortality rates could change due to exogenous political decisions. Currently, the Russian government is considering the release of 400,000 prisoners into the general population. It is known that tuberculosis is rampant within this prisoner population and if this group is released into the public, each infected prisoner could spread the disease to 10 to 20 other people. Such unforeseen political decisions could significantly change the effect that infectious diseases have upon the total population parameters in 2020.

Quantitative vs. Qualitative Measurements of Russian Labor Force

The other two approaches declined to analyze the quality of health of the population due to difficulties with measurement techniques, choosing to instead treat life expectancy as a proxy for morbidity. The epidemiological approach, on the other hand, found that it was essential to address this dimension of the crisis precisely because it was so acute and because the life expectancy variable isn't necessarily closely correlated with all levels of morbidity.

By using statistical evidence and anecdotal comments from leading Russian health officials, the epidemiological approach describes a range of factors that are having an extremely negative impact on the collective health of the Russian population. Although this method doesn't generate results that can be used in a comparative analysis with other countries, it does offer valuable insights into the real condition of the Russian population and provides an arresting alternative to the scenarios laid out by the other two approaches. This alternative scenario contains a younger generation which has such a low level of quality of health that its members' ability to function normally in the society and economy is seriously impaired. This generation ends up being a burden on the Russian economy, further inhibiting the possibility of economic growth.

Referencing the health of military recruits as a rough way of gaining insight on the health of general population, the epidemiological approach notes that the general health of the labor force is poor and could further deteriorate. One-third of the military recruits were declared "unfit" for service. Even allowing for bribery and corruption of officials, this level is very high and is likely to be indicative of larger trends in the society.

The epidemiological approach notes how many deficiencies in the public's diet adversely affects the public's health and inordinately affects the health of the younger generation. Currently there is virtually no production of iodized salt in Russia. Iodized products from eastern Europe that were previously imported to Russia are now being sold on other markets. Without iodine, hypothyroidism can occur and, if not detected and treated within months of birth, can lead to mental retardation. A UNICEF quotes a study that links iodine deficiency to the lowering of IQ in Georgia by 500,000 points in the 50,000 babies born in 1996. The spread of iron deficiency negatively impacts the health of the fetus, as does Vitamin A, B, and D deficiencies, which can lead to blindness and problems with the immune system, convulsions and psychiatric disorders, and poor bone formation respectively. All of these deficiencies, together with malnutrition, impair the ability of children to learn and develop.

The epidemiological approach argues that these changes in the quality of life are essential to understanding the impact of the demographic crisis on future economic growth, noting that labor productivity is inextricably linked to the health and competencies of the individual worker. Population size alone is an incomplete method of estimating economic potential, as economic production is a function of total working population and productivity per working individual. Without understanding what the possible productivity parameters would be—something that could be better understand with the use of qualitative data about the quality of life—the total population parameters only provide partial insights into the impact that the demographic crisis might have on the Russian economy in 2020.

Measurement Techniques

The epidemiological approach takes issue with the nation-wide measurement techniques used by the economic and demographic approaches. Although nation-wide measurements are essential for comparative analysis and for broad indicators about the health of a society, in the case of Russia, it makes more sense to adopt a measurement approach that gives more attention to regional differentiations.

This is important for several reasons. First, measuring health trends by region makes more sense because there are many acute influences on demography, such as environmental degradation, that may severely impact the demographic situation in a particular localized area, but, when averaged into the nation-wide statistics, does not register as significant. National averages may be less important than knowing where acute factors are influencing demography. Some regions will generate more severe political and economic reactions than others.

Second, measuring health trends by region makes more sense because Russia is not a homogenous country, with evenly distributed industry and population centers. Industry, the backbone of the economy, is located in very concentrated geographic areas across Russia. Population centers are clustered in very localized regions, such as the northwest and the far southeast. Therefore, analyzing the impact of a nation-wide trend in demography on nation-wide economic growth may be misleading. For example, if the total population in Russia in 2020 stays around the current level of 147 million, as forecasted by the demographic approach, the precise impact of this demographic situation on the economy cannot be ascertained, unless it is known where this population is distributed. If the population stays the same and maintains the same distribution, then it may be possible to estimate how this will impact economic growth. If, on the other hand, the total population remains the same, while large internal demographic shifts occur from the current population centers to rural regions, or vice versa, the nature of this impact on economic growth could be quite different.

"Carrying Costs"

The epidemiological approach takes issue with the economic approach to "carrying costs", suggesting that if the quality of life continues to remain low or even falls further, there could be significant "carrying costs" incurred, drawing greater levels of resources out of directly productive employment in the Russian economy, thereby inhibiting the prospects for economic growth in Russia.

The epidemiological approach focuses especially upon traditionally non-economic costs, such as the quality of human capital and the ability of people to function responsibly and competently in the workforce.

"Vicious Circle"

The issue of "carry costs" raises the question of the vicious circle. Most of the public health hazards identified by the epidemiological approach need to be addressed by the public health system. In the current economic and political situation, it is unlikely that the public health system will be financially or politically able to allocate sufficient resources to redress these problems. Likewise, the economic and political situation is negatively affected by the poor levels of public health. The low quality of life in the younger generation will negatively impact prospects for economic growth by reducing their productive capacities and increasing the burden they place on the rest of the economy. If mortality rates should remain high or continue to rise, this could cause the current, struggling economy to contract even more over the next 20 years. One is forced to conclude that it will take some sort of exogenous force to break the causes and effects of this vicious cycle.

The final and most important question that the epidemiological approach report poses is "will the Russian economy and society be able to bear the burden of this vicious cycle"? Will a positive exogenous shock occur and lift the economy out of a downward spiral, or will disaster of the demographic crisis, along with many other factors, continue to pull the Russian economy downward? The recent events in Russia do not suggest a promising answer to this question. With the Russian stock market down by 78 percent this year and still falling, there seems little prospect of a positive exogenous shock.

C.4 Historical Approach

This section of the study attempted to gain insight into the issue of how demographic crises can or have affected economic growth potential in the past by looking at historical precedents of what actually happened when countries experienced conditions similar to those existing in Russia. By using a broadly inductive approach, this section of the study helped to drive research and stimulate thinking on the link between demography and economy.

The first caveat that needs to be affixed to the beginning of this study is that no clearly analogous historical precedent was identified. Of the four cases that were chosen, each case contains elements that reflect aspects of the Russian situation, but none of the cases individually adequately reflects the gravity of what Russia is experiencing.

For example, all of the four cases involved a major war in recent proximity to the demographic crisis. Three out of four of the cases saw these demographic crises end shortly after the cessation of conflict. Russia's upsurge in mortality, by contrast, is taking place in a country in a formal state of peace, and there is no foreseeable event—or end of an event—that would bring the demographic crisis to a natural closure. Three out of four of the cases took place within a three year period, whereas the Russian incident has now lasted for more than twice that amount of time already and, with the exception of the 1980s, can even be seen as part of a protracted 35-year decline. All of these differences make the Russian demographic crisis much different, and less conducive to rapid post-crisis recovery, than any of the cases chosen here.

The three cases that most closely represent the Russian situation are described below:

Germany

In the case of Germany after World War II, there was a dramatic demographic crisis, almost entirely caused by direct and indirect losses incurred during the war, followed by rapid stabilization and very high post-war fertility rates as Germany began to rebuild.

Because of the abrupt end to the demographic crisis and the subsequent reversal of that crisis, there are few direct analogies that can be drawn to the Russian case. However, one interesting finding in the German case is that there was a direct correlation between caloric intake and the success of economic and political reforms. As the population approached starvation, reforms were not implemented. As food was distributed and made readily available, first through aid distribution networks, and then soon after through local agricultural production, reforms immediately began to succeed. This common sense finding supports the idea, at least through analogy, that the welfare of Russian people will be important to the success of reforms in Russia. Although starvation is not a wide-spread problem in Russia, the low standard of individual wealth, especially as manifested in standards of health, can be thought of as constituting such a problem. In this sense, it can be envisioned that low standards of health could produce an indirect negative effect on future economic growth by slowing down the process and success of reform.

Japan

Japan also experienced a dramatic demographic shock as the result of the war. As in Germany, disease and famine threatened the success of economic and political reforms. Only when individual welfare was raised above a certain threshold did economic and political reforms meet with success. This further supports the notion that individual welfare is related to economic growth potential.

It is of further interest in the case of Japan that the raising of standards of individual welfare was the result of actions taken by an external, international organization, the US Military Government (USMG). This international intervention was crucial in ameliorating the situation in Japan; without this stabilizing force, which allocated humanitarian and technical assistance to the Japanese population as it was recovering from the devastation of World War II, it is readily conceivable that standards of individual welfare would not have risen, at least not nearly as rapidly and, subsequently, economic and political reforms would have occurred much more slowly, if at all, impeding the prospects for the prodigious economic recovery that Japan eventually experienced. From this example, it is important to note the role of international intervention. In Russia, continued international intervention, both bilaterally and through international financial institutions, may be essential to the mitigation of the effects of the demographic crisis.

Finally, the Japanese case illustrates the danger of operating with linear projections. When there were drastic decreases in mortality rates that were accompanied by rather modest increases in birth rates, there was the unforeseen effect of a population boom. This study has dealt almost uniquely with mortality rates and life expectancies as indicators of the demographic crisis and does not address other factors that could conceivably have a dramatic impact on the parameters of the population in 2020. For example, if the demographic approach's projections of a return of mortality rates to pre-crisis levels were accurate and then for some unforeseen reason Russia experienced an increase in fertility rates, perhaps due to a nationalistic drive to sustain the Russian population, the parameters of the total population in 2020 could be much larger than forecasted by any one of these approaches. While it is not possible to assign probabilities to this incident, it is important to imagine how such an incident could occur and what sort of indicators should be identified to suggest that such an incident was about to occur. Such an incident would be mostly likely to occur through

policies initiated by a nationalist party, such as Zhironovsky's party or the Communist party. By monitoring the policies of these parties, an indicator of this event could be identified.

Spain

In the case of Spain, there was not a dramatic event, such as a war, that had a singular effect on demography. Rather, in the period following the civil war, there was negative population growth that continued over a decade. This period witnessed poor general health conditions and the quality of life was low. In this sense, the Spanish case is more similar to the Russian case, which also did not experience a rapid decline immediately followed by a rapid incline in population growth.

Throughout this decade following the civil war, Spain also experienced economic stagnation in a manner similar to the Russian case. It is interesting to note, however, that economic recovery and growth came about irrespective of improvements in human capital. This would bear out the relationship that the economic approach posits between economic growth and life expectancy, in that economic growth drives increases in life expectancy and not the other way around. Furthermore, the Spanish case indicates the importance of third variables in determining economic growth, as described by the economic approach. In this case, the "third" variables are such things as economic reforms, the influx of young managerial expertise, and the influx of international capital. This exogenous variables were more important in determining economic growth than was the issue of quality of life and life expectancy. Perhaps a parallel can be drawn to Russia in this instance; such similar exogenous variables may be more important to economic growth than issues of demography.

After a period of initial economic growth had already begun in Spain, there was a slight increase in population growth. It is probable that this increase in population growth was fueled by the initial rise in economic growth. As this population cohort moved into the working age population, this increase in population growth supplemented and fueled the economic recovery, introducing more labor into the workforce at the point in which the economy was moving towards full production, employing all of its resources. However, further demographic growth then led to unemployment, as labor continued to be introduced into the economy faster than the economy could productively employ these resources. Gradually, the economy moved into a recession. This aspect of the Spanish case is important because it highlights the different ways in which demography can influence economic growth, depending upon the status of the economy and the economy's proximity to full production.

D. Assessment of Methodologies and Findings

Clearly, this project does not produce one unambiguous view of the demographic crisis in Russia and the effects of this crisis on the Russian society and economy. Precisely because the Russian situation is so complex and the interaction of variables within this crisis is essentially unpredictable, this project has adopted an overall method of highlighting several potential perspectives on this crisis. By highlighting alternative perspectives, this project does not attempt to make a specific prediction, nor prescribe a particular course of action. Rather, these alternative perspectives are intended to inform and provoke strategic thinking about the crisis. Each perspective that has been included in this project differs significantly. The differences between the perspectives center around several key questions:

1) The choice of the right variables;

2) The relative importance of data;

3) The nature of the relationships between the different variables;

4) The degree of similarity between the Russian demographic crisis and other historical precedents.

While it is important and useful to highlight several key perspectives of the crisis, this project also found it necessary to evaluate its findings and compare and contrast the different perspectives. In doing this, the project hoped, first, to provide further context for each approach, and second, to search for any potential for cross-fertilization between the approaches.

The comparison of the different approaches was done in the format of a one-day workshop, in which each researcher presented his findings to a panel of experts. These experts came from widely varying disciplines, including history, sociology, and political science. The intent in choosing these experts from different backgrounds was encourage the panel to think outside of any single discipline, and yet to use the tools of each discipline to critique and analyze the findings produced by each approach. The experts were not chosen for their familiarity with the Russian demographic crisis. It was required, however, that all experts be current or former Russian citizens and that all experts have a broad familiarity with the current Russian economy and society. The intent in choosing Russian citizens focused on the issue of perspective; by drawing upon Russian experts to review the findings, the project was attempting to control for any unrecognized biases that might be inherent in its methodology and perception. These experts were located and identified through the academic community. Approximately one month prior to the workshop, each participating expert received a package of information on the project, including all original research and the project's Interim Report.

D.1 Methodological Concerns

- One of the most common methodological concerns that surfaced during the workshop focused on the choice of variables. This was also an on-going concern throughout the project. Participants emphasized the need to provide more theoretical justification for why and how each approach chose its key variables. In other words, participants were drawing attention to the need to explain why each approach thinks one set of issues are more causally important than another. Without such an explanation, the basis for a comparison of the different approaches is difficult to establish. Without a solid basis for comparison, the findings produced by the different approaches cannot be critiqued vis a vis one another.

- The different approaches all included the assumption that it was possible to treat certain variables as "independent". Participants noted that this may not be a reasonable assumption, especially given the high degree of nonlinearity and complexity that appeared to be present in the Russian demographic crisis. With this type of data, such methods as regression analysis—which are based on the premise of independent versus dependent variables--may also not be particularly well employed.

- Participants noted that the project had not been able to successfully bridge the gap between nation-wide, general, quantified data (as used in the economic approach, and to a large extent, in the demographic approach) and the more anecdotal, local, qualitative data (as used by the epidemiological approach). While the first type of data allowed the researchers to generalize and compare across cases, it did not allow the researchers to obtain a very detailed image of the Russian demographic crisis. While the second type of data allowed the researcher to obtain a much higher level of information about the parameters and qualities of the Russian demographic crisis, it inhibited the ability of the researcher to demonstrate why his findings were important in the aggregate and to compare these findings with the findings of other approaches and other historical precedents.

  Participants felt that it would be worthwhile to seek some sort of synthetic data sets (and methods) that combined comparability with context.

- In a related point, participants drew attention to the demographic approach's attempt to incorporate a greater degree of information in the model by using measurements of quality of life. While the demographic approach's attempts were ultimately deemed unsuccessful, due to the fact that either none of the results were found to be reproducible or the necessary data was not available, participants argued that some measure of the quality of life was required in order to study the full impact of the demographic crisis on the economy through the time period stipulated by the project.

- The measurement of "quality of life" could be expanded to include education levels likely to be achieved by different sectors of the demographic formation. Participants emphasized the precipitous decline in educational levels in the younger generation in Russia and they speculated that this change in demography would quickly impact Russia's economic potential. While it has been popular to say over the past several years that an educated workforce is one of Russia's key economic assets, this may no longer be an accurate assertion. Much of the younger generation has not even completed secondary education, much less received undergraduate and graduate

degrees. Participants noted that the proliferation of new "private universities" has even degraded the value of the undergraduate and graduate degrees that have been awarded. Without this asset of an educated work force, it is easy to imagine that Russia's future economic potential—especially within a post-industry information-based global economy – will be further circumscribed.

- In addition to variables about physical health and life expectancy, participants suggested that the study might also include variables related to mental health. The same forces that are causing increases in mortality rates (stress from social/economic transition, etc.) would also be likely to cause increases in mental illness. Wide-spread instances of mental illness could be expected to negatively impact Russian economic prospects.

D.2 Observations

- In support of the argument that the Russian demographic crisis will not quickly be halted or reversed, participants noted that social behavior in Russia shows no sign of changing. Alcoholism continues to be prevalent and as alcohol consumption is related to external causes of death, in can be expected to continue to play an underlying role in shaping the Russian demographic formation.

- Implicit, to varying degrees, in all of the approaches was the assumption that exogenous variables would cause Russia to experience positive economic growth in the time period specified by this project. In light of the global economic situation and in light of the paralysis of the Russian government and economy over the last year, this assumption does not appear to be particularly valid. The study of the Russian demographic crisis would be enhanced if it included a perspective or scenario that anticipated that exogenous variables will cause continued negative economic growth.

- The epidemiological approach posits that the outbreak of epidemics could have drastic, unpredictable effects on the Russian demographic formation. In addition to the problem of demonstrating that such incidents would have a significant impact in the aggregate, the epidemiological approach is also faced with the issue that "most trends do not continue". Epidemics tend initially to have very large impacts on a demographic formation, but epidemics then tend to rapidly crest and subside. In other words, the effects of epidemics cannot be held constant, and may, over a period of time, have a much more modest—if not negligible—impact than would be apparent from observing the epidemic in a static manner during the epidemic's inception. This point touches once again on the non-linear component that underlies the entire project.

- In the approaches used in this project, the demographic crisis was looked at through a parsimonious model that operationalized only a very few variables. Current economic and political situations in Russia clearly indicate that other issues have rapidly eclipsed the demographic crisis in terms of urgency. In order to put the effects of the demographic crisis in context—and in order to see how the effects of the demographic crisis will interact with the effects of these other economic and political factors—participants proposed that more variables should be included in the model.

- Regarding remediation measures that the US might take to alleviate the impact of the Russian demographic crisis on the Russian society, the participants were highly skeptical that any measures of international assistance could be effective on this current generation.

- Whereas the economic and demographic approaches focused on the population as a whole and the epidemiological approach focused on particular groups of the population that had been exposed to or experienced extreme negative health conditions, none of the approaches attempted to theorize about what portions of the total population would most affect Russia's economic growth potential and then focus on the impact that the demographic crisis has had on that selected group. Such an approach might yield a more nuanced view of the relationship between demography and economic development in Russia.

  Several ancillary questions:

  - What portions of the total population are most essential to Russia's economic development (the "new elite")?

  - How does this "new elite" differ from the previous elite? (I.e., from scientists and intellectuals to the nouveau riche.)

  - Does this change in composition and identity of elites represent an important change in Russian demographics, the effects of which warrant greater study? (I.e., what are the long-term consequences of the "old elite" having lost their social standing?)

  - What effect will emigration have on this new elite over the time period of the project? Although projected rates of emigration may not have a significant impact on the total population, they may have a large impact on certain important portions of this total population.

  - How has this new elite been able to better protect itself from the effects of the demographic crisis than has the total population?

D.3 Alternative Future Outcomes

Participants imagined a range of alternative future outcomes that the impact of the demographic crisis might have on the future prospects of the Russian society and economy.

- *Enlightened dictatorship.* A powerful, but benevolent leader rises to the head of the government and drastically expands his/her mandate beyond the current powers of the president in order to address the many problems stemming from the demographic crisis. The leader establishes rule of law and provides an environment in which the economy can begin to function, generating small, but diversified economic growth. The long-term impact of the demographic crisis on the Russian society and economy is very minimal, as the creative forces within the country rally around this central, powerful figure in rebuilding infrastructure. Instead, rising economic conditions allow the society to spend more on public health, causing health conditions to also rise. This reverses much of the impact of the demographic crisis on the Russian society and economy.

- *Despotic dictatorship.* In the Krasnodarsk region small, but organized fascist/neo-nazi groups continue to grow in power and influence, quickly establishing nation-wide networks. These nation-wide networks introduce a new centripetal force into the Russian society, reducing the threat of regionalization and secession, but at the cost of democratic representation and respect for human rights. A powerful, but despotic leader rises to the head of the government and introduces a regime of "national socialism", which brutally establishes law and order and protects private property just enough for the economy to function. Leaders from the previous Russian business cartels are "purged" from society. There are a number of public executions. The economy begins to function efficiently and foreign investment swells back into the country. The effects of the demographic crisis are hard to measure and quantify. On the one hand, the general situation of crisis and paralysis experienced in Russia at the end of the 20th century—to which the demographic shock contributed—was a partial cause of the despotic dictatorship. This despotic dictatorship re-introduced law and order and presided over the building of a genuine economy. In this sense, the demographic crisis at least indirectly brings about an expansion of economic opportunity and has a minimal long-term negative effect on the economy and society. On the other hand, the despotic dictatorship that rises on the back of the general crisis and paralysis in Russia has an enormous cost in terms of human life and human liberty. In this sense, the demographic crisis has a long term negative effect on society because it introduces a set of problems in Russia that can only be controlled through authoritarian rule.

- *Devolution of Russian government, society, and economy.* Continued weak leadership precludes the Russian government from effectively redressing the negative effects of the demographic crisis. The demographic crisis contributes to the general situation of paralysis in Russia and strengthens the centrifugal forces that are driving Russia towards regionalization. The central Russian government continues to exist, but is only nominally in power, administering a weak confederation of regions. Some regions set up their own governments to deal with, among other things, the effects of the demographic crisis. These regions meet with varying degrees of success, while other areas within Russia where local autonomy is not established either continue to move at a torpid pace or enter a period of sustained regression. The effects of the demographic crisis on Russian economic growth, then, are mixed in this scenario. On balance, however, the effects are essentially negative. On the one hand, they help instigate a devolution of power that ultimately leads to stronger regional governments in some areas. In these areas, the direct effects of the demographic crisis are minimized as the economy begins to function. On the other hand, this economic growth is constantly slowed and constrained by negative spill-over (uncontrolled immigration of the poor, sickly, disaffected, and disenfranchised), from bordering regions that have not been able to establish regional autonomy and which are continuously plagued by the effects of the demographic crisis.

E. Conclusions

Listed below are several key points that come out of this study.

- While rising standards of health may assist economic growth after it has already been initiated, there are many other important exogenous factors than standards of health to the equation of economic growth.

- Specific aspects of the case of the Russian demographic crisis may seriously compromise comparison with other analogous cases.

- Quantitative methodology (life expectancy rates) alone is not adequate for measuring the effects of the demographic crisis on economic growth. Qualitative factors could severely limit productivity, further reducing the projected size of the economy.

- The effects of environmental degradation are under-reported and inadequately understood.

- Further study should endogenize other factors that may stimulate economic growth in order to better understand the complex relationship between demography and economic growth. However, such study would need to draw upon new research models. Any further attempts to expand the economic model—the point of origin for this project– will quickly encounter difficulties in isolating variables. As new relevant factors in the society are examined, it is expected that it will not be possible to treat anyone of them as independent. The circularity of cause and effect that is inherent in this research question requires an appropriate methodology. Various potential methodologies might include

F. INDICATORS

In this section, the study will elaborate on how this study helps form a list of indicators to search for when attempting to identify the particular ways in which demographic change is likely to influence economic growth in Russia.

- Watch for exogenous sources of economic growth. In the absence of these sources, the demographic crisis can be expected to contribute negatively to economic growth potential.

- Place any increase in public health conditions within the context of the 30 year decline. If there is no indication that this protracted decline is actively being reversed, it will be unlikely that the demographic crisis is in the process of remediation.

- Foreign aid, in terms of assistance to the public health system, is instrumental in containing aspects of the demographic crisis and, in terms of economic assistance, is indispensable in promoting economic growth. Levels and priorities for foreign aid, both from the US and from international financial institutions, to Russia should be monitored.

- The demographic crisis is primarily caused by cardiovascular disease and external causes, therefore social stabilization appears to be a prerequisite for a resolution of this crisis. If social stabilization does not occur, demographic crisis should be expected to continue.

- The political importance of public health should be tracked in social research for any change in priorities, which may indicate the possibility of increased public spending on public health. Currently, most research in Russia does not include questions about public health. This should not be taken to mean that it is unimportant and/or it will always remain unimportant.

- Compare production capacity to demographic growth. If the economy moves towards full capacity and the society simultaneously continues to experience negative demographic growth, the economy will be likely to experience inflationary pressures.

- Monitor HIV rates as underlying cause of death, in anticipation of any epidemic tendencies that may alter demographic predictions or that may combine with other factors, such as tuberculosis to produce a nonlinear effect on demographic trends.

- Monitor the contribution of environmental degradation to underlying causes of death. If it increases, this will bring about a scenario similar to the one described by the epidemiological approach.

- The current demographic shocks to fertility, mortality, and migration will have a major impact on the spatial distribution of the population within Russia. Because of differentials in demographic trends, local governments will be confronted with different political dilemmas. Special attention should be paid to these differentials and the constraints these differentials place upon the political choice sets of local governments.

- Analyze social policies of parties, which may artificially alter demographic trends.

- Look for environmental hazards that may have a delayed effect on life expectancy rates. This could significantly reduce population size in 2020.
- Watch for political events that could occur, which might spark epidemics, such as the release of 400,000 TB-infected prisoners into the society.

APPENDIX I

CAN THE HEALTH CRISIS AND ENVIRONMENTAL POLLUTION RETARD RUSSIAN ECONOMIC RECOVERY?

Prepared By:
Vladimir Kontorovich*
69 Thoreau Dr., Plainsboro NJ 08536 USA
Tel: 609-275-9535; Fax: 609-275-7198. e-mail: vkontoro@haverford.edu
July 1998

Prepared For:
Hicks & Associates Inc.
Science Applications International Corporation

* I acknowledge helpful suggestions by Michael Ellman and Vladimir Shlapentokh.

1. INTRODUCTION: THE POTENTIAL FOR GROWTH IN RUSSIA

Russian economic contraction cannot go on forever. A recovery which was widely and erroneously expected to begin in 1998 will come eventually. What kind of growth will follow the turnaround?

Ex-Communist economies have potential for rapid long-run growth. Their technology lags several decades behind the world's best, while the workforce is educated well enough to make the assimilation of the best technology possible. Additional gains can be made as resources misallocated by the planners find better uses. Polish economy averaging 5.5 percent annual growth rates for five years in a row demonstrates what a post-Communist take-off may look like (see Table 10).

There are many reasons why a country may not realize its full growth potential; indeed, historically, few countries did. Political instability, corrupt and inefficient public administration, peculiarities of the initial privatization, and weak legal system are usually cited as reasons for Russia to fall short of fully exploiting the advantages of relative backwardness and post-planning correction. Of course, enumerating present weaknesses does not prove their future deleterious effect on growth. One needs to specify the channels through which these weaknesses operate to retard growth, and estimate the magnitude of their effects. Such analysis has been largely missing from the field long dominated by the cheerleading for the "coming Russian boom".[1]

Since the late 1980s, the country has been undergoing an unprecedented demographic crisis, characterized by a surge in mortality of working age males, and smaller increases in mortality for other age and sex groups; decline in birth rates; and increase in incidence of illness. Russia also inherited from the USSR a level of environmental pollution exceeding that of Western countries, that may be influencing health for years to come. This report evaluates a hypothesis that the present health crisis and the state of the environment in themselves will cause Russian growth to lag behind its potential rate.

Section 2 considers the likely future course of the health crisis, based on the recent trends, causes of mortality upsurge, and developments in other post-Communist countries. Section 3 outlines the relationship between health and environmental pollution. Economists' knowledge about the relationship between health and growth is summarized in Section 4, and applied to Russia in Section 5.

[1] The title of the recent book by Layard and Parker (1996). Elsewhere, I suggested the stunted growth of new businesses as the mechanism through which legal and administrative climate retards growth (Kontorovich, 1998) and also looked at the cost of imperial legacy as the likely growth retardant (Kontorovich, 1996).

2. FUTURE CHANGES IN HEALTH

2.1. The course and dimensions of Russian mortality crisis

In 1988-94, life expectancy at birth fell 6.1 years below its latest peak, with male life expectancy declining 7.6 years (Table 1). Death rates of working age males increased by 50-100 percent (Table 2). The main causes of the upsurge in death rates were the increased number of deaths from cardiovascular diseases and from external causes (Tables 3 and 4).

The crisis had two stages. During the first stage -- in the final years of the Soviet regime (1988-1991) -- male life expectancy was losing 0.2-0.6 years per year. During the second stage -- in the first three years after the collapse of the USSR -- the pace of decline accelerated to 1.5-3.1 years of male life expectancy per year. The first, slow stage of mortality crisis thus predated Soviet economic and political collapse, and cannot be blamed on it. Male life expectancy dropped by 1.5 years at this stage, or 20 percent of the total loss in 1988-94.

In 1995-97, male life expectancy regained 47 percent of the recent loss, and female life expectancy regained 58 percent (Table 1). The pace of recovery has been rapid, with annual gains in male life expectancy comparable to losses in some of the years of the second stage of the crisis. Death rates of males in all age groups has been declining, as has been the number of deaths from the causes responsible for the mortality crisis (Tables 2, 3).

TABLE 1. LIFE EXPECTANCY AT BIRTH IN RUSSIA, YEARS, IN 1987-1997.

		1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997*
Total: level		70.2	69.9	69.6	69.2	69.0	67.9	65.1	64.1	64.6	65.9	66.9
Male: level		65.0	64.8	64.2	63.8	63.5	62.0	58.9	57.4	58.3	59.8	61.0
change			*-0.2*	*-0.6*	*-0.4*	*-0.3*	*-1.5*	*-3.1*	*-1.5*	*0.9*	*1.5*	*1.2*
Female: level		74.6	74.4	74.5	74.2	74.3	73.8	71.9	71.0	71.7	72.5	73.1
change			*-0.2*	*0.1*	*-0.3*	*0.1*	*-0.5*	*-1.9*	*-0.9*	*0.7*	*0.8*	*0.6*

Source: Table 11. * preliminary estimate.

Recent forecasts assumed that life expectancy will stay at or near the crisis low for a long time, and will take several decades to recover to the pre-crisis level. So far, these forecasts have underestimated the speed of recovery. Russian statistical agency, based on preliminary 1996 data, projected total life expectancy in 2010 at 66.2 years (pessimistic case) to 69.2 years (optimistic case) (Vasina, et al., 1997, pp. 70-71). The pessimistic projection 14 years ahead was exceeded the very

next year.[2]

Eberstadt (1998, pp. 23), based on the data through 1995, projected male life expectancy in 2020 at 62.6 in pessimistic scenario and 65.8 years in optimistic one. That means a gain of 4.3 - 7.5 years in 25 years. However, in just 3 years, 1995-97, male life expectancy gained 3.6 years, or almost half of the 25-year gain under the optimistic scenario. The pessimistic projection for 2020 is likely to be reached and surpassed before 2000.

Such large forecasting errors call into question the assumption of durable, intractable mortality crisis.[3] While the exact reasons for the upsurge in mortality are not fully understood (Eberstadt, 1998, pp. 8, 12), empirical data lend various degrees of support to competing explanations of the health crisis and help rule out some of them. This section surveys the data and the existing explanations of the mortality upsurge in Russia to see how long it may persist.

2.2. Experience of other ex-Communist countries

In its severity, Russian demographic disaster of the 1990s can be compared to those that occurred in Germany, Spain, Japan, and Korea earlier this century. Yet the latter were caused by war and attendant dislocation, and therefore differ in "duration, nature, origin" from Russia's health crisis (Eberstadt, 1998, pp. 1-6). For mortality crises with similar nature and origin, one can turn to the developments in other post-Communist societies. Many of them experienced increases in mortality and drops in birth rates, just as Russia did.

Peace-time declines in male life expectancy at birth around the time of the collapse of Communism occurred in all the European ex-Soviet republics and East European countries. (see Table 5).[4] Countries experiencing post-Communist demographic calamity represent a wide variety of traditional cultures, as concerns drinking habits, for example. They differ with respect to their past demographic history, and economic hardship experienced in post-Communist era. The post-Communist mortality upsurge is clearly not a specifically Russian, or even ex-Soviet, phenomenon.

The relative magnitude of decline was the greatest in Russia. Surprisingly, Ukraine and Bielorussia, so similar to Russia culturally and economically, experienced the declines less than half as large as Russia's. Baltic states, more distant from Russia in these respects, experienced declines in life expectancy closer in magnitude to that in Russia. In Hungary, Rumania, and Bulgaria, relative declines in life expectancy were an order of magnitude smaller that in Russia, and in East Germany and Slovenia - two orders of magnitudes smaller.

Small changes in life expectancy may be reflecting quite substantial changes in death rates for

---

[2] Another publication (Antonova et al., 1997, p. 54) presents 66.2-year life expectancy for 2010 as the baseline, rather than worst case, projection.

[3] Indeed, Vishnevskii and Shkolnikov (1997, p. 11) see reasons to hope that the "exacerbation of the mortality crisis in the early 1990s will soon pass".

[4] There is no data on Slovakia and Albania. Moldavia and ex-Yugoslav republics other than Slovenia are not considered because of military conflicts there. Asian ex-Soviet republics are not considered for fear that they are at a quite different stage in their demographic history than the countries we are looking at.

particular age groups. Thus, in East Germany, death rate for men aged 25-45 increased 30 percent in 1989-91 (Eberstadt, 1994). In Poland, male death rates increased between 1990 and 1991, and in Slovenia in 1992-94 (See Tables 6 and 7).

In most of the countries where life expectancy declined, the decline has been reversed. It reached bottom in East Germany in 1992, in Hungary in 1993, and in Estonia and Lithuania in 1994, the same year as in Russia. Lack of data does not allow us to determine if the decline has also bottomed out in Ukraine, Bielorussia, Latvia, Rumania, Slovenia, and Bulgaria. Most likely, it did in at least some of these countries.

Life expectancy in Russia behaved abnormally long before the collapse of the USSR. Male life expectancy has been declining from the mid-1960s through the early 1980s, and female life expectancy was essentially stagnant over the same period (see Figure 3). Even when life expectancy returns to the pre-collapse level, it will remain below its mid-1960s level, and also below the level of some countries poorer than Russia.[5] It is likely to remain substandard for a long time, due to the factors that have been operating in the previous decades, and will change only very slowly.

However, even here it would be misleading to claim Russian uniqueness. East European countries also experienced a decline in male life expectancy in the final decades of Communism. Thus, male life expectancy in Rumania peaked in 1976 at 67.45 and has been below 67 years since 1979. Male life expectancy in Poland in 1987 was the same as in 1965-66. In fact, except for East Germany, all of these countries have underwent periods of increased peacetime mortality under Communism (Eberstadt, 1994).

2.3. Causes of the mortality crisis

The slow decline of life expectancy at the first stage of the crisis (1988-1991) can be seen as the continuation of the decades-old downward trend (see fig. 3 and Table 11) that was interrupted in 1985-87 by the anti-alcohol campaign. The gains of that campaign proved to be unsustainable, and were reversed in 1988-1991 (Vishnevskii and Shkolnikov, 1997, p. 11). The decline in life expectancy in 1992-1994 was much steeper than in the first stage of the crisis or in the long run. This suggests that it was due to a new set of factors, connected to the collapse of Communism.

Many things went wrong in Russia in the late 1980s-early 1990s, as reflected in the upsurge of the number of deaths from most causes, with a spectacular exception of tumors (see Table 3). The number of deaths of working age people from infectious, gastrointestinal, respiratory, and other groups of diseases more than doubled in 1990-94. However, this does not mean that everything is to blame for the mortality crisis. Doubling in the number of deaths from many causes occurred from a very low level and had little impact on the national mortality picture. The crisis was caused by the increases in the major causes of death, cardiovascular diseases and accidents, traumas and poisonings (Table 4; also Eberstadt, 1998, Table 2). These are the same causes of death that have been responsible for the long-run mortality increase in the 1960s-1980s (Shkolnikov, 1997, p. 17).

[5] Point stressed by Vishnevskii and Shkolnikov, 1997, p. 11.

These data on the immediate causes of death allow us to rule out some potential "ultimate causes". Environmental pollution appears to be largely unrelated to the mortality crisis (see 3.1 below). The breakdown of health care system and deterioration in nutrition cannot plausibly account for most of excess mortality (Shapiro, 1995, pp. 161, 163-5; Chen et al., 1996, p. 519).[6] Since all the ex-Communist countries experienced mortality increases right after the change of system (see 2.2 above), it is reasonable to see the latter as the cause of the former.

It has been suggested that rapid and massive social change induced stress in individuals ill prepared to cope with such change (Shapiro, 1995, pp. 167-9). Stress, in turn, exacerbated cardio-vascular diseases and self-destructive behavior, such as heavy drinking. Mortality from "external causes," a grab bag of accidents, murders, and suicides, appears to be strongly correlated with alcohol consumption.[7] While mortality from cardio-vascular diseases also reacted to Gorbachev's "Prohibition" of 1985-87, this connection is weaker (Shkolnikov, 1997, p. 7). Stress related to systemic change appears to be the most plausible explanation of mortality increase.[8]

This explanation also implies the temporary nature of the recent mortality increase. As new institutions congeal and people adapt to the new set of rules, stress should be reduced, and mortality should decline. Indeed, the last column of Table 3 shows that the number of deaths from all but one cause peaked in 1994-95 and has been declining, with above average rates of decline for the causes that contributed the most to the mortality crisis. (This decline may, of course, be the direct result of high mortality in previous years dispatching the most vulnerable individuals.)

In recent history, mortality rate due to the external causes in Russia has been highly variable. It fell by 1/3 from 1980 to 1987, apparently due to the anti-alcohol campaign early in Gorbachev reign, before rising again as the campaign fizzled. If a superficial administrative measure - restricting access to alcohol - had such a profound effect on behavior associated with external causes of mortality, it must also be amenable to the influence of profound social changes in society.

The inquiry into the causes of decline in life expectancy suggests that it is reversible. The "acute stage" of the mortality crisis lasted three years, and has now been followed by three years of recovery, making up almost 60 percent of the losses in male life expectancy in 1992-94. However, there is no indication that the underlying long-run mortality crisis is being reversed. The current recovery may come to a halt as the low levels of life expectancy of the late 1980s are regained.

3. ENVIRONMENTAL POLLUTION AND HEALTH OF RUSSIAN PEOPLE

Tables 3 and 4 show that cancer - the likely effect of environmental pollution - played no role in the

---

[6] This is not to deny the fact that environment is polluted, health system has deteriorated, and nutrition of some population segments may be inadequate.

[7] Vishnevskii and Shkol'nikov, 1997, pp. 31-3; Ellman, 1994a, p. 331.

[8] See Ellman, 1997, pp. 358-362 for a survey of alternative explanations of mortality increase.

mortality upsurge. More generally, the observed levels and changes in mortality do not support the hypothesis that environmental pollution is an important cause of the recent mortality increase (Ellman, 1994a, p. 337; Chen et al., 1996, pp. 518-519).

Can environmental pollution cause an increase in mortality sometime before 2020? The aggregate approach, from so many million tons of gunk dumped nationally to so many more deaths per 100,000 population, does not work here. Environmental pollution is a grab bag of hundreds of substances, each of which has to be studied separately. Most pollution is local, and has to be measured separately for each locale. The same amounts of pollutants result in different exposure of population depending on climate, relief, soil, winds, and other local conditions. And health effects of many pollutants are simply not known.

Consider radiation, the greatest perceived threat to health in Russia. The amount of radiation released in the environment in the USSR in the last 50 years is an order of magnitude greater than that in the US.[9] However, this piece of information does not tell us anything at all about the effects of radiation on health of the population of the country. Most radiation in the USSR is associated with the activity of three nuclear fuel reprocessing plants, and is localized in the vicinity of these plants. Most of the population of the country lives elsewhere and is unaffected by this catastrophic levels of pollution. The levels of exposures for most of Russian population are well within the acceptable limits. (Though the health effects of such exposure are not really known with much certainty.)

Much pollution is the result of past neglect, and can be stopped cheaply. Thus, leaded gasoline, banned throughout the world, is the biggest source of lead pollution in Russia (Thurston, 1998b). Its use is to be discontinued in 1999.

Finally, the dismal state of environment has actually improved somewhat after 1991 due to the drop in economic activity. Russian Federal sanitary inspection reports that in 1992, 12 percent of air tests showed excessive concentration of harmful substances. In 1997, the share of such tests fell to 8 percent. The share of lakes and rivers with concentration of chemical pollutants exceeding the norm fell from 29.4 percent to 25.6 percent. Microbiological norms were exceeded by 13.3 percent of lakes and rivers in 1992 and 9.7 percent in 1997. Similar improvements have been observed in the state of soil (Kamakin, 1998).

The conclusion of this section flies in the face of what Russians think to be the case. Public opinion surveys show high degree of concern about pollution and its effects on health. Fear of environmental pollution forced closing down of hundreds of industrial plants in 1988-91, contributing to the economic disarray of that period. Environmental protests also served to crystallize nationalist movements which eventually fought for secession from the USSR.

While fear of environmental pollution remains strong, its political manifestations have become nearly invisible after 1991. I interpret this sudden reticence on the part of environmentally scared

[9] This paragraph is based on Thurston, 1998a.

public as the recognition of the real world trade-offs. In 1988-1991, when employment and wages were guaranteed, one could demand environmental cleanup measures without the fear of consequences. Now, desirable policy - clean environment - has to be weighted against the risk of losing a job.

There may have also been a reaction to excessive panic of the earlier period. Russia has recently reclassified areas with three quarters of a million of inhabitants adjacent to Chernobyl-affected zone as safe. Their earlier classification as disaster areas lacks scientific merit and was adopted as a give-away to regional authorities in the atmosphere of nuclear hysteria (Bateneva and Chechin, 1998).

4. WHAT IS KNOWN ABOUT THE RELATIONSHIP BETWEEN HEALTH AND GROWTH?

One way health can influence economic growth is through quantity and quality of labor. A healthier population lowers mortality and morbidity. The former boosts working age population. The latter increases labor force participation rate and reduces hours of work lost to illness. All of these effects increase the quantity of labor input, number of hours worked. Output per hour worked may also change with health. In this mechanism, it is the change in health that matters for economic growth.

Another possible mechanism is somewhat more complicated and less certain. Poor or deteriorating health causes popular dissatisfaction. This resonates through the political system and forces a reallocation of resources from investment to health care, suppressing capital accumulation. This mechanism may react to either changes or levels of health.

Empirical studies of health and growth fall in two groups. One group looks at the correlation between health or changes in health and income or changes in income, without differentiating between the two mechanisms described above. Another looks at the determinants of health expenditures, that is, our second mechanism. The subsequent sections summarize this literature.

4.1. Health status, income level and income growth

People in wealthier countries are healthier and live longer than people in the poorer ones. Exponential function of life expectancy in 19 most populous countries explains 80-90 percent of variation in various measures of per capita income in these countries in the same period (Eberstadt, 1998, p. 18). A strong relationship between per capita income and life expectancy has been found also for much larger samples of countries.[10]

The level of income, which is so strongly correlated with life expectancy, is the result of past growth. But we are interested in the relationship between life expectancy and the future growth of income. A regression of per capita GDP growth rates in 1960-80 on life expectancies at birth in 1960 for 35 countries (all from Table 8) yields a much weaker relationship than the one between life expectancy

[10] Ingram (1994, p. 331) regressed logarithm of life expectancy on logarithm of per capita GDP across more than 100 countries in 4 different years, with R-squared ranging from 0.64 to 0.78. See also Pritchett and Summers (1996, p. 841-3).

and terminal income level. Initial life expectancy explain less than 30 percent of the variation in subsequent growth rate across countries, for several different specifications of functional form.

It appears that statistically, life expectancy is a poor predictor of future growth. Out of the three countries in Table 7 with highest (above 60) life expectancy in 1960, two (Argentina and Sri Lanka) had a quite mediocre growth rate in subsequent 25 years. In sample of more than 100 countries, levels of GDP per capita have been diverging in 1960-1985, while life expectancy levels have been converging (Ingram, 1994, p. 327).

It takes many more variables than just life expectancy to explain 80-90 percent of variation in per capita income growth rate across countries. Sachs and Warner (1997, p. 187-8) use eleven independent variables, including life expectancy in 1965 and its square, in their regression for growth in 83 countries in 1965-90. Life expectancy is used as a proxy for human capital; that is, it is hoped that it correlates with other, non-health variables and represents their influence, as well.

Strong correlation between wealth and life expectancy in the same period, and only weak correlation between life expectancy and future growth of wealth suggests that the main causal link is from wealth to health, and not the other way around. Both statistical analysis and historical accounts support this suggestion.

4.2. Increasing mortality is compatible with growth

The onset of modern economic growth is variously dated to the 18th or early 19th century. Declines in mortality started in the 18th century and have been proceeding, with varying speed, through the present, paralleled by increases in height (Fogel and Costa, 1998, p. 51-2). However, health improvements did not proceed monotonically.

In the US, life expectancy at age 10 started increasing in the early 18th century, but took a downturn around 1790, and kept falling through about 1850, before resuming its upward climb. The height of native-born American men has been falling from 1830-90. Similar declines in health status occurred in other countries for which data have been reconstructed (Fogel and Costa, 1998, pp. 57-9 and 61). The chief cause of the surge in mortality is believed to be rapid urbanization. Yet there were no GDP declines to parallel the worsened health conditions. Real GDP per capita in the US has been growing at the average annual rate of 1.2 percent in 1820-50, 1.5 percent in 1850-70, and 1.6 percent in 1870-90.[11]

Similar divergence between change in GDP per capita and life expectancy can be seen for Britain (Table 9). Two decades of falling life expectancy in the 1830s and 1840s did not stop economic growth. In fact, growth in GDP per capita accelerated at a rate that was very high for the British experience in the 19th century in the very decade (1840s) when the decline in life expectancy was the greatest.[12] The contrast appears even more striking if one looks at the changes in life expectancy of urban population, rather than on the national data. It was in the urban centers that growth of

---

[11] Calculated from Maddison, 1995, p. 196.

[12] While growth rate of 2% per capita per annum appears low by the post-1945 standards, at the time that was an exceptionally fast growth (see Steckel and Floud, 1997, p. 424).

English economy in the mid-19th century was generated. Szreter and Mooney (1998, pp. 104-105) estimate that life expectancy at birth in the cities with over 100,000 inhabitants declined from 35 years in the 1820s to 29 in the 1830s (a 17 percent drop), stayed at 30 years in the 1840s, and did not regain the previous peak until well into the 1860s.

Just as economic growth can proceed while life expectancy declines, life expectancy can grow spectacularly even in a poor country. Sri Lanka had life expectancy at birth of 72 years in 1990, not far below the American 75.4 years, while its GDP per capita was only about 12 percent of that in the US (IBRD, 1993, pp. 200, 296). Its life expectancy increased dramatically since the 1920s to reach the level of developed countries. However, income per capita increased only moderately, leaving Sri Lanka poor by international standards.[13]

4.3. Direction of causation and non-linearity

Correlation between changes in life expectancy at birth and real per capita income growth described in the preceding section may reflect the impact of health on growth, or the impact of growth on health, or the fact that both are related to some other variable.

One explanation of the parallel economic growth and health improvements in the last three centuries stresses improved nutrition that reduced the incidence of chronic disease. Economic growth triggers health improvements by raising real incomes, which allow people to ingest more calories (Fogel and Costa, 1998). Greater energy input allows workers to spend more energy at work. This effect is estimated to have contributed roughly 30 percent of the growth of per capita income in Britain between 1790 and 1980. At the same time, better nutrition early in life makes people healthier later on by reducing incidence of chronic disease (Fogel, 1994, p. 383). Health improvements in turn boost economic growth by increasing labor force participation and reducing hours of work lost because of illness (see Figure 1).

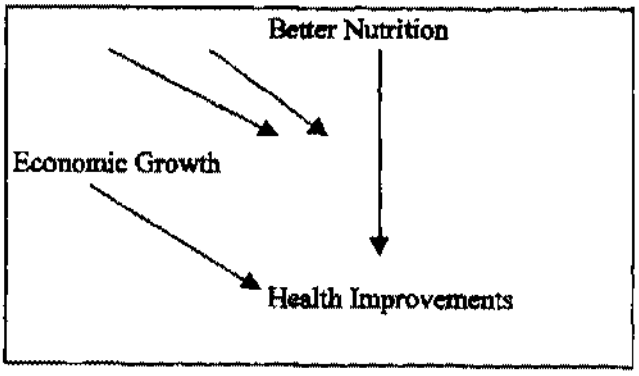


Figure 1. Health improvements and growth according to Fogel.

[13] See Anand and Ravallion (1993, pp. 144-146) for the discussion of Sri Lanka. See also Pritchett and

An alternative, or perhaps complementary explanation stresses advances in knowledge in the XIXth century, translated into public policies and private behavior, as the main cause of reduction in mortality and improvements in health.[14] Advances in knowledge are also the main source of modern economic growth (see Figure 2). Economic growth and health improvements therefore stem from the common source, scientific progress. As with the previous explanation, once health improvements are under way, they increase the number of hours worked per year through fewer sick leaves and higher labor force participation rate.

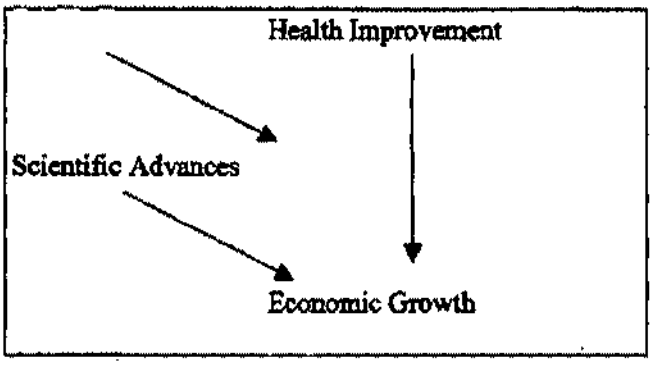


Figure 2. Health improvements and growth according to Easterlin.

Both explanations stress the "third variable" that drives both growth and health improvements - nutrition in one case and scientific advances in another. The first explanation also stresses the role of growth as the primary mover of the whole structure. While there are also direct links from health improvement to growth, they are a part of a more complicated picture, responsible only for a fraction of the observed correlation between growth and health change. The magnitude of this fraction is an empirical question.

Pritchett and Summers (1996) studied the relationship between changes in GDP per capita and changes in health for a large sample of developing countries in 1960-85. In order to determine the direction of causation, they used the method of instrumental variables (p. 848). They found that causation runs from income to health, and not the other way around. These results were obtained for infant mortality, child (under 5) mortality, and life expectancy at birth. The latter indicator was found to be less sensitive to income than the former two, the effect the authors ascribed to the poor quality of data (p. 858).

Ettner (1996) studied the relationship between income and several indicators of morbidity for a cross-section of the US population at a point in time. She also used instrumental variables method to figure out the direction of causality driving high correlation between income and health. Her results

---

Summers (1996, pp. 863-4) on developing countries with above average growth and below average health improvements in 1960-1990.

[14] Mokyr, 1993; Easterlin, 1996, Chapter 6.

support the predominant influence to be from income to health.

Health-wealth interaction is the strongest for the poor countries with short-lived populations, and then levels off, as can be seen from the shape of the curves fitted to cross-country data.[15] That is why the relation between income and longevity has been studied mostly, if not exclusively, by the economic historians and specialists in development. While Pritchett and Summers tell us that this correlation is driven mostly by the impact of wealth on health, the influence of health improvements on growth is likely to have the same type of non-linearity.

Sachs and Warner (1997, p. 187-8) find that higher life expectancy raises growth rate until it reaches 65 years, and depresses it afterwards. Life expectancy in the US increased from 57 in 1929 to 71 in 1970.[16] However, changes in health during this period are not believed to have effected growth perceptibly, over and above the contribution of the change in the number of hours worked.[17]

4.4. Health and health care expenditures

Apart from productivity differences, should not less healthy population impose costs on society, thereby diverting resources from investment? The metaphor of "carrying cost of illness" is appealing, because it derives from individual experience. An individual paying for health care out of own resources incurs higher costs when he is ill than when he is healthy. However, this relationship does not have to hold across individuals. Richer ones may spend more on prevention than poorer ones do on cure, and are healthier than the latter. The "carrying cost" of good health would then turn out to be greater than that of disease.

Health care is a luxury good: as income increases, demand for health care increases even faster, driving up the share of health care expenditures in total spending.[18] This means that countries with less healthy, more short-lived populations spend relatively less on health care than countries with healthier, longer-lived populations. It has been found that 90 percent of cross-country variation in health care expenditures is explained by variation in income.[19] The metaphor of "carrying cost" is misleading when applied to the problem at hand, just as the metaphor of "races" or warfare applied to international economic relations (McCloskey, 1990, pp. 153-161).

Of course, a society may choose to spend more on public health while it is still relatively poor. This will improve life expectancy, as happened in the Indian state of Kerala or in Sri Lanka. Indeed, there is a school in development studies that recommends just that policy, rather than pursuing growth and waiting until it will take care of improving health (Anand and Ravallion, 1993; Sen, 1998). A government can choose to emphasize health care spending, at the expense of other priorities. The result will be longer and healthier lives of its citizens. It does not have to do so, however. The advocates of "life-expectancy-maximization" approach to development do not argue that it will

---

[15] Anand and Ravallion, 1993, p. 139; Pritchett and Summers, 1996, pp. 841-4.
[16] US Census Bureau, 1960, p. 25, and 1973, p. 57.
[17] Denison, 1974, p. 49.
[18] Murray et al., 1994, pp. 142, 148.

[19] Moore, et al., 1992 and references in Murray et al., 1994, p. 141 and Hansen and King, 1996, p. 127.

speed up growth or that the failure to follow their prescription will jeopardize growth. The additional costs of this strategy are not unavoidable, but rather self-imposed.

5. HEALTH AND GROWTH IN RUSSIA

The unprecedented upsurge of mortality in Russia in the past 10 years was concurrent with an economic and political collapse of equally unprecedented proportions. A jump in death rates and the increases in morbidity could have, generally speaking, contributed to the contraction of the economy which started in 1989-90. Yet the by now voluminous literature on transformation recession does not see health deterioration as one of its causes.[20] Rather, the causation appears to run in the opposite direction (see 4.3 above).

Since mortality crisis is over, it cannot influence future growth. Recent and expected future declines in mortality should have a positive impact on economic growth. However, the magnitude of this effect would have been negligible, because of the non-linearity mentioned above.

There is economic life after the mortality crisis. The three Baltic countries which suffered a mortality crisis comparable in magnitude to that of Russia and underwent a similarly deep decline in economic activity in 1990-93 (see Table 10) have recovered. Since 1995, all three economies have been growing at a respectable rate, and in the case of Estonia, exceptional rate. Other countries that experienced a smaller mortality up-tick - Hungary, Poland, Rumania, and Slovenia - have also recovered from their, admittedly less deep, economic slump, and have been growing, some of them very fast.

The only demographic suspect that could retard Russian growth is the level of life expectancy, and it is not a likely suspect. Historical and contemporary evidence demonstrates that relatively poor health status of population is compatible with rapid economic growth. In the past, economic growth has always started in countries with sick and short-lived populations. Healthier and longer lives came as the result of growth, not as a precondition.

Russian life expectancy at birth in 1995 was exactly what one would have predicted given Russian GDP per capita at that time and the relationship between these two variables across 19 most populous countries (Eberstadt, 1998, pp. 20-21 and Fig. 11). As can be seen from Table 8, even life expectancy at birth in the low 50s is compatible with rapid economic growth. Life expectancy at birth in Russia today is higher than in any country in Table 8, and male life expectancy alone, the most disastrous indicator, is at 61 (see Table 1).

Life expectancy in Russia is lower than in other post-Communist countries (Table 5). We argued above that even as mortality rates decline, Russia's relative ranking in terms of mortality is likely to remain unchanged for a long time. Regrettable as it is on humanitarian grounds, this lag will have little bearing on future growth. To see this point, it is useful to look at the US and other rich countries. Table 12 shows that the US lagged in terms of life expectancy behind 19 developed

[20] Ellman, 1994b; Kornai, 1994.

countries in 1980, and this lag increased by 1994. At the same time, the US, already in 1980 richer than all of these countries, grew faster than 8 of them in 1980-92.

Russian life expectancy it is an average for a large country, masking significant regional variation. While male life expectancy for Russia as a whole in 1993 of 58.9 years, it was 57.9 years in the rural areas and 59.3 in the cities. Mortality also varied by region, with East Siberia, parts of the Far East, and European North and North West being above average.[21] Male life expectancy in Tuva was 52.3 years, while in Dagestan - 65.7 years. Such variation is to be expected, and indeed is observed in other diverse societies. Life expectancy at birth for white males in the US in 1995 was 73.4 years, and for black males - 65.4 (Statistical .. 1997, p. 88). Regional variation, and the existence of extreme outliers, does not invalidate the use of national averages when considering the prospects for economic growth, itself a national aggregate.

Life expectancy in Russia in 1996 was 66 years (see Table 1). That is, if Sachs and Warner result is taken literally, Russian growth has nothing to gain, and something to lose from further improvement in life expectancy. The moral, though, is not to take the results of cross country regressions too literally.

Poor or deteriorating health, even if it does not slow economic growth, still makes people unhappy. If this unhappiness assumes the form of massive popular disaffection, it may force politicians to spend heavily on healthcare. Taxes imposed to finance such spending will retard economic growth. The plausibility of such a conjecture can be investigated by looking at the 1987-94 catastrophic surge in mortality.

Public opinion surveys over the last 10 years are devoid of information on the reaction to increased mortality. The pollsters have not been including this question in their questionnaires. This reflects the public opinion experts' sense that the issue, unlike recession, inflation, crime, or environmental pollution, does not register with the public.[22] This sense is apparently shared by the politicians, who, while aware of the demographic situation, as evidenced by parliamentary hearings on the subject, have been neglecting healthcare in making the budget (Shapiro, 1995, pp. 151, 155).

If the decline in life expectancy had no political repercussions, there is even less chance that its low but increasing level will. Russian citizens do not ponder life expectancy data from around the world before going to vote. As with other aspects of well-being, Russians calibrate their expectations by the "achieved level", looking at their own experience and that of others around them. The fact that their life expectancy is lower than that in Sweden is as irrelevant for Russians' behavior as is the gap between their real income and that of Swedes.[23]

Now that the drop in life expectancy is being reversed, politicians will be quick to claim credit for it. The chance for the state of health to become a political issue is even smaller now than in the

---

[21] Vishnevskii and Shkolnikov, 1997, pp. 56, 76; Bradshaw and Palacio, 1996, pp. 35-38.

[22] Suggested by V. Shlapentokh in an oral communication.

[23] See Shlapentokh, 1998, on the determinants of satisfaction with the standard of living.

previous 10 years.

Since health problems are not a bar to economic growth, there is no policy reason forcing the Russian government to throw money at them. There is no political reason to do that, either, since the drop in life expectancy did not register with the public. The current policy of low spending on health care is compatible both with future growth and the government's political survival.

If Russian government and parliament decided to saddle the society with additional cost of health care and environmental protection, these would have only a marginal payoff in terms of life expectancy increases. Bad and deteriorating as Russian health care system may have been, it did not cause the mortality upsurge of 1988-94 (see 2.3 above). Giving the health care system more resources, however desirable on other grounds, will not help much in reversing the mortality upsurge (Shapiro, 1995, p. 151).

Meanwhile, life expectancy will keep increasing on its own, as people adjust to the post-Communist shock. Russia is likely to experience at least modest economic growth, as most countries do nowadays. Rising incomes will push life expectancy higher, by boosting demand for health care and healthier consumer goods, by raising the value of life and thus prompting people to adopt healthier habits, and also by providing tax revenue for public health measures.

6. Summary and Caveats

The uniquely severe increase in mortality in Russia in 1992-94 is being reversed. Life expectancy of men took a dip in all European post-Communist after the change in regime. In most of them, it has recovered, or is in the process of recovering. Mortality increase appears to have been caused by disorientation and stress of changing social order. As people adapt to new circumstances, mortality should return to its customary level. Environmental pollution is not to blame for the mortality crisis. It is also unlikely to cause large mortality increases in the future.

The current improvements in health will a have a positive, though negligibly small, effect on Russian growth. The current health status of the population does not entail any extra "carrying cost" for the economy. Present health and environmental problems will not retard Russian economic growth.

It is important to state what I am not saying here. I am not saying that Russian population is not suffering from grievous health problems and that Russian landscape is not littered with noxious and hazardous substances. I am not saying that Russian health care system is not in a pitiful state, and that Russians would not have benefited from a better funded one. I am not saying that Russia is set for rapid growth.

Throughout this paper, we concentrate on just one measurable aspect of health, mortality. One uniformly defined indicator - life expectancy at birth - conveniently summarizes mortality. This makes comparisons over time and across countries easier. By contrast, morbidity cannot be reduced to one number; instead, one has to keep track of the incidence of many diseases, each with different, but only vaguely defined, "weight". There is no uniformity across countries in reporting categories for morbidity. Morbidity data are less reliable that those for mortality, because they depend on the

likelihood of individuals seeking medical attention, the accuracy of diagnosis, and changes in medical knowledge and technology.

The use of mortality as a proxy for health is legitimate, if changes in mortality are strongly correlated with changes in morbidity. Intuitively, this should be the case. Are there data to support this conclusion?

The accuracy of our conclusions depends on this correlation holding for Russia in the 1990s. Could it be that while mortality rates peaked in 1994, the share of ill in the population keeps increasing? Russian data starting in 1990 do not show an improvement in 1995 compared to 1994.

Our conclusions on the impact of environmental pollution on health are based on the assumption that the level of pollution will stay about the same. If pollution increases significantly, our conclusions will not necessarily hold. Such an increase could be the result of a major catastrophe at a nuclear power station or nuclear waste storage site. I am not equipped to forecast the likelihood of such an event.

7. BIBLIOGRAPHY

Anand, Sudhir, and Martin Ravallion, "Human Development in Poor Countries: On the Role of Private Incomes and Public Services" *Journal of Economic Perspectives 7*, no. 1, Winter 1993.

Antonova, A., V. Brui, T. Gorbunova, and S. Nikitina, "O demograficheskoi situatsii v Rossiiskoi Federatsii na period strukturnoi perestroiki i stabilizatsii ekonomiki", *Voprosy statistiki* no. 12, 1997.

Bartholdy, Kasper, "Statistical Review", *Economics of Transition 3* no. 4, 1995.

Bateneva, Tatiana, and Oleg Chechin, "Uscherb ot Chernobylia byl preuvelichen v 9 raz po politicheskim motivam" *Izvestiia* April 25, 1998.

Bradshaw, M. J., and J. A. Palacin, "An Atlas of the Economic Performance of Russia's Regions", Russian Regional Research Group Working Paper no. 2, University of Birmingham, England, 1996.

Chen, Lincoln C., Friederike Wittgenstein, and Elizabeth McKeon, "The Upsurge of Mortality in Russia: Causes and Policy Implications", *Population and Development Review 22*, no. 3, Sept. 1996.

Cornia, Giovanni Andrea, and Renato Paniccia, "Changes in Poverty, Capabilities and Population-Based Welfare Indicators", *Most 6* no. 1, 1996.

Czech Statistical Office, *Statistical Yearbook of the Czech Republic 1996*. Prague: Scientia, 1997.

Denison, Edward F., *Accounting for United States Economic Growth 1929-1969*. Washington, DC: Brookings Institution Press, 1974.

Easterlin, Richard A., *Growth Triumphant: The Twenty-first Century in Historical Perspective*. Ann Arbor, MI: University of Michigan Press, 1996.

Eberstadt, Nicholas, "Demographic shocks in Eastern Germany", *Europe-Asia Studies 46*, no. 3, 1994.

Eberstadt, Nicholas, "Health of Russia's Workforce", Feb. 1998.

Ellman, Michael, "The increase in death and disease under 'katastroika'", *Cambridge Journal of Economics 18*, 1994a.

Ellman, Michael, "Transformation, Depression, and Economics: Some Lessons", *Journal of Comparative Economics 19*, no. 1, August 1994.

Ellman, Michael, "Transformation as a demographic crisis", in: Salvatore Zecchini, ed., *Lessons from the economic transition: Central and Eastern Europe in the 1990s*. Boston: Kluwer Academic Publishers, 1997.

Ettner, Susan L., "New evidence on the relationship between income and health" *Journal of Health Economics 15*, 1996.

Feshbach, Murray, *Ecological Disaster. Cleaning Up the Hidden Legacy of the Soviet Regime*. New York: The Twentieth Century Fund Press, 1995.

Floud, Roderick, and Bernard Harris, "Health, Height and Welfare: Britain 1700-1980". Historical Paper 87, NBER, Cambridge, MA.

Fogel, Robert W., "Economic Growth, Population Theory, and Physiology: The Bearing of Long-Term Processes on the Making of Economic Policy", *American Economic Review 84*, no. 3, June 1994.

Fogel, Robert W., and Dora L. Costa, "A theory of technophysio evolution, with some implications for forecasting population, health care costs, and pension costs", *Demography* 34, no. 1, Feb. 1998.

Glowny urzad statystyczny, *Rocznik statystyczny 1993*. Warszawa, 1994.

Glowny urzad statystyczny, *Roczmik statystyczny 1996*. Warszawa: Rok LVI, 1997.
Goskomstat SSSR, *Narodnoe khoziaistvo SSSR v 1988 g.* Moscow: Finansy i statistika, 1989a.
Goskomstat SSSR, *Naselenie SSSR 1988*. Moscow: Finansy i statistika, 1989b.
Goskomstat SSSR, *Narodnoe khoziaistvo SSSR v 1990 g.* Moscow: Finansy i statistika, 1991.
Goskomstat Rossii, *Rossiiskii Statisticheskii Iezhegodnik*. Moscow: Logos, 1996.
Goskomstat Rossii, *Rossiiskii Statisticheskii Iezhegodnik*. Moscow: 1997.
Goskomstat Rossii, *Sotsial'no-ekonomicheskoe polozhenie Rossii:1997 god*. XII Moscow, 1998.
Guibert-Lantoine, Catherine de, and Alain Monnier, "La conjoncture demographique: l'Europe et les pays developpes d'outre-mer", *Population* no. 5, Sept. - Oct. 1997.
Hansen, Paul, and Alan King, "The determinants of health care expenditure: A cointegration approach" *Journal of Health Economics 15*, 1996.
Hungarian Central Statistical Office, *Statitical yearbook of Hungary 1996*. Budapest, 1997.
IBRD (International Bank for Reconstruction and Development), *World Development Report 1993. Investing in Health*. New York: Oxford University Press, 1993.
Ingram, Gregory K., "Social Indicators and Productivity Convergence in Developing Countries" in: William J. Baumol, Richard R. Nelson, and Edward N. Wolff, eds., *Convergence of Productivity. Cross National Studies and Historical Evidence*. New York: Oxford University Press, 1994.
Kamakin, Andrei, "'Obratnaia storona' krizisa" *Nezavisimaia gazeta* July 8, 1998.
Kontorovich, V., "Imperial Legacy and the Transformation of the Russian Economy", *Transition 2*, Aug. 23, 1996.
Kontorovich, V., "New Business Creation and Russian Economic Recovery", presented at the ASSA meeting, Chicago, Jan. 1998.
Kornai, Janos, "Transformation Recession: The Main Causes", *Journal of Comparative Economics 19*, no. 1, August 1994.
Layard, Richard and John Parker, *The Coming Russian Boom: A Guide to New Markets and Politics*. New York: Free Press, 1996.
Maddison, Angus, *Monitoring the World Economy 1820-1992*. Paris: OECD, 1995.
McCloskey, Donald N., *If You Are So Smart. The Narrative of Economic Expertise*. Chicago: University of Chicago Press, 1990.
Mokyr, Joel, "Technological Progress and the Decline in European Mortality", *American Economic Review Papers and Proceedings 83* no. 2, May 1993.
Moore, William J., Newman, Robert J., and Fheili, Mohammad, "Measuring the Relationship between Income and NHEs", *Health Care Financing Review 14*, no.1, Fall 1992.
Murray, C. J. L., R. Govindaraj, and P. Musgrove, "National health expenditures: a global analysis" in: C. J. L. Murray and A. D. Lopez, eds., *Global Comparative Assessments in the Health Sector*. Geneva: World Health Organization, 1994.
National Commission for Statistics, *Romanian Statistical Yearbook 1993*.
National Statistical Institute, *Statistical Yearbook 1996*. Sofia, 1997.
Pritchett, Lant, and Lawrence H. Summers, "Wealthier is Healthier", *The Journal of Human Resources* 31, no. 4, Fall 1996.
Republic of Slovenia, *Statistical yearbook 1997*. Ljubljana, 1997.
Reynolds, Lloyd G., *Economic Growth in the Third World, 1850-1980*. New Haven: Yale University Press, 1985.
Sachs, Jeffrey D., and Andrew M. Warner, "Fundamental Sources of Long-Run Growth", *American Economic Review Papers and Proceedings 87*, no. 2, May 1997.
Sen, Amartya, "Mortality as an Indicator of Economic Success and Failure", *Economic Journal 108*,

no. 446, January 1998.
Shapiro, Judith, "The Russian Mortality Crisis and Its Causes" in: Anders Aslund, ed., *Russian Economic Reform at Risk.* London: Pinter, 1995.
Shkolnikov, Vladimir M., "The Russian Health Crisis of the 1990s in Mortality Dimensions", Harvard Center for Population and Development Studies Working Paper Series no. 97.01, March 1997.
Shlapentokh, Vladimir, "Standard of Living and Popular Discontent", in: Michael Ellman and Vladimir Kontorovich, eds., *The Destruction of the Soviet Economic System. An Insiders' History.* Armonk, NY: M. E. Sharpe, 1998.
Statistical Office of Estonia, *Statistical Yearbook of Estonia 1997.* Tallinn, 1997.
Steckel, Richard H., and Roderick Floud, "Conclusions", in: Richard H. Steckel and Roderick Floud, eds., *Health and Welfare during Industrialization.* Chicago: University of Chicago Press, 1997.
Szreter, Simon, and Graham Mooney, "Urbanization, mortality, and the standard of living debate: new estimates of the expectation of life at birth in nineteenth-century British cities", *Economic History Review LI,* no. 1, 1998.
Thurston, Adam, "Ionizing Radiation and Health in Russia: Scourge or Scare?" independent study paper, Haverford College, Haverford, PA, May 1998a.
Thurston, Adam, "Lead pollution from mobile sources in Russia" independent study paper, Haverford College, Haverford, PA, May 1998b.
UNDP (United Nations Development Program), *Human Development Report 1996. Russian Federation.* Moscow: Academia, 1997.
US Census Bureau, *Historical Statistics of the United States. Colonial Times to 1957. A Statistical Abstract Supplement.* 1960.
US Census Bureau, *Statistical Abstract of the United States 1973.* 1973.
Vasina, G., S. Vukolova, and S. Nikitina, "Prognoz chislennosti naseleniia Rossiiskoi Federatsii do 2010 goda", *Voprosy statistiki* no. 10, 1997.
Vishnevskii, Anatolii, and Vladimir Shkol'nikov, *Smertnost' v Rossii. Glavnye gruppy riska i prioritety deistvii.* Moscow Carnegie Center Report no. 19, 1997.
Vishnevskii, A. G., ed., *Naselenie Rossii 1995.* Moscow: 1996.

8. Tables and Figures

Table 2. Index of male age specific death rates in Russia, 1985-86=100.

Age group	1985-86	1990	1991	1992	1993	1994	1995	1996
0-4	100.0	73.3	73.3	71.7	75.0	76.7	76.7	76.7
5-9	100.0	100.0	114.3	100.0	100.0	100.0	100.0	85.7
10-14	100.0	100.0	116.7	116.7	116.7	116.7	116.7	100.0
15-19	100.0	114.3	121.4	128.6	150.0	150.0	*171.4*	150.0
20-24	100.0	104.0	108.0	128.0	152.0	160.0	*172.0*	164.0
25-29	100.0	110.0	116.7	140.0	170.0	*183.3*	180.0	163.3
30-34	100.0	110.3	115.4	141.0	179.5	*197.4*	189.7	174.4
35-39	100.0	112.0	118.0	142.0	186.0	*212.0*	200.0	172.0
40-44	100.0	93.8	98.8	121.0	164.2	*187.7*	174.1	149.4
45-49	100.0	109.3	108.4	126.2	166.4	*194.4*	180.4	155.1
50-54	100.0	99.4	101.9	119.8	156.2	*179.6*	168.5	146.9
55-59	100.0	103.1	102.6	111.5	137.9	*159.5*	149.8	137.9
60-64	100.0	104.3	105.5	112.5	138.1	*155.5*	143.6	127.7
65-69	100.0	97.1	98.5	102.9	123.8	*133.8*	127.7	120.0
70+	100.0	106.1	106.6	108.3	121.7	*124.4*	114.8	101.7

Source: Calculated from Goskomstat, 1997, p. 88.

TABLE 3. INDEXES OF DEATHS BY CAUSE FOR WORKING AGE POPULATION IN RUSSIA, 1990= 100.

CAUSE	1991	1992	1993	1994	1995	1996	Rate of change since the peak, %
Total	102.9	118.9	151.5	172.1	163.9	146.0	-15.2
Infectious & parasitic diseases	103.1	119.6	166.0	202.1	216.5	230.9	did not peak
Neoplasms	99.8	100.0	101.2	101.5	98.7	94.7	-6.7
Cardiovascular diseases	101.0	113.9	149.4	178.6	163.6	145.2	-18.7
Respiratory diseases	95.0	111.9	175.5	216.4	203.8	173.0	-20.1
Gastrointestinal diseases	102.3	126.9	170.0	222.3	230.0	203.1	-8.7
Accidents, poisonings & traumas	106.6	132.7	174.0	190.9	181.2	158.8	-16.8
Other	106.0	127.1	173.7	212.0	210.0	173.3	-18.2

Source: Goskomstat, 1997, p. 89.

TABLE 4. CONTRIBUTION OF CAUSES OF DEATH TO INCREASED DEATHS OF WORKING AGE POPULATION IN RUSSIA, 1990-1994.

CAUSE	Increase, thousands	Share of cause in total, %
Total	295.6	100.0
Infectious & parasitic diseases	9.9	3.3
Neoplasms	1.3	0.4
Cardiovascular diseases	90.6	30.6
Respiratory diseases	18.5	6.3
Gastrointestinal diseases	15.9	5.4
Accidents, poisonings & traumas	131.3	44.4
Other	28.1	9.5

Source: Calculated from Table 4.

TABLE 5. MALE LIFE EXPECTANCY AT BIRTH, YEARS, IN POST-COMMUNIST COUNTRIES.

COUNTRY	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	Decline from peak to trough, %
Russia	65.0	64.8	64.2	63.8	63.5	62.0	58.9	57.4	58.3	59.8	61.0	*-11.7*
Ukraine	66.3	66.4	66.1	65.5		64.0	64.0	62.8				*-5.4*
Bielorussia	67.2	67.0	66.8	66.3		64.9						*-3.4*
Estonia	66.5	66.6	65.7	64.6	64.4	63.5	62.5	61.1	61.7	64.5		*-8.3*
Latvia	66.3	66.3	65.3	64.2		63.3	61.6	60.7				*-8.4*
Lithuania	67.8	67.7	66.9	66.6		64.9	63.3	62.8	63.6			*-7.4*
E. Germany				70.0		69.8	70.3					*-0.3*
Poland	66.8	67.2	66.8	66.3	66.1	66.5	67.1	67.2	67.6			*-1.6*
Czechia				67.5		68.5	69.3	69.5	70.0			*decline in 1990**
Hungary	65.7	66.2	65.4	65.1	65.0	64.6	64.5	64.8	65.3	66.1		*-2.5*
Rumania	66.3	66.5	66.6	66.6	66.6	66.1	65.9	65.7	65.5			*-1.6*
Slovenia				69.4		69.5	69.4					*-0.1*
Bulgaria				68.1	68.0	67.6	67.7	67.3	67.1			*-1.5*

Sources: Russia - Table 1; other countries - Guibert-Lantoine and Monnier, 1997, pp.1213-14. Soviet republics through 1989 - Goskomstat, 1991 p. 94; Goskomstat, 1989a, p. 31, and Goskomstat, 1989b, p. 494. Hungary - Hungarian, 1997, p. 51. Bulgaria - National, 1997, p. 42. Czechia, 1995 - Czech, 1997, p. 116. Poland 19987-89, 1991 - Glowny, 1994, p. 61. Rumania 1987-1991: National, 1993, p. 134. Estonia, 1989-96 - Statistical .., 1997, p. 77.

* According to Shkolnikov, 1997, p. 9.

TABLE 6. AGE SPECIFIC DEATH RATES FOR MALES IN POLAND, PROMILLE.

Age group	1990	1991	1992	1993	1994	1995	Peak rate of increase, %
0-4	4.6	4.4	4.3	3.7	3.5	3.0	-4.4
5-9	0.3	0.3	0.3	0.3	0.3	0.3	0.0
10-14	0.3	0.4	0.3	0.3	0.3	0.3	33.3
15-19	1.0	1.1	1.0	0.9	1.0	0.9	10.0
20-24	1.7	1.7	1.6	1.3	1.4	1.3	0.0
25-34	2.3	2.3	2.2	2.0	2.0	2.0	0.0
35-44	4.7	5.1	5.0	4.6	4.6	4.7	8.5
45-54	11.7	12.5	11.7	10.6	10.4	10.5	6.8
55-59	20.8	21.7	21.0	20.1	19.4	19.6	4.3
60-64	30.2	31.5	30.1	29.3	28.4	28.6	4.3
65-69	43.0	44.4	43.4	42.9	41.2	40.7	3.3
70+	103.7	105.4	100.4	100.0	96.2	93.7	1.6

Source: Glowny, 1996, p.63.

TABLE 7. AGE SPECIFIC DEATH RATES FOR MALES IN SLOVENIA, PROMILLE.

Age group	1990	1991	1992	1993	1994	1995	1996	Peak rate of increase, %
10-14			0.2	0.3	0.2	0.3	0.3	0.0
15-19			0.9	0.9	1.3	0.9	1.0	44.4
20-24			1.7	1.9	1.5	1.4	1.3	11.8
25-29			1.4	1.7	1.8	1.2	1.5	28.6
30-34			2.2	2.2	1.9	1.7	1.5	0.0
35-39			2.9	2.9	2.8	2.1	2.2	0.0
40-44			4.0	4.5	4.2	3.9	3.8	12.5
45-49			6.1	6.2	6.4	5.9	5.7	4.9
50-54			9.7	10.2	10.3	9.5	9.3	6.2
55-59			16.4	17.4	14.7	14.8	13.3	6.1
60-64			26.8	25.9	25.0	24.1	22.7	decline
65-69			37.5	37.7	35.8	35.6	34.7	decline

Source: Republic of Slovenia, 1997, p. 91.

TABLE 8. REAL GDP PER CAPITA ANNUAL GROWTH RATE, %, 1960-1980, AND LIFE EXPECTANCY AT BIRTH, YEARS, IN 1960 FOR 35 COUNTRIES.

Country	Growth rate	Life expectancy	Country	Growth rate	Life expectancy
South Korea	7.0	54	Morocco	2.5	47
Taiwan	7.1	63	Sri Lanka	2.4	62
Iraq	5.3	46	Argentina	2.2	65
Brazil	5.1	57	Tanzania	1.9	42
Thailand	4.7	51	Chile	1.6	57
Malaysia	4.3	57	India	1.4	43
Nigeria	4.1	39	Ethiopia	1.4	36
Indonesia	4.0	41	Burma	1.2	43
Turkey	3.6	51	Peru	1.1	48
Egypt	3.4	46	Zimbabwe	0.7	45
Algeria	3.2	47	Zambia	0.2	40
Colombia	3.0	53	Zaire	0.2	40
Pakistan	2.8	44	Nepal	0.2	37
Philippines	2.8	51	Mozambique	-0.1	37
Kenya	2.7	47	Sudan	-0.2	39
Mexico	2.6	58	Uganda	-0.7	44
Venezuela	2.6	58	Ghana	-1.0	40
Ivory Coast	2.5	37			

Source: Reynolds, 1985, pp. 390, 393.

TABLE 9. GROWTH OF GDP PER CAPITA (UK) AND LIFE EXPECTANCY AT BIRTH (ENGLAND), XIXTH CENTURY.

Year	1801	1811	1821	1831	1841	1851	1861	1871
GDP per capita, average annual growth rate in the preceding decade, %		0.66	0.46	0.81	0.30	2.17	1.63	1.94
Life expectancy at birth, years	35.9	37.6	39.2	40.80	40.3	39.54	41.19	41.31
Life expectancy at birth, percentage change in the preceding decade		4.74	4.39	3.98	-1.3	-1.84	4.17	0.29

Source: Floud and Harris, 1996, pp. 45-46 and 55.

TABLE 10. GROWTH IN REAL GDP IN EX-COMMUNIST COUNTRIES SINCE 1990, %.

Year/ Country	1989	1990	1991	1992	1993	1994	1995	1996	1997	*Average annual growth rate, %, over the last X years*	
Russia			-5.0	-14.5	-8.7	-12.6	-4.0	-5.0	0.4		
Ukraine			-11.6	-13.7	-14	-23.0	-11.8	-10.1	-3.0		
Bielorussia			-1.2	-9.6	-11	-12.6	-10.1	2.6	2.0		
Estonia			-7.9	-14.2	-8.5	-1.8	4.3	4.0	7.0	*5.1*	*3 years*
Latvia			-10.4	-35.0	-15	0.6	-0.8	2.8	3.4	*3.1*	*2 years*
Lithuania			-13.4	-37.7	-24	1.0	3.0	3.6	4.5	*3.7*	*3 years*
Poland	0.2	-11.6	-7.0	2.6	3.8	5.2	7.0	6.0	5.5	*5.5*	*5 years*
Czechia	1.4	-0.4	-14.2	-6.4	-0.9	2.6	4.8	4.1	1.0	*3.1*	*4 years*
Slovakia	1.4	-0.4	-14.6	-6.5	-3.7	4.9	6.8	6.9	4.5	*5.8*	*4 years*
Hungary	0.7	-3.5	-11.9	-3.1	-0.6	2.9	1.5	1.0	3.0	*2.1*	*4 years*
Rumania	-5.8	-5.6	-12.9	-8.8	1.3	3.9	6.9	4.1	-2.0	*3.2*	*4 years*
Slovenia			-8.9	-5.5	2.8	5.3	4.1	3.1	4.0	*4.1*	*4 years*
Bulgaria	0.5	-9.1	-11.7	-7.3	-2.4	1.8	2.1	-10.9	-7.0		

Sources: *Economics of Transition* 5, no. 2, 1997, p. 530 (1997 - projected). Russia 1997 - Goskomstat. 1989-90 - Bartholdy, 1995, pp. 525-30.

TABLE 11. RUSSIAN LIFE EXPECTANCY AT BIRTH, YEARS, IN 1962-1997.

Year	Male	Female	Year	Male	Female
1962-63	63.9	72.5	1980-81	61.5	73.1
1963-64	64.4	73.0	1981-82	62.0	73.5
1964-65	64.6	73.3	1982-83	62.3	73.6
1965-66	64.3	73.4	1983-84	62.0	73.3
1966-67	64.2	73.5	1984-85	62.3	73.3
1967-68	63.9	73.5	1985-86	63.8	74.0
1968-69	63.5	73.5	1986-87	64.0	74.6
1969-70	63.1	73.3	1987	65.0	74.6
1970-71	63.2	73.6	1988	64.8	74.4
1971-72	63.2	73.6	1989	64.2	74.5
1972-73	63.2	73.5	1990	63.8	74.2
1973-74	63.2	73.6	1991	63.5	74.3
1974-75	62.8	73.4	1992	62.0	73.8
1975-76	62.3	73.0	1993	58.9	71.9
1976-77	62.0	73.1	1994	57.4	71.0
1977-78	61.8	73.2	1995	58.3	71.7
1978-79	61.7	73.1	1996	59.8	72.5
1979-80	61.5	73.0	1997*	61.0	73.1

Sources: Vishnevskii and Shkolnikov, 1997, p. 56; Goskomstat,1998, pp. 290-292. * preliminary estimate.

TABLE 12. LIFE EXPECTANCY AND GROWTH RANKING ACROSS DEVELOPED COUNTRIES.

Country	Life expectancy at birth, US = 1.0				Real GDP per capita, US=1.0		
	1980		1994		1980(b)	1992(a)	(a) - (b)
	Male	Female	Male	Female			
Canada	1.03	1.02	1.04	1.03	0.92	0.91	-0.01
Australia	1.01	1.01	1.04	1.02	0.82	0.81	-0.01
N.Zealand	1.01	0.99	1.01	1.00	0.68	0.63	-0.04
Japan	1.05	1.02	1.06	1.05	0.66	0.84	0.18
Spain	1.04	1.02	1.02	1.03	0.48	0.55	0.06
Greece	1.03	0.99	1.04	1.02	0.39	0.38	-0.01
Italy	1.01	1.00	1.03	1.03	0.67	0.71	0.03
W.Germany*	1.00	0.99	1.01	1.01	0.78	0.82	0.04
Austria	0.99	0.98	1.01	1.01	0.69	0.72	0.03
Belgium	1.00	0.99	1.01	1.01	0.73	0.75	0.03
Denmark	1.02	1.00	1.00	0.99	0.74	0.79	0.04
Finland	0.99	1.02	1.01	1.02	0.71	0.67	-0.04
France	1.00	1.01	1.02	1.04	0.77	0.78	0.01
Iceland	1.05	1.03	1.06	1.03	0.76	0.70	-0.05
Norway	1.03	1.02	1.03	1.02	0.79	0.86	0.07
Netherlands	1.04	1.03	1.03	1.02	0.74	0.74	0.00
UK	1.00	0.98	1.02	1.01	0.66	0.71	0.04
Sweden	1.04	1.02	1.05	1.03	0.81	0.78	-0.04
Switzerland	1.03	1.02	1.04	1.03	0.94	0.89	-0.05

Sources: life expectancy - Guibert-Lantoine and Monnier, 1997, pp. 1213-15; GDP - Penn World Tables, Mark 5.6. * Life expectancy in 1993.

APPENDIX II

THE HEALTH OF THE RUSSIAN WORKFORCE

Prepared By:
Nicholas Eberstadt
American Enterprise Institute
February 1998

Prepared For:
Hicks & Associates Inc.
Science Applications International Corporation

A. Introduction

This report summarizes and highlights research undertaken by Nick Eberstadt for SAIC on the Future Health Of Russia's Workforce Project.

An earlier progress report established that the size and age structure of the Russian Federation's 15-64 year-old population as of the year 2020 could be described with some confidence today, insofar as the overwhelming majority of the people in that prospective grouping are already alive today, and insofar as even radically different assumptions about health levels in the year 2020 do not significantly affect survival totals over this time horizon. (See attached supplement A)

This report focuses on the prospects for the health of the Russian populace and workforce around the year 2020, and of the possible implications of labor force health levels on economic productivity. Taken together, the research described in the two reports permits us to hypothesize about 1) Russia's potential health profile in the year 2020 in comparison with other countries; 2) Russia's prospective GDP in the year 2020 in relation to that of other populous countries; and thus 3) upon the role that continuing health problems may play in constraining Russia's economic recovery (and any concomitant geopolitical comeback) in the decades immediately ahead.

Overview of Findings

Our research to date on the Russian health crisis and its implications for Russia's economic and geopolitical recovery may now be briefly summarized:

- First, while other industrial countries have experienced sudden upsurges in mortality from which they went on to enjoy steady health progress, there are important differences between those earlier instances and the current Russian mortality crisis – differences which make it unlikely that Russia can replicate those earlier rapid health recoveries.
- Second, a number of factors relating to current Russian mortality patterns suggest that raising male or female levels of life expectancy much beyond current, abnormally low, levels may prove to be an unexpectedly difficult task. Even with effective public health policies and economic stability – quantities that cannot yet be taken for granted in the Russian environment – it might be an ambitious challenge to re-attain by 2020 the sorts of health levels that characterized Soviet Russia during the last years of the Communist regime.
- Third, even if Russia does achieve some health recovery over the coming two decades, many other currently low-income countries would be expected to make more significant strides. Thus, by the year 2020, Russia's international ranking with respect to life expectancy will likely be even lower than it is today, despite the "unnaturally" low ranking that Russia registers today due to its health crisis.
- Fourth and finally, there is a strong and persistent international correspondence between levels of life expectancy and levels of per capita output. These correspondences suggest that, ceteris paribus, Russia' relative international ranking in terms of both per capita output and aggregate GDP will decline further between now and the year 2020 (notwithstanding the prospect of absolute economic improvements in Russia itself). Our illustrative projections suggest that Russia in 2020 could be a country surrounded by neighbors with larger economies. Those

economically larger neighbors, our approach indicates, might not only include Japan and China, but also Korea, India, Pakistan, Iran, and Turkey. In the final analysis, human health matters greatly in the modern economy. Given Russia's health problems, the Russian Federation's economic recovery is likely to be constrained, and its international economic ranking is likely to decline further, all other factors notwithstanding.

B. Health Recovery And Economic Progress After Demographic Disaster: The Twentieth Century Record

In considering the potentialities for health recovery and economic recovery for the Russian Federation in the decades immediately ahead, we began by examining the historical experience of various countries that had been beset by "demographic disasters" over the course of the Twentieth Century.

Russia's post-1991 demographic patterns reflect a "demographic shock" comprised of 1) a sudden and dramatic upsurge in mortality levels[1] and 2) a parallel drop-off of fertility levels.[2] A number of other modern countries with market-oriented economies have been gripped by seemingly similar trends: these have included i) Spain (whose demographic convulsions resulted from the Spanish Civil War 1936/39); ii) West Germany (demographic shocks due to World War II, especially the years 1943-46); iii) Japan (World War II, especially 1944-46); and the Republic of Korea (the Korean War 1950/53).

Health and economic trends before and after "demographic disaster" in these four countries are charted out in Figures 1A through 1D. In these figures, we examine purchasing-power-parity adjusted changes over time in per capita GDP as estimated by the economic historian Angus Maddison,[3] and changes in life expectancy at birth for males, since it is males whose health was disproportionately affected during each of these past "demographic disasters," just as in the Russian Federation today.

In the period of extreme demographic stress in each of these four countries, mortality rates surged and life expectancy at birth plummeted; although, owing to attendant disruption and turmoil, statistical authorities did not always pinpoint the absolute nadir of life expectancy during these crises. What is striking to note, however, is the brisk pace of health recovery in each of these instances once the "demographic shock" was over. In none of these four countries did an extreme and sudden bout of "excess mortality", and a temporary but brutal drop in life expectancy, seem to

[1] In fact: measured against the hardly exemplary mortality levels in the RSFSR in 1989/91, the age-standardized toll of "excess mortality" for the years 1992-1997 would amount to over 2.5 million deaths.

[2] In 1996, according to the Russian State Statistics Committee (Goskomstat), the total fertility rate (TFR) for the Russian Federation had fallen below 1.28 ["Russia: Interfax Statistical Report", FBIS-SOV-97-206, July 28, 1997] This would amount to a drop of roughly 40 percent from the fertility levels registered in the RSFSR in 1989/91. Initial figures for 1997 indicate that fertility levels in Russia continue to be extremely depressed.

[3] Angus Maddison, Monitoring The World Economy, 1820-1992, (Paris: OECD, 1995).

compromise long-term health progress. In each of these four, in fact, life expectancy at birth apparently had not only recovered to "pre-disaster" levels within a few years after the end of the crisis in question, but continued to improve at a robust tempo -- almost as if disaster had never struck. Perhaps the most remarkable instance of post-disaster health progress is Japan's. (See Figure 1C.) In 1944/45 male life expectancy had been driven down to essentially neolithic levels (under 25 years). Barely three decades later -- in the late 1970s -- Japan was estimated to enjoy virtually the highest male life expectancy in the world![4]

Figures 1A-1D similarly emphasize that "demographic disaster" only temporarily constrained economic growth in each of these four countries. Spain, West Germany, Japan, and South Korea not only all managed to re-attain their pre-crisis levels of output per capita, but went on to achieve records of impressive economic advance.[5] After its "demographic disaster," West Germany resumed its long-term pace of relatively rapid economic growth; Spain, Japan and South Korea in fact substantially accelerated their tempos of economic growth in the wake of their respective demographic crises.

The instances of Spain, Japan, West Germany and South Korea may be viewed as offering a fairly optimistic prognosis for health recovery and economic advance in a modern industrial economy in the aftermath of a severe "demographic shock." Three qualifications, however, must be kept in mind when assessing the relevance of their experiences to the prospects for Russia's health and economic productivity around the years 2020.

- First, the duration, nature, origins, and prospective trajectory of Russia's current demographic crisis and concomitant health problems looks to be different -- in some respects, dramatically different -- from those of the four countries under consideration above. We will establish this in the next section of the progress report.

- Second, it is important to remember that the institutional infrastructure for post-"demographic disaster" economic growth was, in important respects, already in place in Spain, West Germany, Japan and South Korea. That institutional infrastructure included established market mechanisms and commercial systems, including systems of property rights, commercial and civil codes, traditions of contract and contract enforcement, and the like. By contrast, such a framework is only evolving, not yet firmly established, in the Russian Federation -- as the very classification of Russia as a "transitional economy" is meant to underscore.

---

[4] See United Nations, World Population Prospects: The 1996 Revisions, (New York: UN Department for Economic and Social Information and Policy Analysis, forthcoming), Annex I. By these estimates, the only country in the world with a higher male life expectancy at birth than Japan for the period 1975/80 would have been Iceland.

[5] In several of these cases, economic success after "demographic disaster" is widely acknowledged internationally and implicitly connoted by such phrases as "the Japanese economic miracle," "the Korean economic miracle," and "the German Wirtschaftswunder."

- Third, even in the "success stories" examined above, economic progress in the first few decades after "demographic disaster" was more limited than many accounts suggest.

This fact is brought out in Table 1. Twenty three years after "hitting bottom" in their respective demographic/economic disasters,[6] Spain, West Germany, Japan, and South Korea had indeed each raised their levels of per capita output high above their demarcated crisis low-points: improvements in per capita output over this time horizon ranged from 70 percent for Spain to 440 percent for Japan. (See Table 1, Column C.) One may argue, however, that the more appropriate index against which to measure economic progress after "demographic disaster" is the peak of pre-disaster productivity, rather than the depths of the disaster itself.

Table 1

RECOVERY FROM DEMOGRAPHIC/ECONOMIC CATASTROPHE:
Per Capita $ GDP and Calculated Ratios at Selected Historical Points for Germany, Spain, South Korea and Japan

	A low point	B 23 years later	C improvement factor 1 (B/A)	D pre-disaster high point	E improvement factor 2 (B/D)
Spain	2022 (1938)	3437 (1960)	1.7	2947 (1929)	1.2
Germany	2503 (1946)	11465 (1968)	4.6	6249 (1944)	1.8
Japan	1295 (1945)	6954 (1967)	5.4	2765 (1940)	2.5
ROK	808 (1951)	2840 (1973)	3.5	1681 (1937)	1.7

Note: Per capita GDP in 1990 PPP Dollars
Source: Derived from Angus Maddison, *Monitoring the World Economy* (Paris: OECD, 1995), appendix D

Against this arguably more appropriate starting point, post-disaster economic progress in the four countries under consideration, while by no means negligible, nevertheless looks decidedly more modest. (See Table 1, Column E.) Japan's results, we should note, were truly extraordinary. Twenty-three years after the low-point of its health/economic crisis, the country had attained a per capita output that was fully two and a half times higher than its highest pre-disaster level. In two other cases of successful health and economic recovery – West Germany and South Korea – per capita output nearly a generation after "demographic disaster" was about 70-80 percent higher than the pre-disaster apex. In Spain, the corresponding figure was about 20 percent.

[6] We have selected this time horizon because twenty-three years separate Russia 1997 from Russia 2020. Implicitly, we are also embracing the assumption that health/economic recovery in Russia might begin immediately. Subsequent sections of this progress report will cast that assumption as optimistic, and perhaps unrealistically so.

The data in Table 1 (column E) point to the limits that would be expected of a Russian health/economic recovery by the year 2020 under something like a "best of all possible worlds" scenario.[7] For reasons already mentioned, and other reasons that will be reviewed in the following pages, we believe expectations for Russian health/economic recovery by 2020 should be much more modest.

C. Structure and Trends of Contemporary Russian Mortality: Constraints against Health Recovery and Health Progress

Having reviewed the record of health progress under some of the modern market economies subjected to severe demographic shocks, it may be useful at this juncture to point out some of the more obvious ways in which the current Russian demographic crisis is different:

i) The demographic disasters experienced in Spain, West Germany, Japan and South Korea were the result of war or civil war. Russia's upsurge in mortality, by contrast, is taking place in a country in a formal state of peace.[8]

ii) As war-related phenomena, the demographic disasters in Spain, West Germany, Japan and South Korea naturally concluded with the cessation of fighting and resumption of peace. No such option exists for ending Russia's ongoing upsurge in mortality.

iii) The duration of each of the four previously considered demographic disasters was roughly three years. Russia's upsurge in mortality, on the other hand, is now (early 1998) entering into its seventh year.

iv) Spain, West Germany, Japan, and Korea South were areas that had enjoyed steady health progress in the generation immediately before their respective demographic crises. Contemporary Russia, experienced stagnation, and even retrogression, in public health conditions for broad portions of its population during the generation before its demographic crisis.

v) Devastating as they may have been, the demographic shocks suffered by Spain, West Germany, Japan and South Korea were discrete in the sense of having apparently had minimal adverse implications for the health prospects of crisis survivors.[9] The same cannot be automatically presupposed for contemporary Russia.

---

[7] Thinking about recovery from a pre-disaster peak begs the question, in Russia's case, of determining the level in market-economic terms of the RSFSR's per capita output at its zenith under central planning. That problem can be identified, but not easily resolved.

[8] It is true that post-1991 Russia has experienced mortality due to military conflict--most notably in Chechnya, where deaths associated with the uprising have commonly been estimated at up to 50,000. Those estimated Chechnya losses, however, would amount to less than 2 percent of Russia's excess mortality for the years 1992-97.

[9] This may be seen most clearly in the German situation. According to recent calculations by German demographers, World War II and its repercussions is estimated to have taken only about six months off the life

In sum, the nature and origins of Russia's current mortality crisis are far less conducive to rapid post-crisis health recovery, or to subsequent health progress, than were the war-related crises experienced by Spain, West Germany, Japan, and South Korea. We can perhaps better understand the impediments to health progress embedded in Russian conditions today if we examine the structure of Russian mortality, and consider the perverse trends in "cohort inertia" the have been emerging with respect to Russia's death rates.

Russia's recent upsurge of mortality is highlighted in Table 2, which compares age-standardized mortality rates for males (whose health setbacks have been more extreme than those of Russian females) in 1987 and 1994. Over those seven years, age-standardized mortality rates for Russia's men jumped by over 40 percent.

Table 2

AGE-STANDARDIZED MALE MORTALITY BY REPORTED CAUSE OF DEATH: RUSSIA, 1987 VS. 1994
(Deaths per 100,000; "New European" Model)

Reported Cause	1987	1994	Difference	%
(Total)	1626.1	2290.5	664.4	100
Infectious/Parasitic	23.6	36.8	13.2	2
Malignant Neoplasms	306.8	314.3	7.5	1
Diseases of the Circulatory System	888.3	1130.7	242.4	36
External Causes	170.7	416.2	245.5	37

Source: WHO, *World Health Statistics Annual 1995* (1996), table B-4.

The exact reasons for this upsurge are unclear to public health specialists today; a number of competing (sometimes mutually exclusive) hypotheses have been advanced to account for this sudden deterioration.[10] The etiology of the current crisis, however, is in a proximate sense represented by the changing patterns of causes-of-death. While Russia's cause-of-death data must

expectancy of the cohort of Western German women born in the year 1920. [Charlotte Hoehn, "Kohortensterblichkeit unter besonderer Berucksichtigung der Weltkriege", in Reiner Hans Dinkel, Charlotte Hoehn, and Rembeandt D. Scholz, eds., Sterblichkeitsentwicklung--unter besonderer Berucksichtigung des Kohortenansatzes, (Munich: Harald Boldt Verlag, 1996)].

[10] For a representation of these analyses, see Vladimir M. Shkolnikov, "The Russian Health Crisis Of The Early 1990s In Mortality Dimensions" Harvard Center For Population And Development Studies Working Paper Series, no. 97.01 (March 1997); Jose Luis Bobadilla, Christine A. Costello, and Faith Mitchell, eds., Premature Death In The New Independent States, (Washington, DC: National Academy Press, 1997); Lincoln C. Chen, Friedenike Wittgenstein, and Elizabeth McKeon, "The Upsurge Of Mortality In Russia: Causes And Policy Implications", Population And Development Review, vol. 22, no. 3 (September 1996); and Murray Feshbach, Ecological Disaster: Cleaning Up The Hidden Legacy Of The Soviet Regime, (New York: Twentieth Century Fund, 1995).

be treated with caution, they provide a number of reliable insights into the nature of the current health crisis:

i) First, although reports of outbreaks within Russia of diphtheria, cholera, and other relatively easily suppressed communicable diseases have received wide press coverage,[11] both in Russia and internationally, infectious and parasitic diseases are essentially incidental to the current Russian health crisis. According to cause-of-death data, for example, increased deaths from infectious and parasitic diseases accounted for less than 2 percent of the mortality upsurge for Russian men between 1987 and 1994. As of 1994, furthermore, deaths attributed to infectious and parasitic diseases accounted for well under 2 percent of Russia's male death total – a fraction not far different from that in the United States today.[12] The communicable disease situation in Russia today may well speak to a breakdown in some of the capabilities of the country's public health system, and may arguably augur ill for the country's ability to deal with such challenges in the immediate future, but it has not been a principal factor to date in Russia's health deterioration.

ii) Second, perhaps surprisingly, cancer-related deaths (malignant neoplasms) appear to account for only a relatively small proportion of Russian male age-standardized mortality as of 1994 (under 14 percent). An increase in deaths attributed to cancer is not a significant explanatory factor in Russia's recent mortality upsurge; a rise in deaths attributed to malignant neoplasms, in fact, accounts for barely 1 percent of the age-standardized mortality increase between 1987 and 1994.

iii) Cardiovascular disease (CVD) appears to be primary cause of death for Russian men today. Nearly half of Russia's age-standardized death male rate in 1994 was attributed to diseases of the circulatory system. The rise in deaths attributed to cardiovascular disease, moreover, accounted for 36 percent of the upsurge in age-standardized mortality for Russian men between 1987 and 1994. Moreover, as we shall see in a moment, Russia's current levels of cardiovascular mortality are extraordinarily high by any international benchmark – possibly without historical precedent. Note that cardiovascular mortality is influenced by a number of behavioral risk factors – among these, diet/obesity, sedentary lifestyle, smoking, heavy drinking, and psychological stress. The risk of death from cardiovascular disease, furthermore, tends to be cumulative, in the sense that it is influenced by past as well as present health insults accumulated over one's lifetime.

---

[11] See, for example, John Maurice, "Russian Chaos Breeds Diphtheria Outbreak", Science, vol. 206, March 10, 1995, and Phil B. Fontanarosa, "Diphtheria in Russia: A Reminder Of Risk", JAMA, vol. 273, no. 16, April 26, 1996.

[12] Another way of looking at this is in terms of the probability of ultimately dying from such diseases. According to World Health Organization estimates, if Russia's cause-of-death patterns in 1994 were held fixed and projected into the future, a Russian man would have about a 1.9 percent chance of eventually dying from infectious or parasitic diseases. For American males with US cause-of-death patterns from 1992, the corresponding risk was calculated to be 1.3 percent. [World Health Organization, World Health Statistics Annual 1995 (Geneva: WHO, 1996), Table B-3].

iv) Deaths due to "external causes" – that is to say, injury and trauma – have taken on an extraordinary prominence in the Russian male mortality structure. Injuries now account for nearly a fifth of overall age-standardized mortality for Russian men. In fact, at the moment they are even more likely than this to end up as the eventual cause of death for Russia's males.[13] The age-standardized mortality level attributed to "external causes" jumped by about 150 percent for Russian men between 1987 and 1994; the upsurge in deaths-by-injury accounted for nearly three-eighths of the overall upsurge in male mortality in Russia over those same years. Like cardiovascular disease, deaths from "external causes" are heavily influenced by behavioral and lifestyle factors. Although unlike CVD, deaths from injury are likely to be caused by an immediate episode rather than a cumulation of insults. Some portion of the upsurge in deaths from injury may be viewed as relating closely to Russia's changing political and economic atmosphere, e.g., Mafia murders, finance-related suicides.[14] A much greater share of these deaths, however, may be explained by an apparent upsurge in heavy drinking by Russian men since the end of the Soviet regime – an increase in drunkenness that has made them more likely to hurt themselves unintentionally at home, at work, or on the roads, and also more likely to hurt themselves or each other deliberately.[15]

The inherent difficulties in eliciting rapid health recovery from a population with contemporary Russia's cause-of-death profile may be appreciated by comparison against the corresponding mortality structure for Japanese men in the early 1950s. (See Figure 2.) Although overall male mortality levels in Russia 1994 and Japan 1950/54 were similar, the contributions of various causes of death were strikingly different.

Infectious and parasitic diseases, for example, accounted for a much higher proportion of deaths in Japan.[16] Progress against infectious and parasitic diseases can be obtained through public health interventions that are extensive but relatively inexpensive. Such progress, moreover, can be expected very soon after the public health interventions in question.

Deaths attributed to cardiovascular disease, on the other hand, accounted for a much greater proportion of overall male mortality in Russia 1994 than in Japan 1950/54. Medical interventions to reduce CVD deaths are intensive rather than extensive in nature – and thus ceteris paribus, much

[13] Projecting 1994 mortality patterns forward, the chance that a Russian male's ultimate cause of death would be "external causes", according to WHO calculations, was 22.5 percent,

[14] Note that deaths from military actions are not included in the International Classification of Diseases (ICD) category "external causes", but rather classified separately.

[15] For a comprehensive discussion of the role of alcohol in contributing Russian male injury patterns, see Vladimir M. Shkolnikov and Alexander Nemtsov, "The Anti-Alcohol Campaign And Variations In Russian Mortality", in Bobadilla, Costello, and Johnson, eds., Premature Mortality In The Newly Independent States, op.cit.

[16] The proportion of deaths actually due to infectious and parasitic diseases for Japanese men in the early 1950s is likely even higher than Figure 2 suggests, insofar as cause-of-death was not determined for a high share of the country's decedent males at that time.

more expensive. Due to the chronic nature of CVD problems, moreover, a strategy to reduce CVD mortality – even if completely embraced, adequately funded and competently implemented – will only show results gradually over time.

Deaths from injury and poisoning were also vastly higher for Russian men in 1994 than for Japanese men in the early 1950s. Injury prevention may prove to be considerably more problematic than suppression of infectious and parasitic disease. An effective injury prevention campaign would require massive behavioral changes on the part of the Russian population – especially, a radical drop in the prevalence of heavy drinking. While this would by no means be impossible to achieve, it would presuppose that the Russian government pursues a very different set of policies toward hard spirits from the ones it embraces today. Given the Russian budget's heavy current dependence upon revenues from sales of vodka, altering the country's alcohol policy would seem all the more challenging.

Prospects for health recovery and health progress for Russia today are complicated not only by the types of afflictions from which modern Russians are dying, but also by Russia's patterns of death by age groups. To an extraordinary degree, mortality in contemporary Russia is concentrated among people of "working ages" – the population aged 25-64.[17] Other countries have registered life expectancies for men and women that match contemporary Russia's. In none of those countries, however, have death rates for the "working age groups" been as high as those witnessed in Russia today.

The dramatic discrepancy between mortality levels for Russia's working age population and those of other modern industrial societies may be seen in Figures 3A-3C, which contrast deaths for men aged 25-64 by selected causes over the postwar period. Overall age-standardized death rates for males in Russia 1994 and Japan 1950/54 may have been roughly similar, but Figure 3A shows that age standardized death rates for the 25-64 group were over twice as high in Russia in 1994 as in Japan in 1950/54. In 1994, in fact, Russia's mortality for "working age" men was far higher than it had been among their relatively impoverished Chilean counterparts in the late 1950s. As of 1994, Russia had by far the highest level of mortality for working age males of any country reporting such data to the World Health Organization (WHO): a level over three and a half times higher than for contemporary Chilean males, and over four times higher than for contemporary Japanese males. The 1994 mortality levels for Russian males of working ages attributed to cardiovascular disease and to external causes were, likewise, higher than anything registered during the postwar period by any of the countries reporting such data to the WHO.

A final unfavorable aspect of contemporary Russian mortality patterns bearing upon prospects for health recovery can bee seen in the evolution of mortality schedules by cohort. These patterns may be seen from Figures 4A-4D.[18] In Japan, West Germany, Chile – and for that matter, virtually all

[17] This designation of "working age population" is arbitrary, but not entirely unreasonable. Demographers tend to use a somewhat different designation: ages 15-64, inclusive.

[18] These figures depict age-specific death rates by five-year population groupings. For technical reasons, it would be preferable to have breakdowns by individual years. A final version of this study will present such figures.

Western or "emerging Third World" populations – survival schedules for successive generations have progressively improved. (See Figures 4A-C) In Russia, by contrast, there appears to have been no improvement in mortality schedules over time for recent generations of men. (See Figure 4D) In fact, there appears to be a discernible worsening of survival schedules for men over time: for any given age group, in other words, mortality levels are likely to be highest for the birth cohort that has passed through it most recently!

The causes of Russia's current health crisis, to repeat, are not fully understood by demographers, epidemiologists, or other health specialists. The consequences of these patterns, on the other hand, are fairly straightforward when it comes to health prospects for the Russian populace over the next two and a half decades.

A considerable amount of "negative inertia" appears to be built into the country's mortality structure. That is to say, simply attaining their parent's mortality levels at similar ages will require a major reversal of, and improvement in, current health trends.

Given Russia's cause-of-death profile, however, counteracting this "negative inertia" may prove to be tremendously challenging for public health authorities and other governmental policymakers. It is possible to imagine, for example, that the toll of injuries could be quickly and substantially reduced through stringent alcohol control policies; although, raising this possibility begs the question of how the Russian government, as currently constituted, could be brought to embrace and actually implement such a strategy. Controlling the toll of cardiovascular disease is another matter. Future health interventions in this area will be dealing, in some significant sense, with health insults incurred today, and in the past.

The 50-year-olds in the Russian workforce in the year 2020, for example, will be 28 years old this year. Judging by current mortality and cause-of-death patterns in Russia, this grouping is already exposed to higher risks of CVD than earlier birth cohorts. Even if effective public health policies are put in place in Russia in the years immediately ahead – no sure thing at the moment – it will not be easy to bring CVD mortality in the coming generation down below the levels experienced in recent years.

In summary, a review of the structure and underlying trends in Russian mortality suggests that health progress over the coming decades – up to the year 2020 – is likely to be at best modest for the Russian population in general and for the population of working ages. Health recovery and health progress of the sort witnessed earlier in post-disaster Spain, West Germany, Japan and South Korea simply does not look to be in the cards for Russia over the next several decades. It is possible to imagine a gradual return, over the next twenty-two years, to levels of male and female life expectancy reminiscent of the last years of the RFSFR – levels of life expectancy that had been reported in Soviet Russia in the 1980s. We should emphasize, however, that this outcome would represent a relatively optimistic scenario, insofar as it would presuppose a significant impact from health interventions not yet undertaken (or, as best one can tell, even under consideration in Moscow today). It also assumes that a number of looming or potential health problems, e.g., AIDS, environmentally-induced illnesses, will never attain epidemic proportions.

Under less optimistic assumptions about health interventions, public health system cohesion and epidemic illnesses, it is possible to draw out a plausible picture in which life expectancy at birth for men and women alike in Russia in the year 2020 would be lower than had been the case in the late 1980s.

D. Quantifying "Health Status" In Russia and The World: For Now, An Unworkable Task

Initially we had hoped to utilize some recently pioneered techniques for quantifying the "health status" of a population to produce a summary measure that would permit comparisons of overall health levels in Russia today with that of other countries--a measure that might further offer the opportunity of analyzing the interplay between health levels and economic performance, now and in the years ahead. After considerable effort, we have reluctantly concluded that such newly developed techniques proposing to quantify "health status" cannot be used in our project. For the purposes of our exercise, those techniques are unworkable at best, and would generate unreliable or positively misleading results at worst.

The defects inherent in the two current approaches to quantifying health status can be succinctly described and explained. The first technique, invented at the Harvard School of Public Health and promoted by the World Health Organization and the World Bank, is known as the "disability adjusted life year" (or DALY) method of estimating the "global burden of disease."[19] In essence, this approach offers a synthetic measure for the health of a population that combines actually measured mortality with an estimated figure representing the "mortality equivalent" of the illnesses and disabilities afflicting the population in question.

The DALY techniques remain controversial among public health statisticians and have been critiqued by other health specialists as well.[20] From a practical standpoint, two enormous problems loom over this approach: 1) how to obtain accurate information on the actual incidence and severity of the entire range of illnesses and disabilities besetting a given population; and 2) how to value, or scale, those various illnesses or disabilities so that they may be measured in "mortality equivalents" and thus added together into a summary number.

DALY practitioners answer the second question by arguing that the scaling or weighting of illness and disability does not matter greatly to their calculated results: that DALYs are not highly sensitive even to significant adjustments in the hypothetical weighting of illnesses and injuries considered. If they are correct, however, this would suggest prima facie that the informational content of DALYs

---

[19] The DALY approach is detailed in the following publications: World Bank, World Development Report 1993: Investing In Health, (New York: Oxford University Press, 1993); C.J.L. Murray and A.D. Lopez, eds., Global Comparative Assessments In The Health Sector: Disease Burden, Expenditures And Intervention Packages, (Geneva: World Health Organization, 1994); and Christopher J.L. Murray and Alan D. Lopez, eds., The Global Burden Of Disease: A Comprehensive Assessment of Mortality And Disability From Diseases, Injuries And Risk Factors in 1990 And Projected To 2020, (Cambridge, MA: Harvard University Press, 1996).

[20] For example: Sudhir Anand and Kara Hanson, "Disability-Adjusted Life Years: A Critical Review", Harvard Center for Population and Development Studies Working Paper Series, no.95.06 (September 1995).

is limited and thus that DALYs would not necessarily offer useful insights to our project, even under the best of circumstances.

DALY proponents do not always address the first question directly. Reviewing DALY work, however, it quickly becomes clear that results are being provided for areas and regions that could not possibly provide the level of detail these calculations would presuppose. The 1993 World Bank World Development Report, for example, goes into exacting detail about the precise "burden of disease" in sub-Saharan Africa, even though death registration, much less health registration, is still highly incomplete in every single sub-Saharan country! DALY studies offer calculations on the "burden of disease" in "Formerly Socialist Economies" for 1990. Despite an exhaustive, we were unable to replicate those results. We could not determine the exact method by which those numbers had been calculated, much less locate substantiating data on actual prevalence of the multiplicity of diseases and injuries the DALY techniques described.

In our view, DALYs are a useful heuristic device for considering some issues pertaining to health status. It is questionable, though, whether the DALY technique will ever be able to represent a population's health status accurately and unambiguously. At the moment, we conclude it certainly cannot be relied upon to do so. Even if DALYs were accurate and reliable today, however, they would convey rather less information about the interplay between health and economic performance than does the simpler and more intuitively comprehensible measure of life expectancy. This much is illustrated in Figure 5, which compares estimated DALYs for different regions of the world with their estimated GNPs per capita for the year 1990.

While the regression equation produced the expected general relation (lower DALY correspond with higher per capita GNP), the degree of correlation is relatively low: the R-Square on the equation is about 0.4. By contrast, as we will see in the next section, the R-Square on international correlations between life expectancy and per capita GDP over the postwar period under a variety of different adjustments generally range between 0.8 and 0.9. In a purely positive sense, then, it is more informative to examine the relationship between life expectancy and economic output than the relationship between this measure of "health status" and economic output.

The second approach to quantifying "health status" involves techniques for calculating "health expectancy". These techniques – first outlined in the early 1970s, but applied much more widely in the 1990s under the auspices of REVES[21] – essentially build contingent life tables for a variety of health statuses – "disability free" life, "impairment free" life, "healthy" life, etc. – based upon the calculated probability of surviving from one given age to the next without suffering from the negative health outcome under consideration.

From a methodological standpoint, "health expectation" calculations appear superior to DALYs in two particular respects: 1) the techniques involved are far more transparent and 2) the requisite data on both mortality and disability (or impairment, or "healthy life") are readily available for a number of countries, including Russia.[22] Unfortunately, interpretation of "health expectancy" calculations is

[21] Reseau d'esperence de vie et esperence de sante [Network on Life Expectancy and Health Expectancy].

[22] For example: Yuri M. Konorov et. al., "Epidemiology Of Disability In The New Independent States",

quite problematic. The contingent data used for calculating health status are, almost invariably, subjective, drawn from survey questions and based upon self-assessment. The subjective nature of these assessments severely limits comparability among countries, or even within a given country over time.

The problematic nature of "health expectancy" computations is underscored in Figures 6A and 6B, which show estimates for changes in life expectancy and "healthy life expectancy" for males and females in Western and Eastern Germany. These carefully computed results fail to pass the "reality check" in two important respects. First, despite a wealth of information indicating that general health status in Western Germany was superior to health status in Eastern Germany before unification, these figures indicate virtually identical "health expectancies for males in Eastern and Western Germany in 1992, and for females in Eastern and Western Germany in 1992. Second, despite gradual improvements in life expectancy and per capita output in Germany over the 1992-95 period, "health expectancy" calculations indicate a sharp countrywide deterioration in male and female health status. These computations appear to be distorted by two factors: 1) a tendency for former East Germans to have lower personal expectations with respect to health, and thus a disposition to rank their personal health status more favorably than would West German counterparts with the same impairments; and 2) changes in pension and medical care regulations which, ceteris paribus, encouraged potential service recipients to rank their own health status less favorably in 1995 than they would have in 1992.

In theory, the quantification of health status is an intriguing proposition. Unfortunately, we have concluded that for the time being, such quantifications cannot be undertaken in a reliable and meaningful manner. For better or worse, we are left with mortality and life expectancy as the most serviceable proxy for health status and as the best measure for comparing health status among countries and within countries over time.

E. The Relationship between Life Expectancy and Economic Output: Recent Historical Indications and Indications for Russia

The international relationship between life expectancy and economic output per capita provides the basis, in this project, for assessing the possible impact of Russia's health problems in the years ahead. While there are a number of other, more theoretically sophisticated, approaches to modeling the impact of Russia's health problems on its prospective "growth paths," the virtue of using the life expectancy-output relationship as a starting point is precisely its simplicity and the ease with which other countries, against which Russia might be compared, can be accommodated in this framework.

Over the postwar period, there has always been a strong international correspondence between life expectancy at birth and per capita output. This correspondence is illustrated in Figures 7A through 7H, which demonstrate the relationship between life expectancy at birth and GDP per person in the "working age population" (ages 15-64) over successive five year periods between 1955 and 1990 for

unpublished paper presented at "Workshop On Mortality And Disability In The New Independent States", Washington, National Academy of Sciences, September 8-9, 1994.

the world's nineteen most populous countries for which data were available. That relationship appears to have been persistently robust: the OLS regression equations plotting out the relationship consistently generated R-Squares of 0.8 to 0.9, indicating that 80 to 90 percent of the variance in life expectancy in any given period tracks with the variance in per capita output. (See Figure 8.) These correlation coefficients, incidentally, prove not to be sensitive to different specifications of the variables (e.g. male, female or overall life expectancy at birth; per capita GDP or GDP per person 15-64 years of age).

In any given period, relationship between life expectancy and per capita output appears to be semi-logarithmic: that is to say, along the continuum of life expectancies and per capita incomes among countries, an increase in life expectancy of a fixed number of years corresponds with a proportional increase in per capita GDP. The specification of that relationship, however, has gradually changed between 1955 and 1990. (See Figure 9.) Between 1955 and 1990, life expectancy became gradually associated with lower levels of per capita output, but only for countries with life expectancies of about 70 years or less. Interestingly, for countries with life expectancies above 70, life expectancy appears to be associated with ever higher real levels of per capita output.

How does one interpret this result? In Figures 7 and 8, we are treating life expectancy at birth as an independent variable that determines the dependent variable, per capita output. In real life, we know this is at best a gross oversimplification. Income also affects longevity and health; in addition, a host of factors not mentioned here affect the two. (We will deal with these complications in a moment.) For the time being, we may note that relatively low levels of life expectancy have become progressively "cheaper" to purchase, while relatively high levels of life expectancy have become progressively more "expensive." Or, conversely, the economic returns associated with relatively low levels of life expectancy have gradually diminished, while those associated with relatively high levels of life expectancy have gradually increased.

Although the relationship between life expectancy and per capita output is, in a statistical sense, fairly robust in our figures, it is no means perfect. On the basis of their life expectancies, some countries in Figures 7A through 7H have higher than predicted per capita output; others are lower than predicted. There are extreme outliers: typically, the United States' output level is 80 or 80 percent higher than would be predicted; conversely, China's is often 60 to 70 percent lower than would be predicted. (See Table 3.) If we think of per capita output as dependent upon both a populations life expectancy and certain other factors not identified in the regression analysis – for instance: the country's scientific/technological level; its level of higher education; the competence of its corporate infrastructure; and the efficiency of its economic/marketing system – we can explain divergence from predicted results, and even the situation of extreme outliers.

Figure 10 helps to lay this out. It plots the life expectancy/per capita output "paths" over time for China and the United States – the low and high outliers over most of the postwar period – and plots the "paths" for India and Japan. As one may see, postwar America has consistently produced more output per person, or per potential worker than would have

Table 3

HIGH AND LOW OUTLIERS IN RELATION TO GDP PER PERSON AGED 15-64 AS PREDICTED BY LIFE EXPECTANCY

Year	Country	High	Country	Low
1955	USA	1.88	Japan	0.65
1960	USA	1.75	Spain	0.58
1965	USA	1.87	Spain	0.65
1970	USA	1.80	China	0.36
1975	USA	1.68	China	0.31
1980	USA	1.60	China	0.31
1985	USA	1.68	China	0.40
1990	USA	1.78	China	0.51

Note: We have excluded Nigeria, high outlier for 1970-90; Poland and Russia, low outlier for 1955; and Poland, low outlier for 1965.
Source: Derived from equations in Figs 7A-H.

been expected on the basis of life expectancy alone. The differential, we might suggest, has been due to a number of additional factors which have tended to make American human resources more productive: among these, perhaps, the American higher education system, American scientific and technological pre-eminence, and the American corporate/managerial competitive advantage. China, by contrast, has consistently "underperformed" economically in relation to its level of life expectancy: a low level of technological attainment and the inherent inefficiencies of its socialist system are among the plausible explanations for this seeming discrepancy. Note that China reached its nadir of "underperformance" in Figure 9 in the early 1970s, shortly before the "Four Modernizations" and the Deng-era reforms were embraced. Since then, China's per capita output has advanced much more rapidly than its life expectancy, but China today is still "below the line". In a sense, China's rapid increase in per capita output has been a matter of reducing "underperformance," coming closer to the international norms described by the lines from the regression equations.

And what of Russia today? Perhaps surprisingly, per capita output for the Russian Federation in 1995 was almost exactly what would have been expected internationally, given the country's life expectancy over the period 1990/95.[23] (See Figure 11.) One might have expected Russia to be an international "underperformer" in these equations, given its "transitional" socioeconomic system its underdeveloped managerial capabilities, etc. Yet it was not. One way of interpreting these results is that Russia will be more dependent upon improvements in life expectancy for eliciting improvements in per capita output than is the case in a number of other countries (China, India), simply because eliminating "underperformance" is that much less of an option.

[23] This regression analysis utilized a separate source of data from that in Figures 7 - 9: World Bank estimates for PPP adjusted 1995 GDP. The R-Square for these equations were somewhat lower: in the range of 0.7 to 0.8. In the various specifications, however, Russia almost always came out "on the line".

F. Health and Output in Russia and The World, c. 2020: Some Illustrative Calculations

The international relationship between life expectancy and levels of per capita output that we examined in the previous section provides us with a basis for speculating about the impact of Russia's health difficulties on its economic performance, and its international economic ranking, in the decades immediately ahead.

We can begin by examining projections for life expectancy at birth for some of the world's most populous countries. (See Tables 4A-4C.) These projections come from the United Nations Population Division's yet unpublished 1996 revisions of its "World Population Prospects" series.

Between the late 1990s and the year 2020, UN projections anticipate an increase in overall life expectancy at birth in the Russian Federation of nearly six and a half years. This would bring Russian life expectancy up to a level somewhat higher than was attained in the RSFSR under the Gorbachev regime.

For reasons we have already detailed, we are inclined to view this projection as somewhat optimistic, and thus contrast it in Tables 4A - 4C with our own preliminary (and by this comparison, "pessimistic") projection of a four year increase.[24]

[24] That level would be roughly consonant with levels of life expectancy in the RSFSR witnessed during the Brezhnev era.

Table 4A

PROJECTED LIFE EXPECTANCY FOR 20 MOST POPULOUS COUNTRIES IN 2020 VS. PROJECTED LIFE EXPECTANCY FOR RUSSIA IN 2020 (BOTH SEXES)

20 most populous Countries, less Russia	Life Expectancy	Russia "Optimistic" Scenario	Russia "Pessimistic" Scenario
Japan	81.6		
USA	79.5		
Germany	79.3		
Mexico	76.3		
Thailand	74.9		
Iran	74.8		
Turkey	74.4		
China	74.2		
Philippines	74.0		
Vietnam	73.8		
Egypt	73.0		
Brazil	72.8		
S. Africa	72.5		
Indonesia	72.3		
Pakistan	71.9		
		70.8	
India	70.0		
			68.5
Bangladesh	68.4		
Zaire	63.4		
Nigeria	61.4		
Ethiopia	61.3		

Note: Life expectancy for 2020 is taken as arithmetic average of UN medium-variant projected totals for 2015-20 and 2020-25.
Source: United Nations, *World Population Prospects: The 1996 Revision* (New York: UN Department for Economic and Social Information and Policy Analysis, 1996).

Between the late 1990s and the year 2020, rapid health progress is envisioned in these projections for much of the world. This is especially true for current low-income areas. As a result, Russia's relative international health ranking, as measured by life expectancy, may actually decline from its current, and seemingly unnaturally low, level. Projections in Table 3A, for example, suggest that overall life expectancy for Russia in 2020 might be lower than that for such countries as South Africa, Indonesia, and Pakistan; possibly lower than for India; and possibly only barely higher than for Bangladesh. Male life expectancy in Russia, by these projections, would be lower than in Bangladesh and perhaps only slightly higher than in Zaire. (See Table 4B.) Female life expectancy, in these projections, would rank relatively higher – roughly, at the Brazilian level. Even so, life expectancy for Russian women would be lower than for their counterparts in such places as Iran, the Philippines, Vietnam, or Egypt. (See Table 4C.)

Table 4B

PROJECTED LIFE EXPECTANCY FOR 20 MOST POPULOUS COUNTRIES IN 2020 VS. PROJECTED LIFE EXPECTANCY FOR RUSSIA IN 2020 (MALES)

20 most populous countries, less Russia	Life Expectancy	Russia "Optimistic" Scenario	Russia "Pessimistic" Scenario
Japan	78.6		
USA	76.6		
Germany	76.3		
Mexico	73.3		
Thailand	73.3		
Iran	72.2		
Turkey	72.1		
China	71.9		
Philippines	71.9		
Vietnam	71.3		
Egypt	71.2		
Brazil	70.2		
S Africa	70.1		
Indonesia	69.9		
Pakistan	69.1		
India	68.6		
Bangladesh	67.7		
		65.8	
			62.6
Zaire	61.9		
Nigeria	59.8		
Ethiopia	59.7		

Note: Life expectancy for 2020 taken as arithmetic average of UN medium-projected totals for 2015-20 and 2020-25.
Source: United Nations, *World Population Prospects: The 1996 Revision* (New York: UN Department for Economic and Social Information and Policy Analysis, 1996).

What would the economic significance of such health rankings be? One very simple way of approaching this question would be to consider what such levels of life expectancy would imply about levels of output for the working age population, based on the international correspondences that existed between life expectancy and levels of output in the world in 1990. (The relationship between life expectancy and per capita output will, of course, almost surely be somewhat different in 2020 from that of 1990, just as the relationship in 1990 differed from that in 1960; even so, using the 1990 relationship s a starting point may be illustrative.)

Table 4C

PROJECTED LIFE EXPECTANCY FOR 20 MOST POPULOUS COUNTRIES IN 2020 VS. PROJECTED LIFE EXPECTANCY FOR RUSSIA IN 2020 (FEMALES)

20 most populous countries, less Russia	Life Expectancy	Russia "Optimistic" Scenario	Russia "Pessimistic" Scenario
Japan	84.7		
USA	82.5		
Germany	82.4		
Mexico	79.4		
Thailand	77.7		
Iran	77.0		
Turkey	76.6		
China	76.4		
Philippines	76.3		
Vietnam	76.1		
Egypt	76.0		
		75.7	
Brazil	75.1		
			75.0
S Africa	74.9		
Indonesia	74.6		
Pakistan	73.8		
India	71.6		
Bangladesh	69.1		
Zaire	64.9		
Nigeria	63.0		
Ethiopia	62.9		

Note: Life expectancy for 2020 taken as arithmetic average of UN medium-projected totals for 2015-20 and 2020-25.
Source: United Nations, *World Population Prospects: The 1996 Revision* (New York: UN Department for Economic and Social Information and Policy Analysis, 1996).

If UN projections of Russian life expectancy for the year 2020 prove accurate, and if we further presume that the international correspondence between life expectancy and output per person of "working ages" experienced today will also hold in the year 2020, we would predict a per capita GDP for Russia in 2020 of about $7700 (1990 PPP dollars). (See Table 5.) By such a calculation, per capita output in Russia would be envisioned as growing by an average of about 2.3 percent a year between 1995 and 2020. This would be no means constitute negligible economic progress, but many other regions of the world, by the same computational approach, would be predicted to grow rather faster – and indeed to overtake Russian per capita output levels by the year 2020. Among the countries, by this method, that would be predicted by 2020 to enjoy levels of per capita output higher than Russia's would be: Iran, Turkey, Brazil, South Africa, Indonesia and Pakistan. India's level of per capita output would be predicted, by this approach, to be only slightly lower than Russia's in 2020.

Table 5

ILLUSTRATIVE PROJECTED COUNTRY GDPS FOR 2020
As Derived from Projected Life Expectancy (LE) and Population, Aged 15-64,
And Calculated 1990 Correlation between LE and GDP per Person Aged 15-64

Populous Country	Life Expectancy	Predicted GDP in ($) per person aged 15-64	Population aged 15-64 (1,000s)	GDP ($tril.)
Japan	81.6	38849.5	74781	2.9
USA	79.5	30726.7	206259	6.3
Germany	79.3	30227.9	54459	1.6
Mexico	76.3	21790.3	84359	1.8
Thailand	74.9	18602.0	47391	0.9
Iran	74.8	18500.8	65425	1.2
Turkey	74.4	17710.8	56175	1.0
China	74.2	17234.3	1008377	17.4
Philippines	74.0	16862.3	67365	1.1
Vietnam	73.8	16588.6	73023	1.2
Egypt	73.0	15202.1	61703	0.9
Brazil	72.8	14874.0	141808	2.1
S Africa	72.5	14395.1	42618	0.6
Indonesia	72.3	14084.4	183342	2.6
Pakistan	71.9	13483.0	153637	2.1
Russia	*70.8*	*11958.2*	*92441*	*1.1*
India	70.0	10958.7	874865	9.6
Bangladesh	68.4	9153.4	116223	1.1
Zaire	63.4	5304.8	50929	0.3
Nigeria	61.4	4288.2	138409	0.6
Ethiopia	61.3	4218.6	64585	0.3

Note: 1990 correlation for $y = 5.2851e^{0.1091x}$; see Fig 7H
Source: United Nations, *World Population Prospects: The 1996 Revision* (New York: UN Department for Economic and Social Information and Policy Analysis, 1996).

Taking the UN's projections for populations of working ages in the year 2020, and multiplying these by the predicted level of output per person of working age 2020 from Table 4, we can produce illustrative projections of GDP in the year 2020 for selected countries around the world. (See Table 6.) On an unadjusted basis, these calculations would indicate that the Russian Federation in the year 2020 might have a trillion dollar GDP (in 1990 PPP dollars).

Table 6

ILLUSTRATIVE PROJECTIONS OF COUNTRY GDPS FOR 2020
Unadjusted and Adjusted

Populous Country	Unadjusted GDP($tril.)	Adjustment Coefficient	Adjusted GDP ($tril.)	Adjusted Rankings	GDP ($tril.)
China	17.4	0.51	8.8	USA	11.3
India	9.6	0.77	7.3	China	8.8
USA	6.3	1.78	11.3	India	7.3
Japan	2.9	0.98	2.9	Indonesia	2.9
Indonesia	2.6	1.11	2.9	Japan	2.9
Brazil	2.1	1.27	2.7	Brazil	2.7
Pakistan	2.1	0.88	1.8	Germany	2.4
Mexico	1.8	0.81	1.5	Pakistan	1.8
Germany	1.6	1.47	2.4	Mexico	1.5
Vietnam	1.2	Na		Turkey	1.1
Iran	1.2	Na		**Russia**	**1.1**
Philippines	1.1	0.70	0.8	Bangladesh	0.9
Russia	**1.1**	**1.02**	**1.1**	Philippines	0.8
Bangladesh	1.1	0.81	0.9	Thailand	0.7
Turkey	1.0	1.15	1.1		
Egypt	0.9	Na			
Thailand	0.9	0.78	0.7		
S Africa	0.6	Na			
Nigeria	0.6	2.10 (sic)			
Ethiopia	0.3	Na			
Zaire	0.3	Na			

Note: Coefficients based upon discrepancies between actual and predicted GDP per "working-age" person as indicated in Figure 7H.

A trillion dollar economy is, to be sure, a sizeable economy. But by the indications of our approach, trillion dollar economies would be far from exceptional in the year 2020. Pakistan and Brazil, for example, would be predicted to have economies of two trillion dollars or more; Iran's economy would be predicted to measure 1.5 trillion dollars; and Turkey's would be predicted to be a trillion dollar economy as well. On an unadjusted basis, these calculations would rank Russia's economy as thirteenth in size among the twenty-one most populous countries in the contemporary world. Furthermore, since such countries as France, Italy, the United Kingdom, and the Republic of Korea are not among the twenty most populous countries in the world today, yet nevertheless have large and growing economies, it seems likely that Russia's international GDP ranking in 2020 in a fuller application of this method would be rather lower than thirteenth.

The unadjusted calculations in Table 5 posit that all countries in the sample would "fall on the line" predicted by the equation from Figure 7-H. As we know, however, many countries "underperformed" or "overperformed" predictions of per capita output based on their levels of life expectancy. Indeed, it seems highly unlikely that, for example, United States' level of per capita output twenty-some years hence will be "only" as high as life expectancy levels alone would predict.

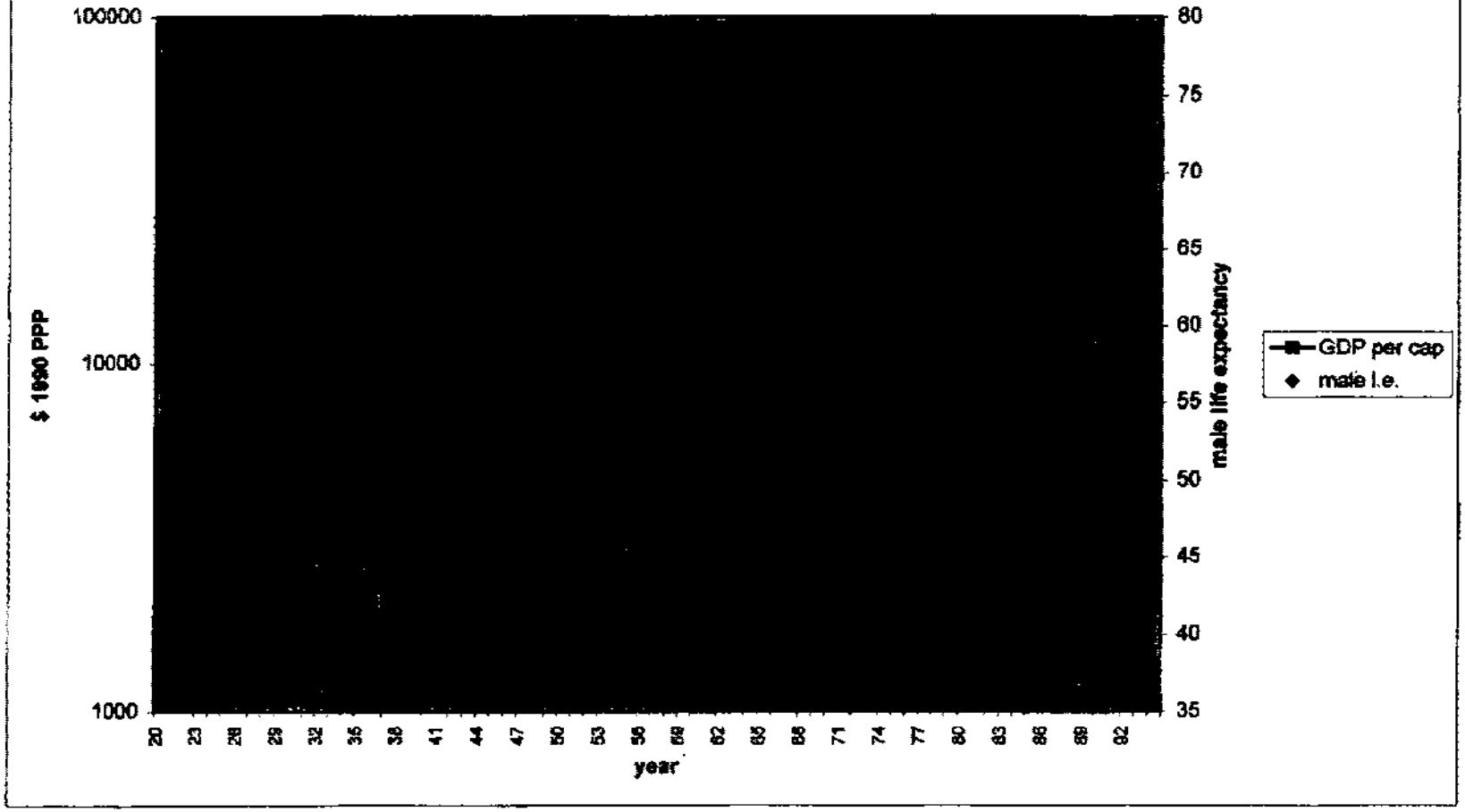
For this reason, it may also be informative to adjust our predicted GDPs by a factor reflecting the discrepancy between actual and predicted levels of per capita output derived in Figure 7-H.

These adjusted rankings are intriguing. They suggest that the US economy would still be the world's largest in 2020 (at over 12 trillion 1990 PPP dollars), although China would be a relatively close second (9 trillion) and India a more distant third (7 trillion). Russia's economy, in these adjustments, would still be envisioned as amounting to about one trillion dollars.[25] Of the fourteen countries for whom such adjustments can be scaled, Russia ends up with the eleventh largest predicted GDP – below Brazil, Pakistan, Mexico, and Turkey, and only slightly above Bangladesh.

The figures in Table 6, of course, should be taken as indicative. What they emphasize is that health matters in the modern economy—and that given Russia's health problems, the Russian Federation's economic recovery is likely to be constrained, and its international economic ranking is likely to decline further, all other factors notwithstanding. We should also note that we have used the optimistic projections about Russian health recovery in Tables 4 and 5. Our somewhat more "pessimistic" projections for Russian life expectancy in 2020, ceteris paribus, would imply a level of per capita output, and an aggregate GDP for Russia, over 20 percent lower than what we have seen with these "optimistic" calculations.

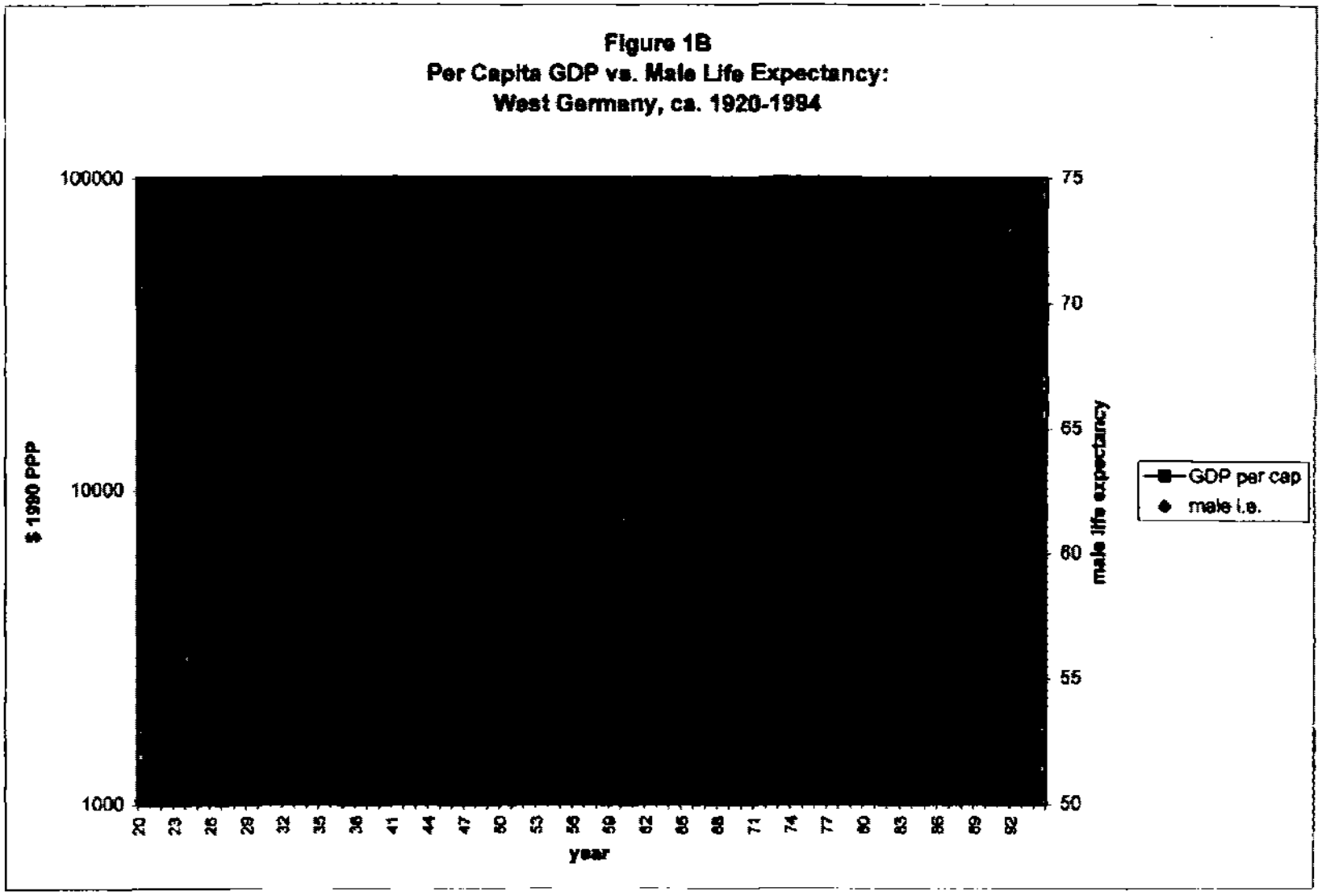
[25] Russia could not be included in Figure 7-H, owing to the lack of reliable estimates of per capita output for the Soviet Union. Because Russia was almost exactly "on the line" in the international calculations for 1995 that were mentioned earlier, we are presuming there would be no reason to adjust her per capita output level upward or downward from that predicted by our basic equations.

Figure 1A
Per Capita GDP vs. Male Life Expectancy:
Spain, ca. 1920-1994



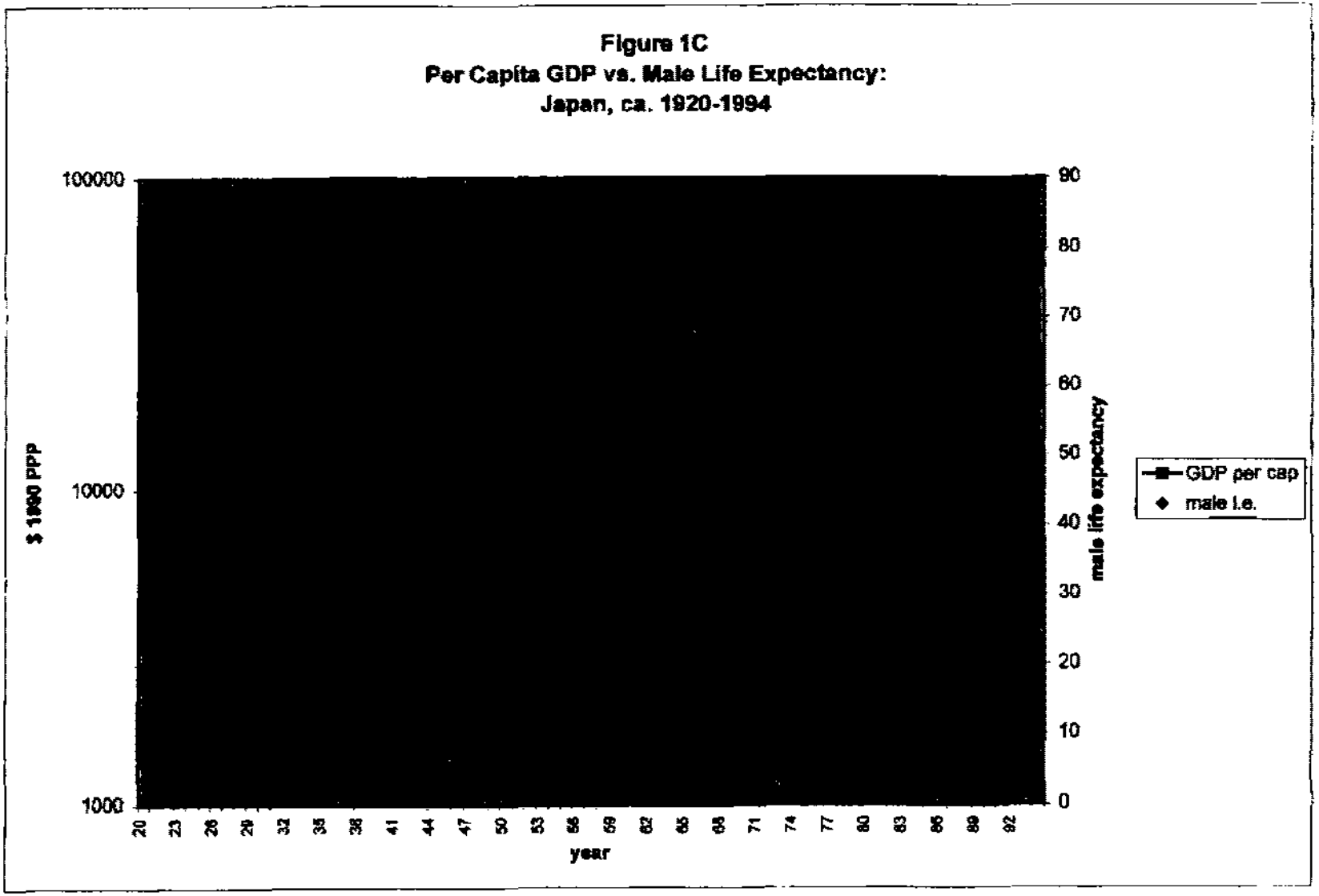
Sources, for GDP: Maddison, 1995, table D-1b; for life expectancy: *UN Demographic Yearbook*, various editions

Figure 1B
Per Capita GDP vs. Male Life Expectancy:
West Germany, ca. 1920-1994



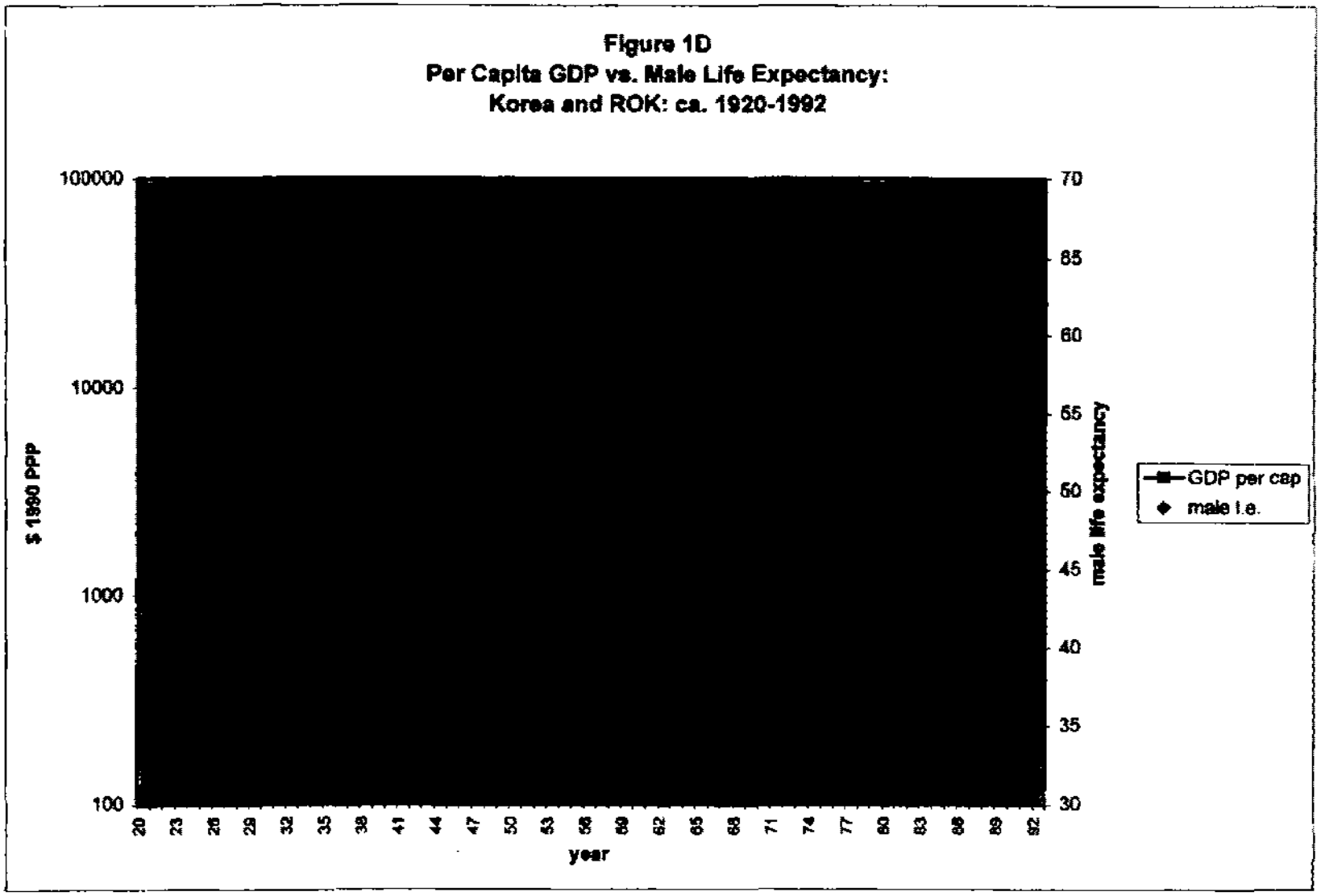
Sources, for GDP: Maddison, 1995, table D-1a; for life expectancy, *Statistisches Jahrbuch fur des Bundesrepublik Deutschland*, 1975, 1986, 1995

Figure 1C
Per Capita GDP vs. Male Life Expectancy:
Japan, ca. 1920-1994



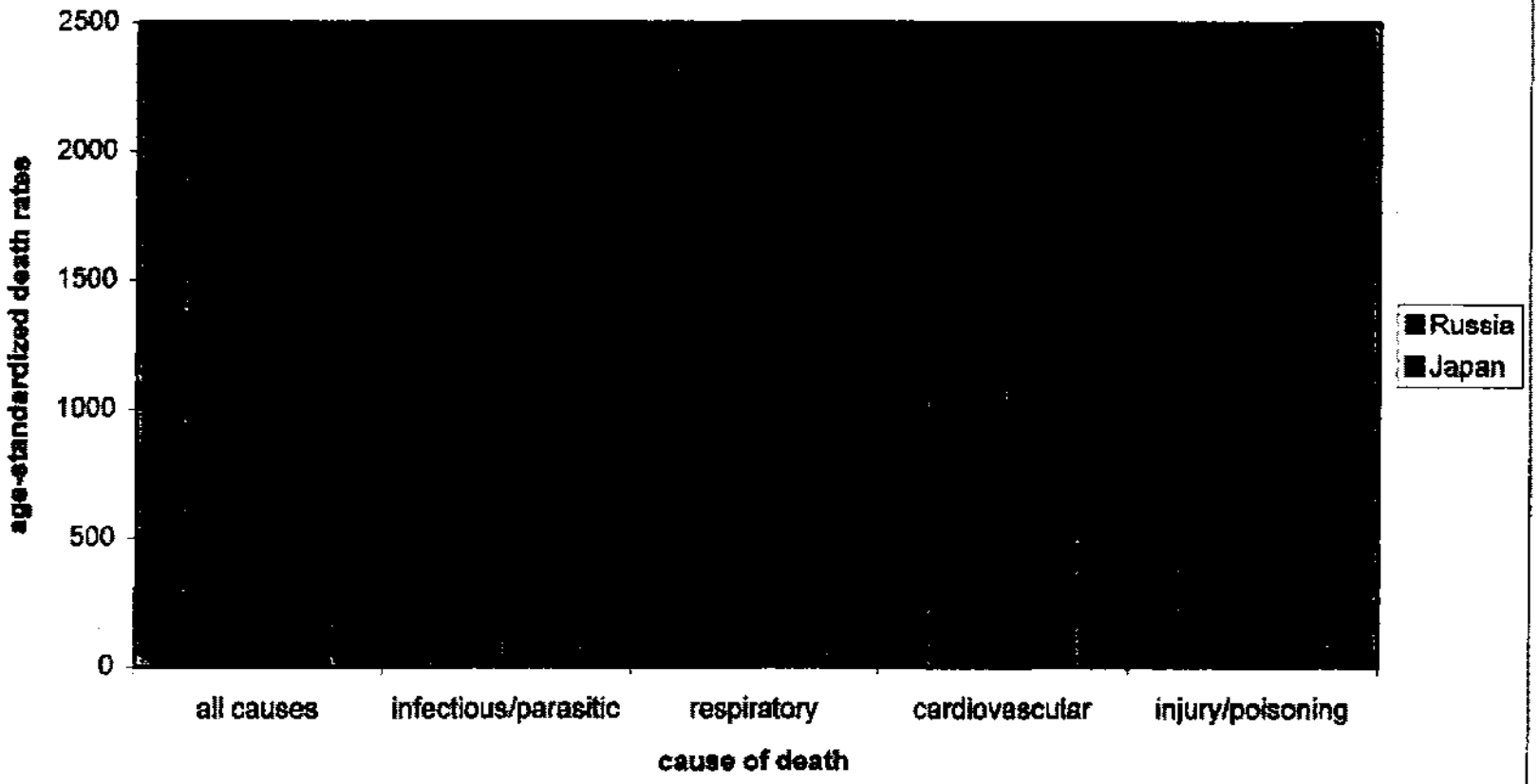
Sources, for GDP: Maddison, 1995, table D-1a; for life expectancy: *UN Demographic Yearbook 1953*, p. 330; and *Japan Statistical Yearbook*, various issues.

Figure 1D
Per Capita GDP vs. Male Life Expectancy:
Korea and ROK: ca. 1920-1992



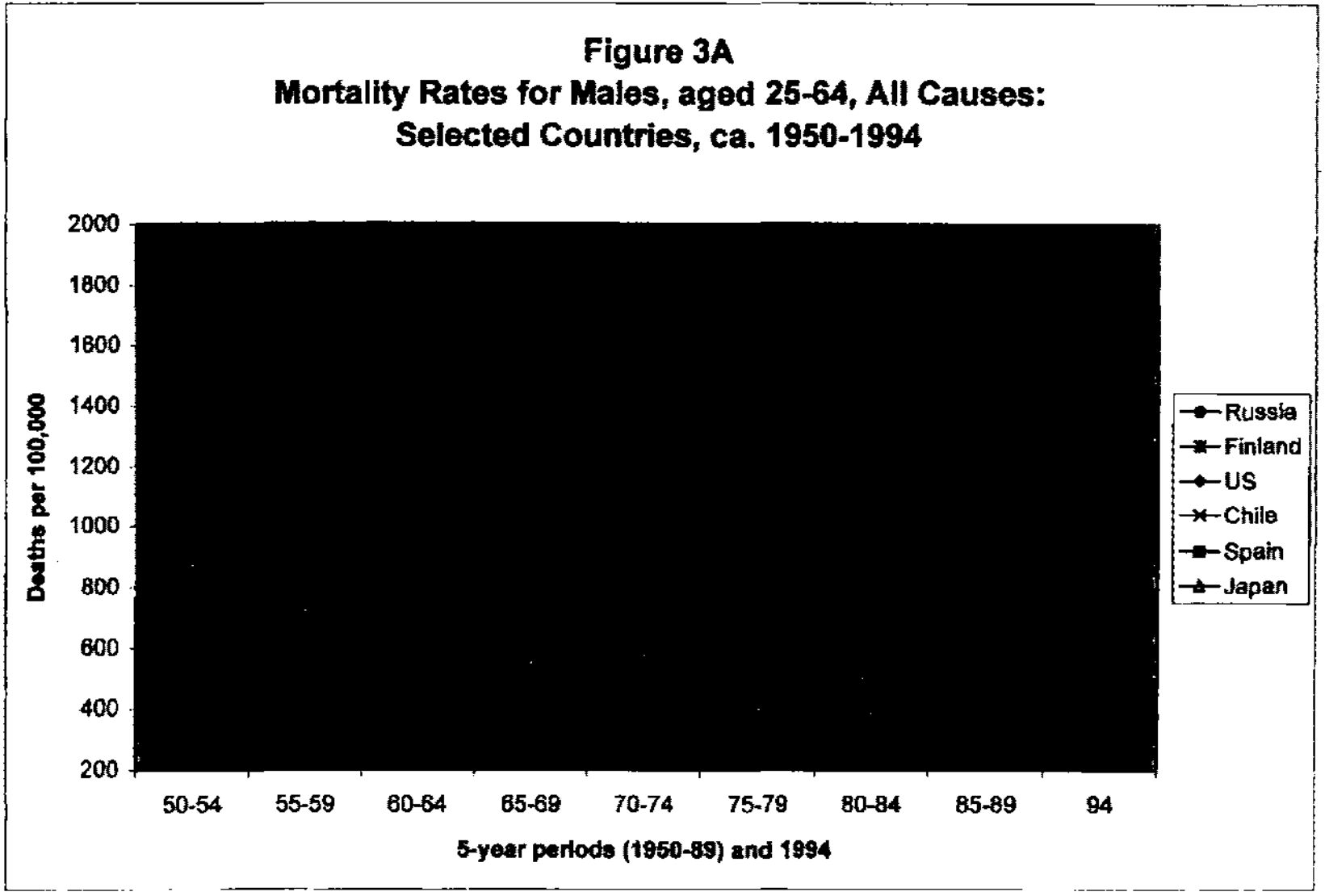
Sources, for GDP: Maddison, 1995, table D-1e; for life expectancy, 1925-65: Tae Whan Kwon, 1977, pp. 311-18; for 1979, 1991: *Social Indicators in Korea 1995*, p. 247

Figure 2
Age-Standardized Death Rates by Selected Causes for Males: Japan 1950/54 vs. Russian Federation 1994 (per 100,000)



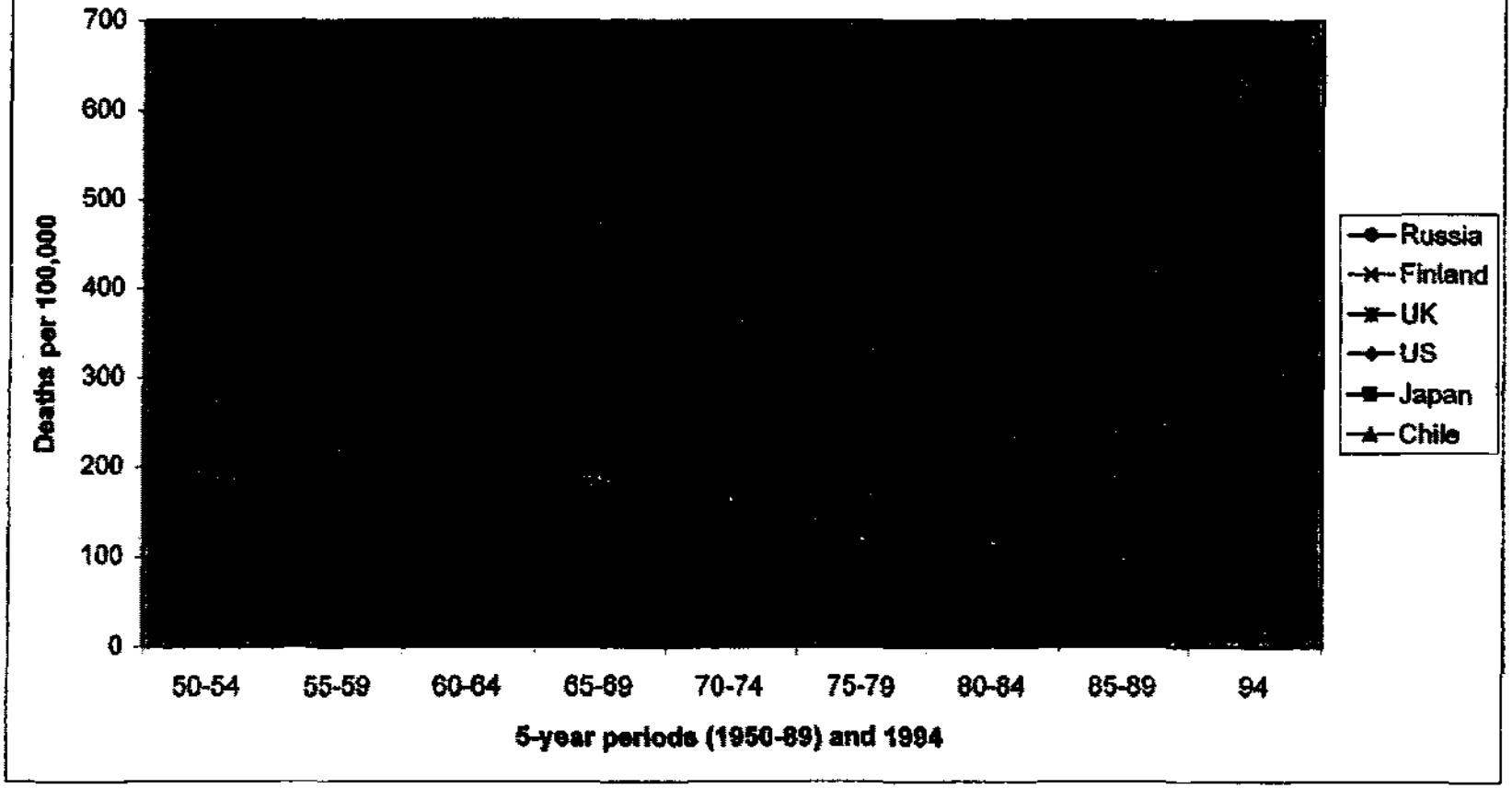
Note: Death rates standardized according to WHO "New European" Model Age Structure
Source: Derived from WHO, *World Health Statistics Annual*, 1993 and 1995 editions.

Figure 3A
Mortality Rates for Males, aged 25-64, All Causes: Selected Countries, ca. 1950-1994



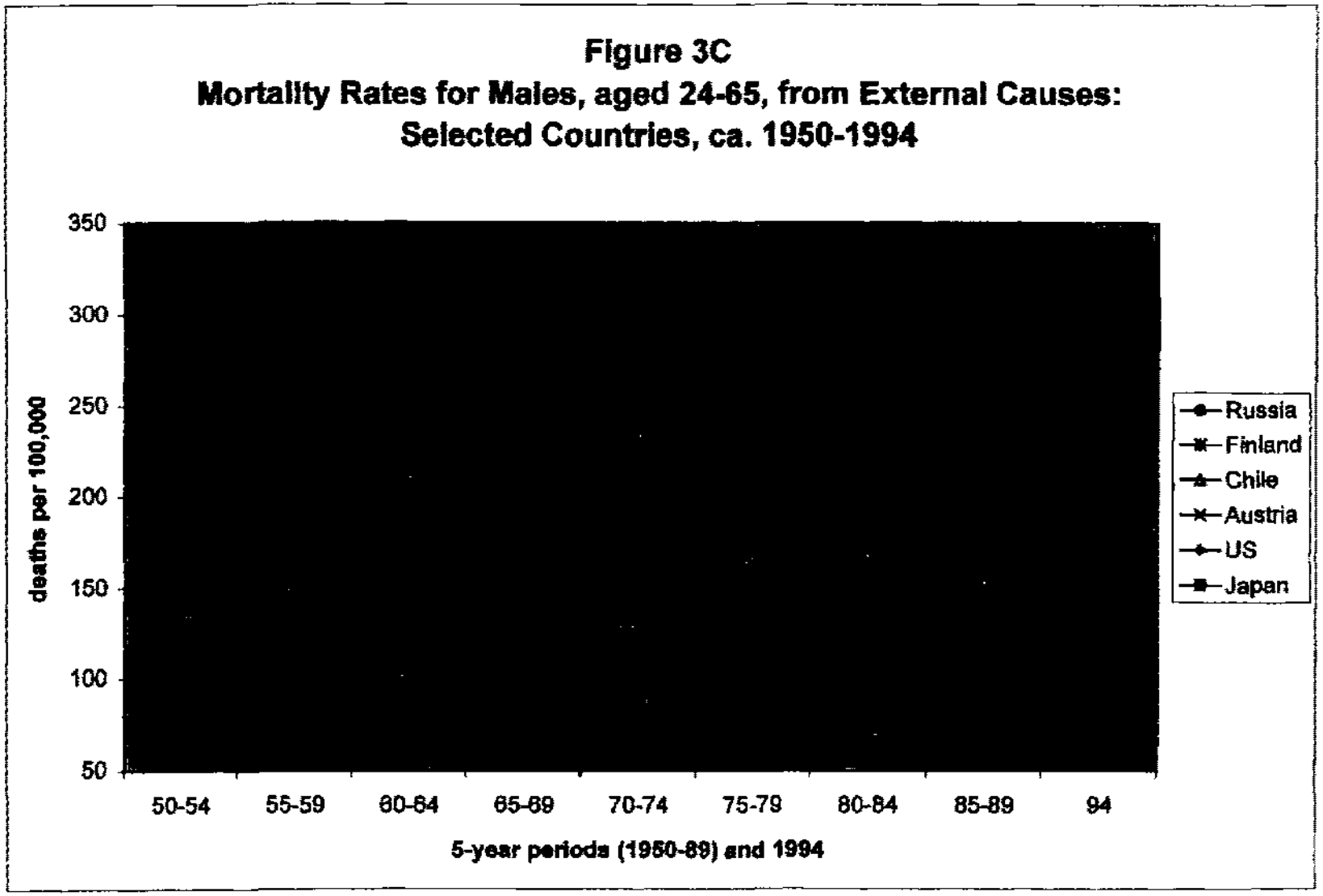
Note: Death rates standardized according to WHO "New European" model age structure. Russian data for years 1981, 1987, and 1994
Sources: WHO, *World Health Statistics Annual* (Geneva: WHO) 1993 and 1995 editions.

Figure 3B
Mortality Rates for Males, aged 25-64, from Diseases of the Circulatory System: Selected Countries, ca. 1950-1994



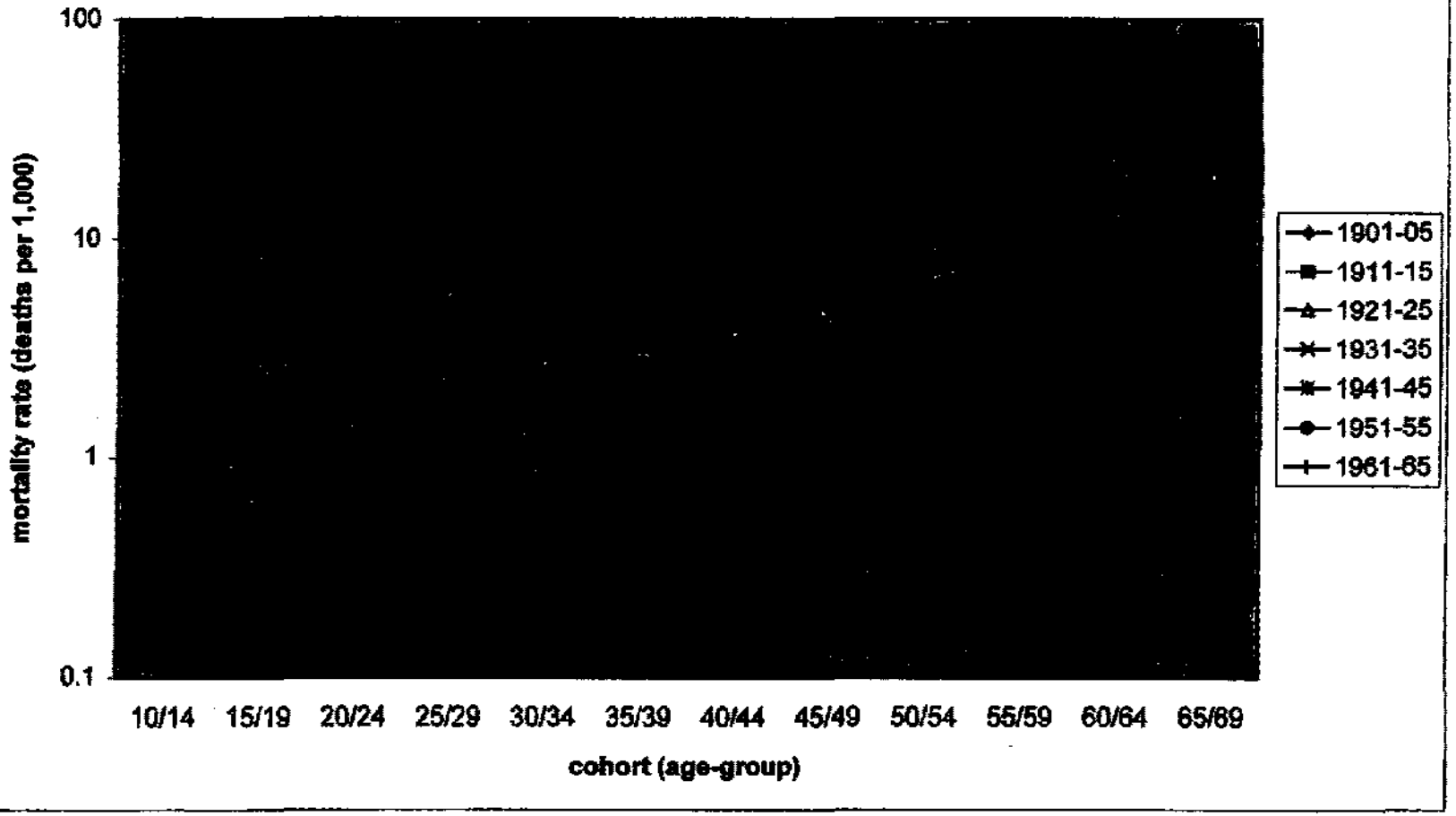
Note: Russian data for years 1961, 1987, and 1994
Sources: WHO, *World Health Statistics Annual* (Geneva: WHO) 1993 and 1995 editions.

Figure 3C
Mortality Rates for Males, aged 24-65, from External Causes: Selected Countries, ca. 1950-1994



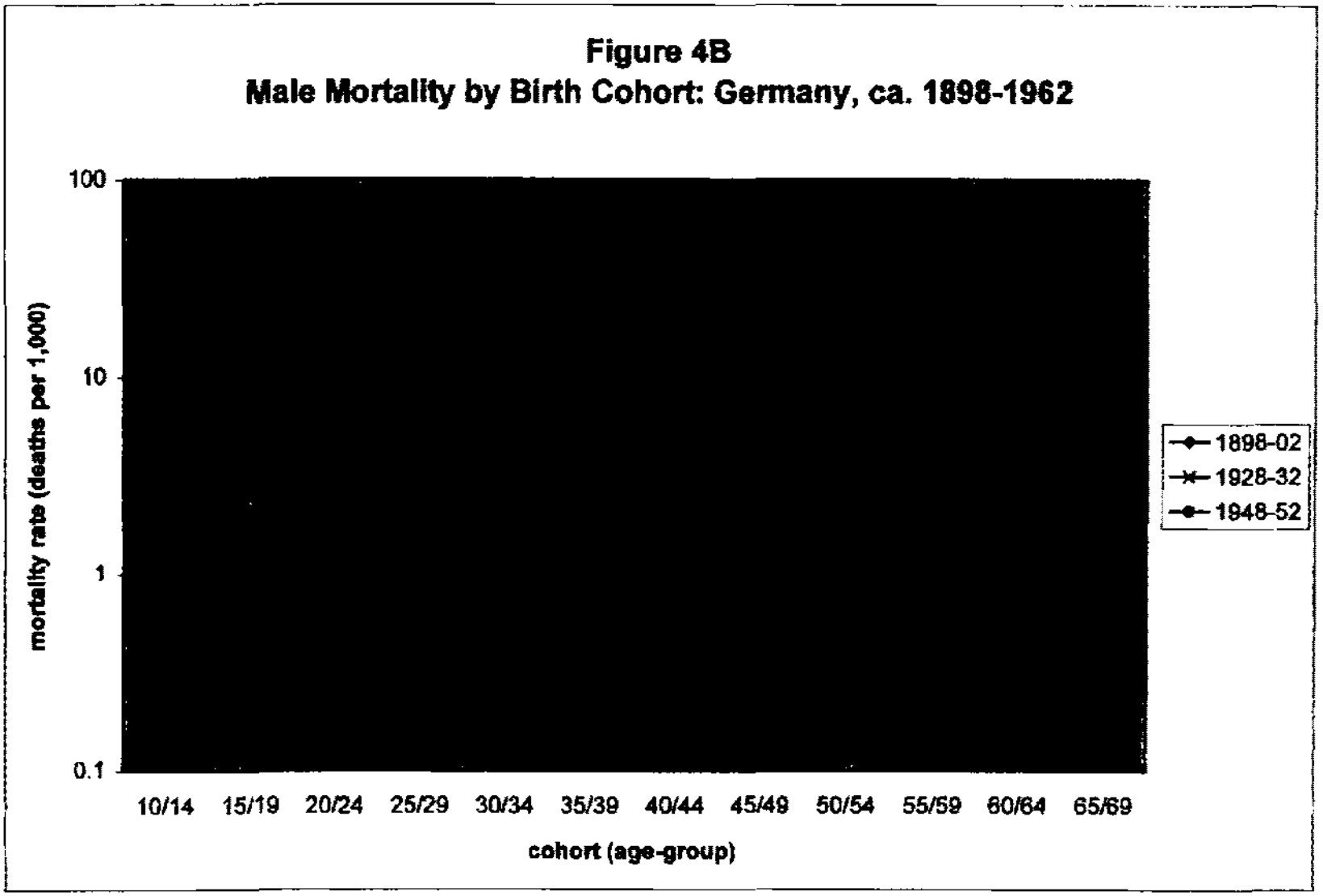
Note: External Causes = "Injury and Poisoning (E47-E56)"; Russian data for years 1981, 1987, and 1994
Sources: WHO, *World Health Statistics Annual* (Geneva: WHO) 1993 and 1995 editions.

Figure 4A
Male Mortality by Birth Cohort: Japan, ca. 1901-1965



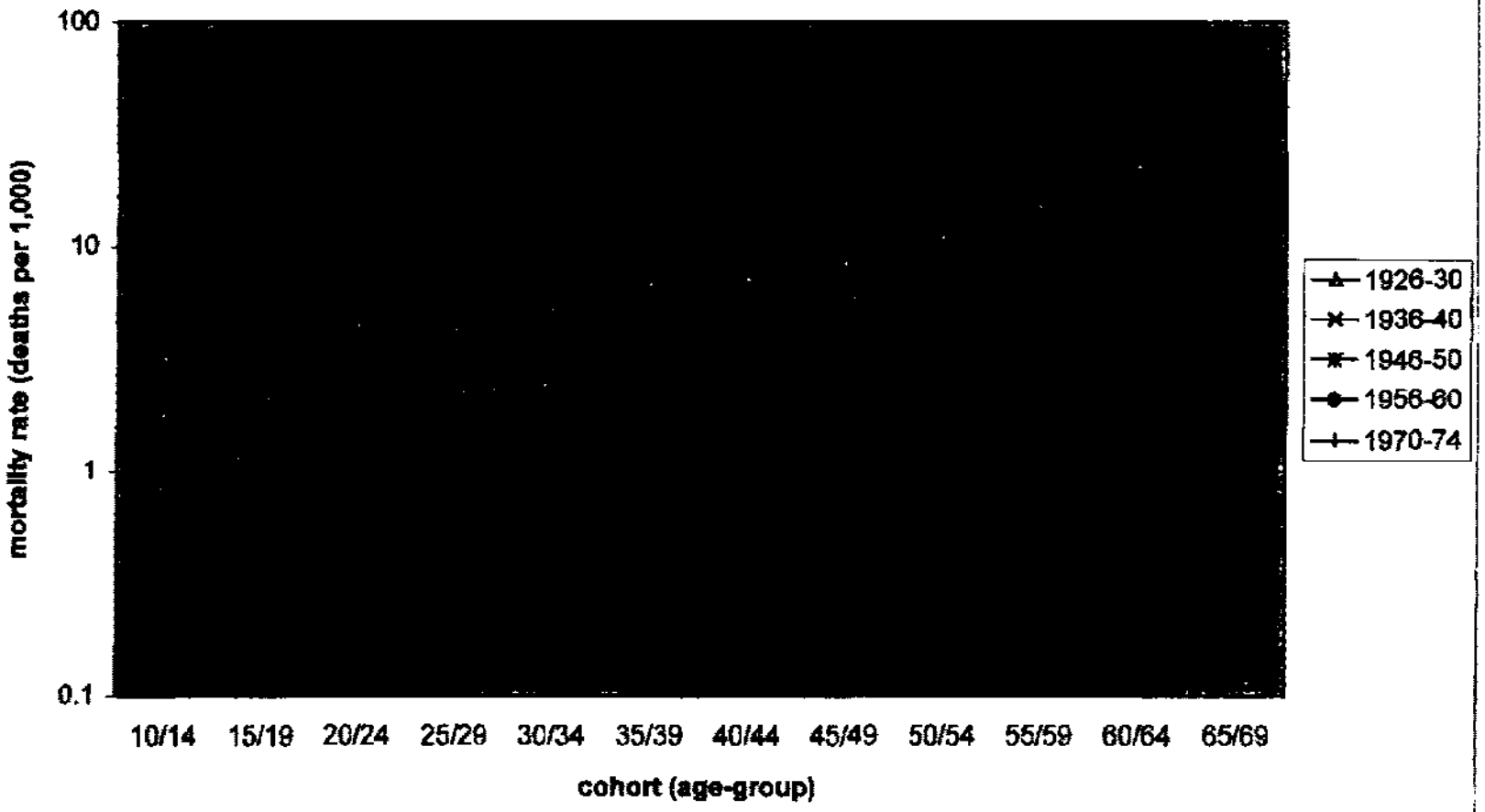
Source: *UN Demographic Yearbook*, 1952, 1978, 1985, 1992 editions

Figure 4B
Male Mortality by Birth Cohort: Germany, ca. 1898-1962



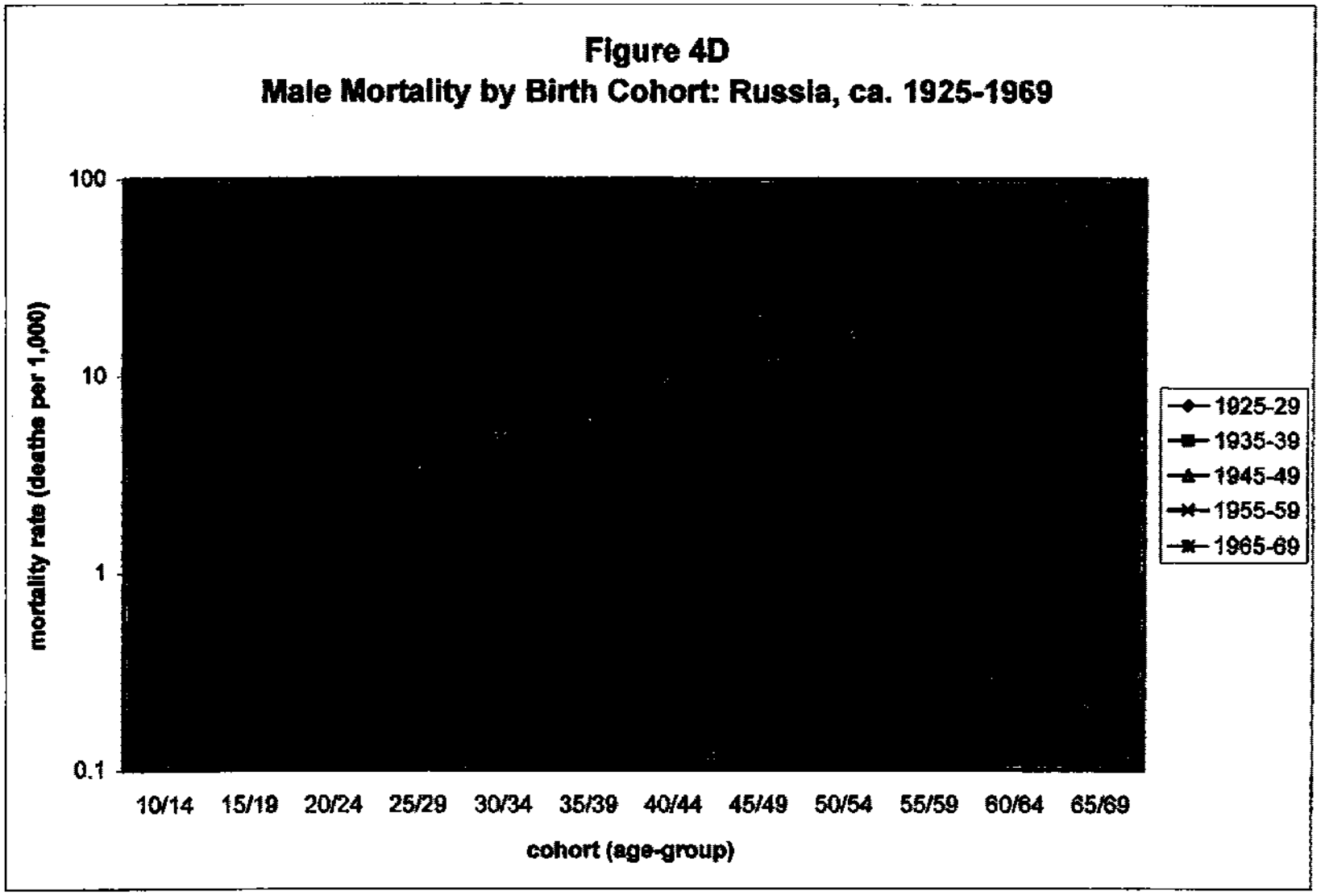
Source: *UN Demographic Yearbook*, 1952, 1978, 1985, 1992 editions

Figure 4C
Male Mortality by Birth Cohort: Chile, ca. 1906-1974



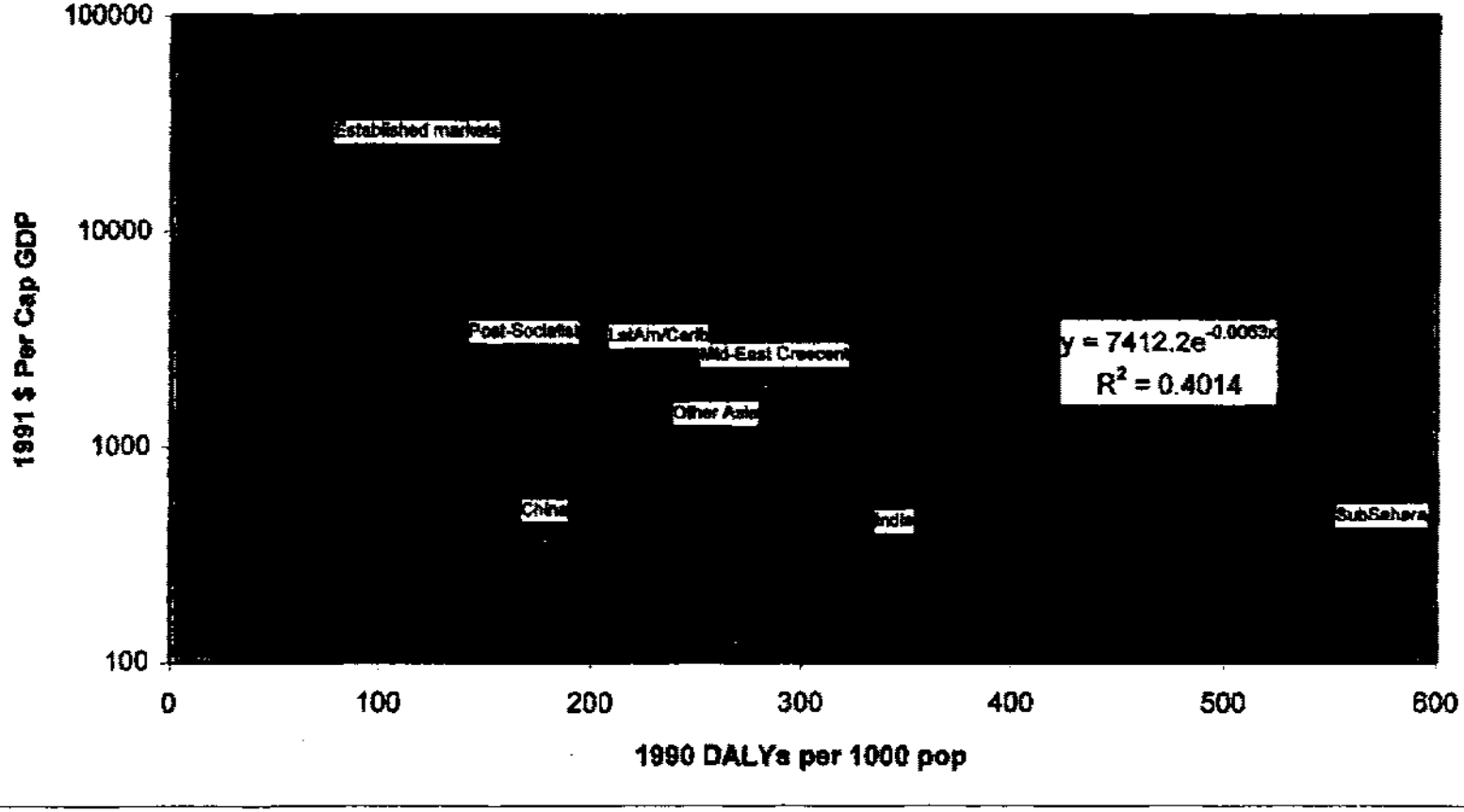
Sources: *UN Demographic Yearbook*, 1952, 1978, 1985, 1992 editions

Figure 4D
Male Mortality by Birth Cohort: Russia, ca. 1925-1969



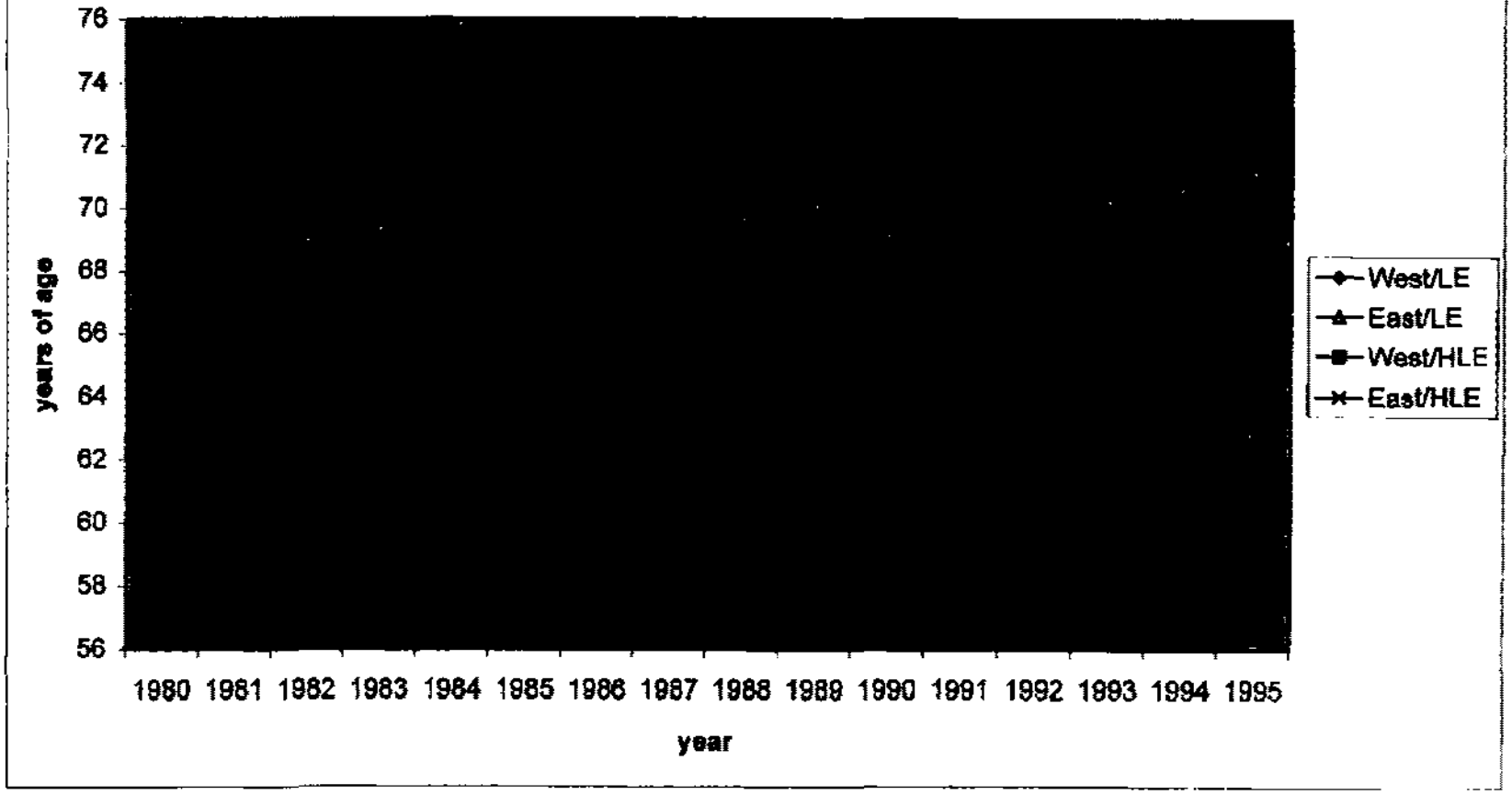
Sources: *Naseleniye SSSR 1987*, p. 326; *Demographicheskiye Yezhegodnic SSSR 1990*, p. 363; *Demographicheskiye Yezhegodnik Rossii 1995*, p. 219

Figure 5
Disability Adjusted Life Years (DALYs) per 1,000 population vs. Per Capita GDP, selected regions and countries, ca. 1990-91



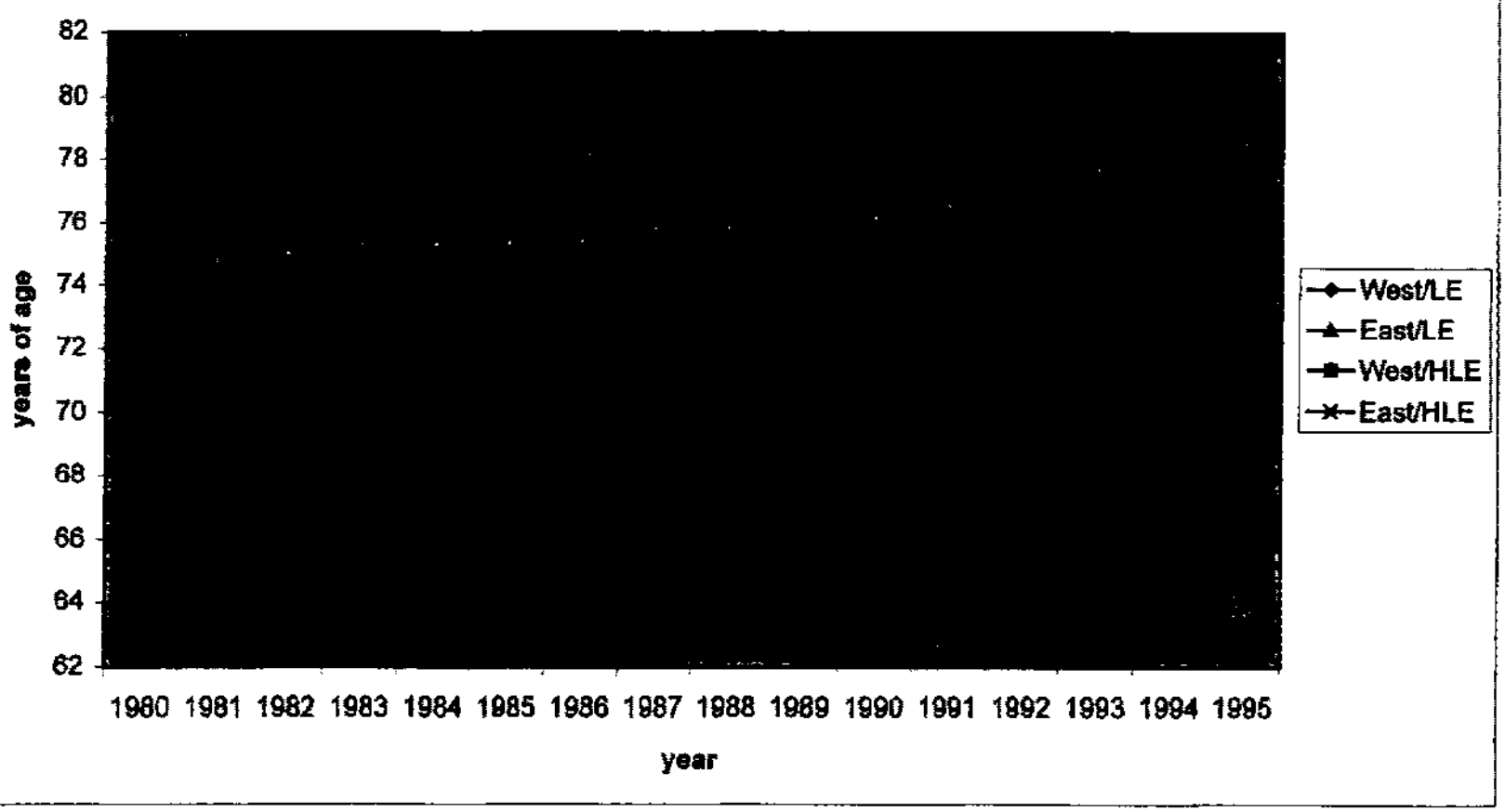
Source: World Bank, *World Development Report 1993* (Oxford: Oxford University Press, 1993).

Figure 6A
Life Expectancy and Healthy Life Expectancy for Males
East(ern) and West(ern) Germany, 1980-1995



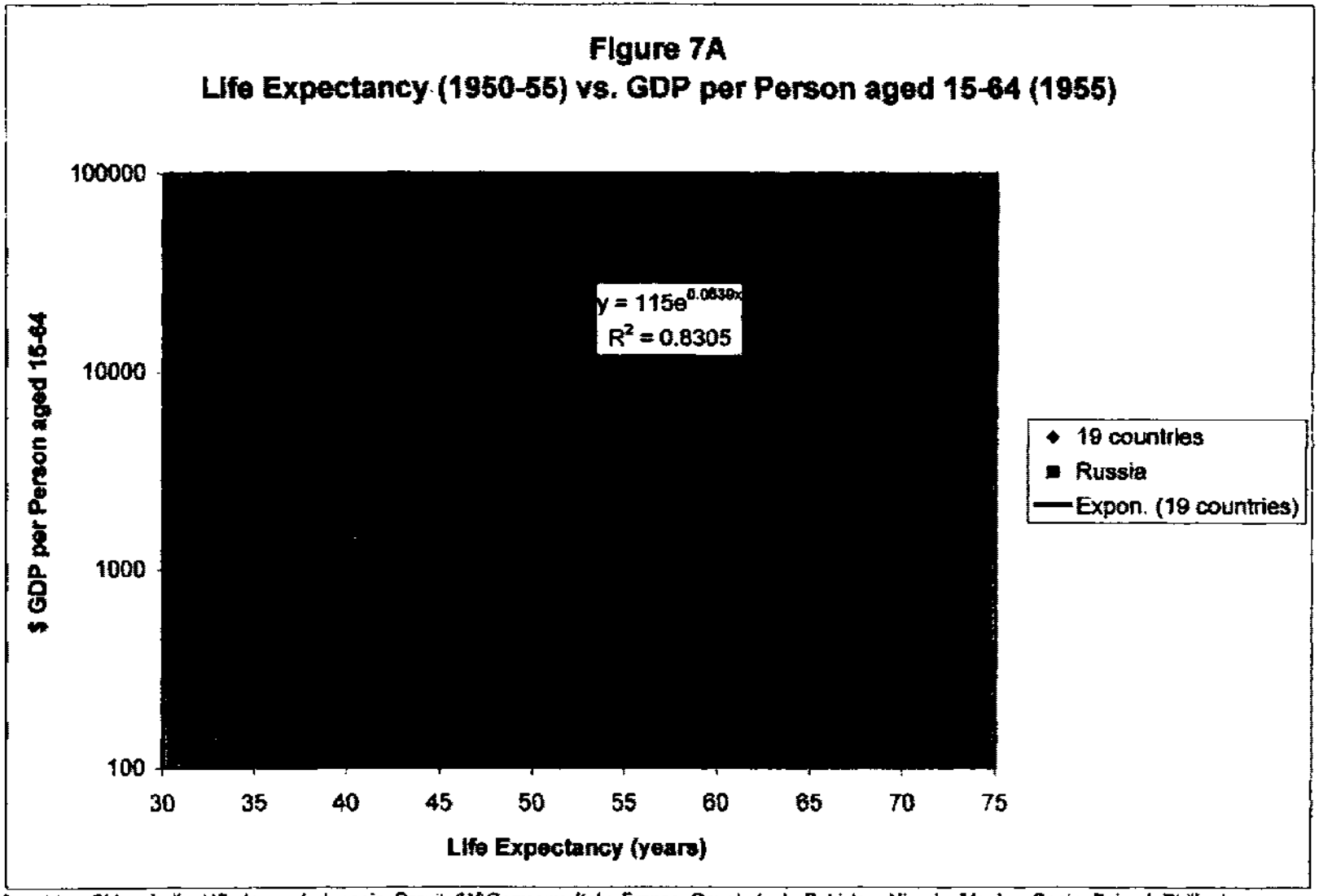
Source: Gunter Brueckner, "Health Expectancy in Germany: What Do We Learn From the Reunification Process?", Paper presented at the REVES 10 Meeting of the Network on Health Expectancy, Tokyo, October 9-11, 1997

Figure 6B
Life Expectancy and Healthy Life Expectancy for Females East(ern) and West(ern) Germany, 1980-1995



Source: Gunter Brueckner, "Health Expectancy in Germany: What Do We Learn From the Reunification Process?" Paper presented at the REVES 10 Meeting of the Network on Health Expectancy, Tokyo, October 9-11, 1997

Figure 7A
Life Expectancy (1950-55) vs. GDP per Person aged 15-64 (1955)



Countries: China, India, US, Japan, Indonesia, Brazil, (W)Germany, Italy, France, Bangladesh, Pakistan, Nigeria, Mexico, Spain, Poland, Philippines, Turkey, Thailand.
Sources: UN, World Population Prospects; Maddison, Monitoring the World Economy

Figure 7B
Life Expectancy (1955-60) vs. GDP per Person aged 15-64 (1960)

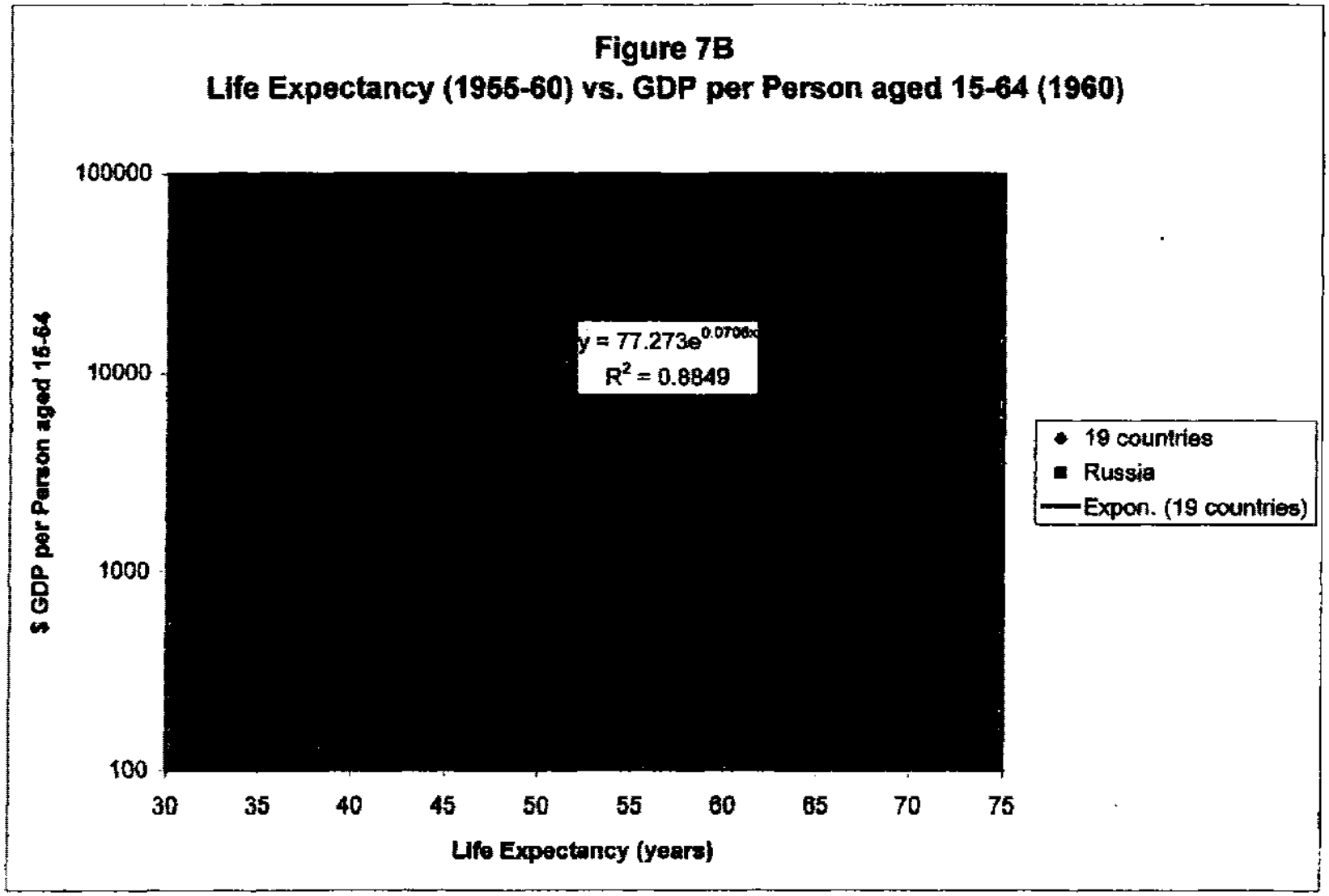


Figure 7C
Life Expectancy (1960-65) vs. GDP per Person aged 15-64 (1965)

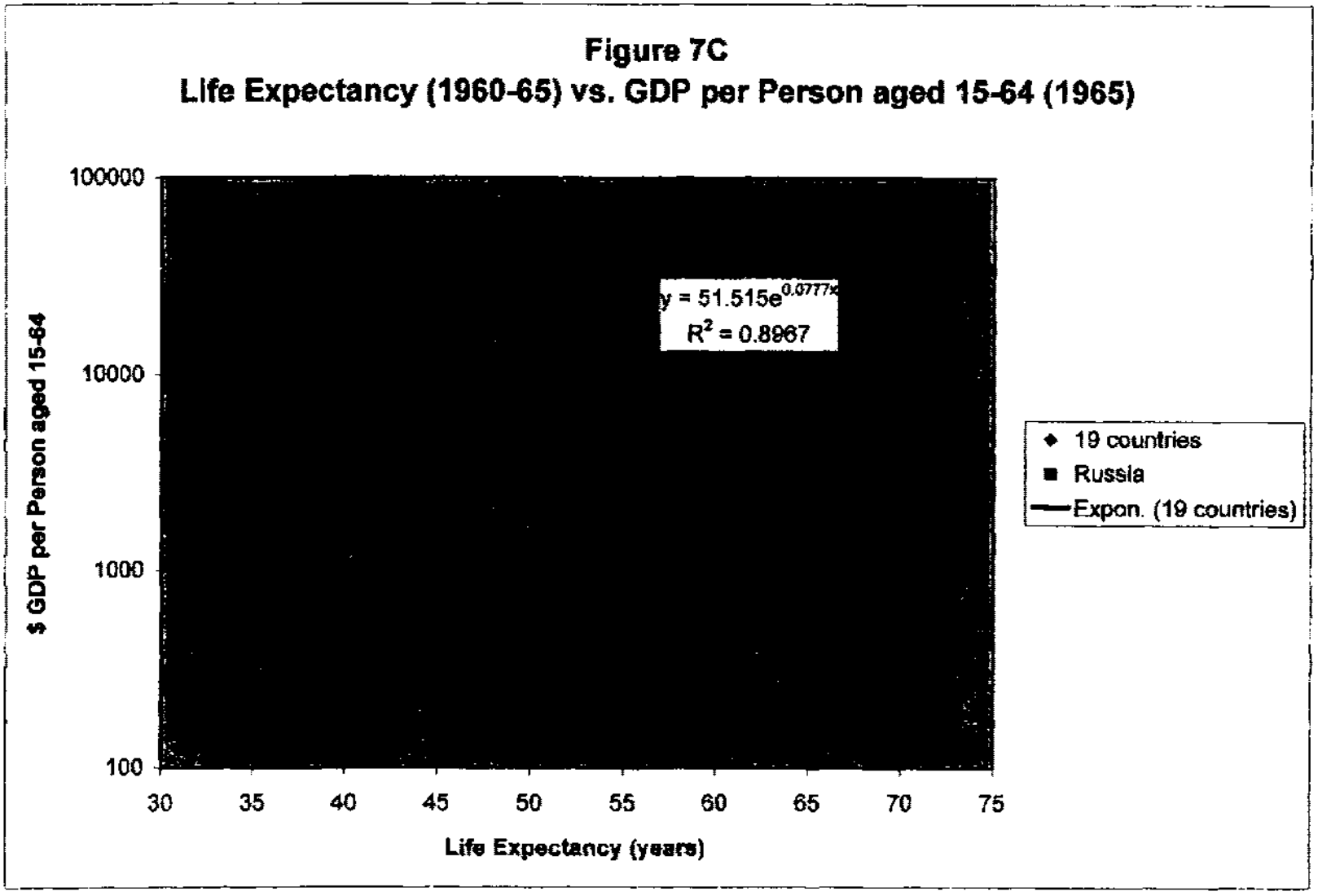


Figure 7D
Life Expectancy (1965-70) vs. GDP per Person aged 15-64 (1970)

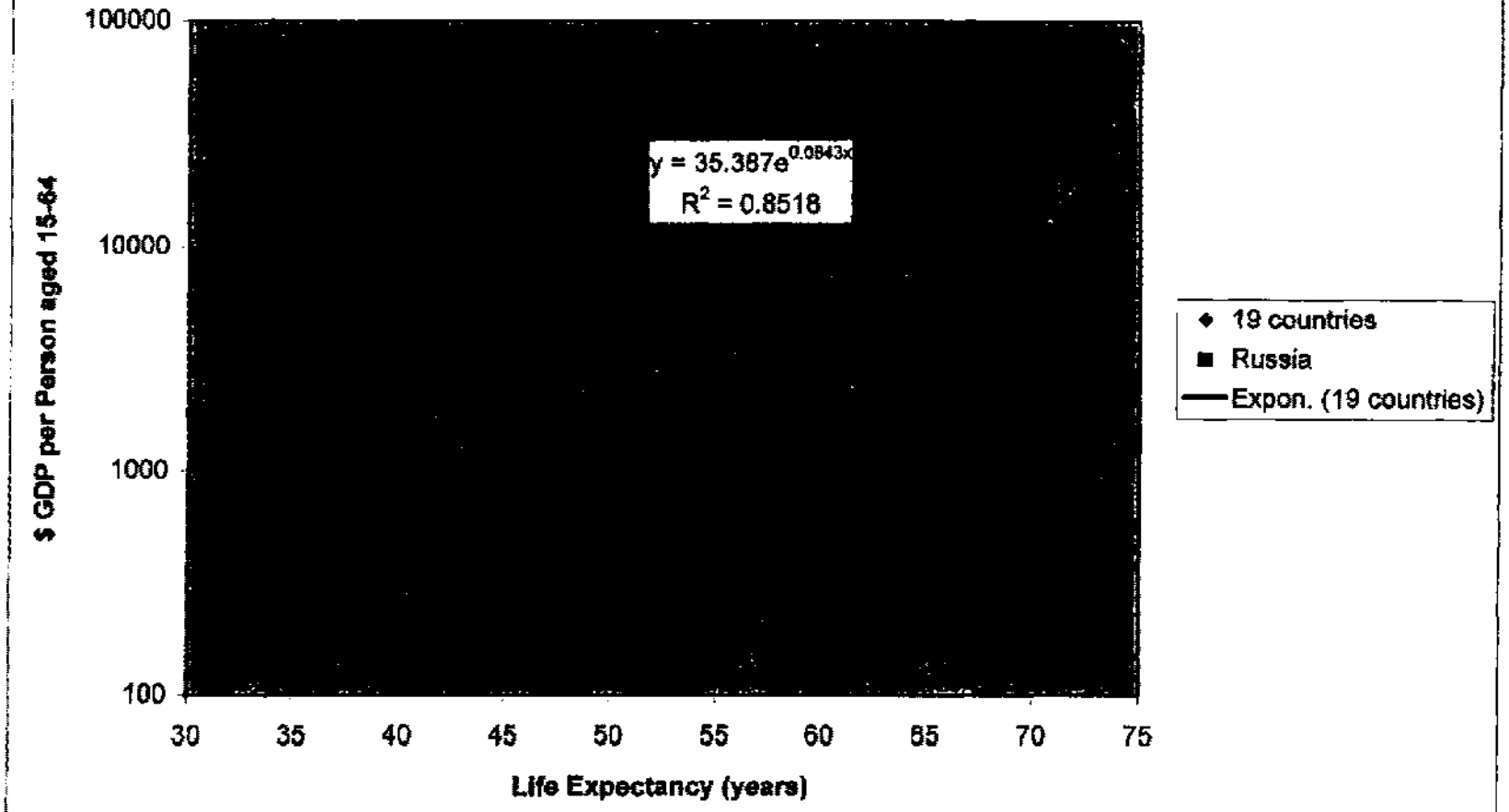


Figure 7E
Life Expectancy (1970-75) vs. GDP per Person aged 15-64 (1975)

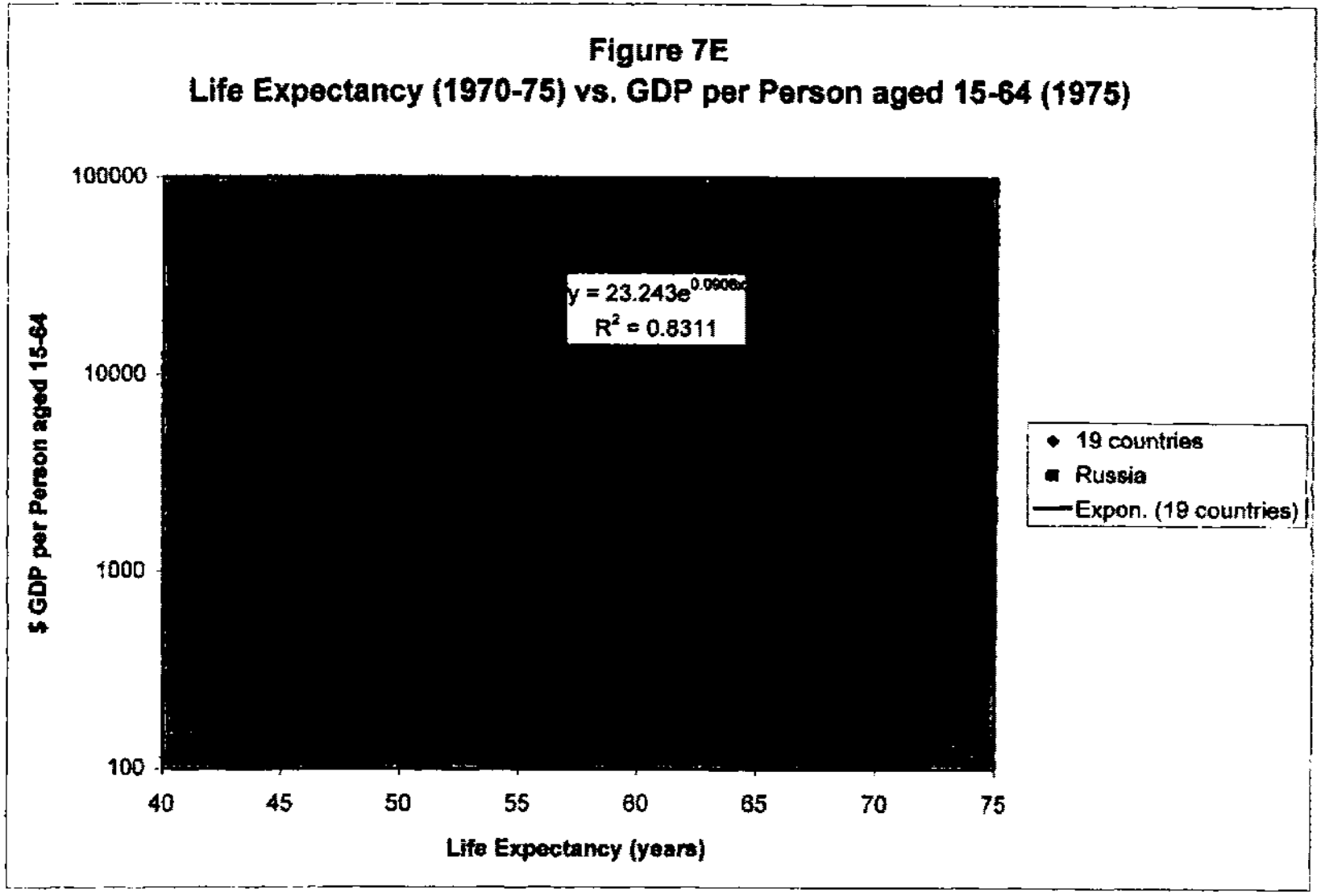


Figure 7F
Life Expectancy (1975-80) vs. GDP per Person aged 15-64 (1980)

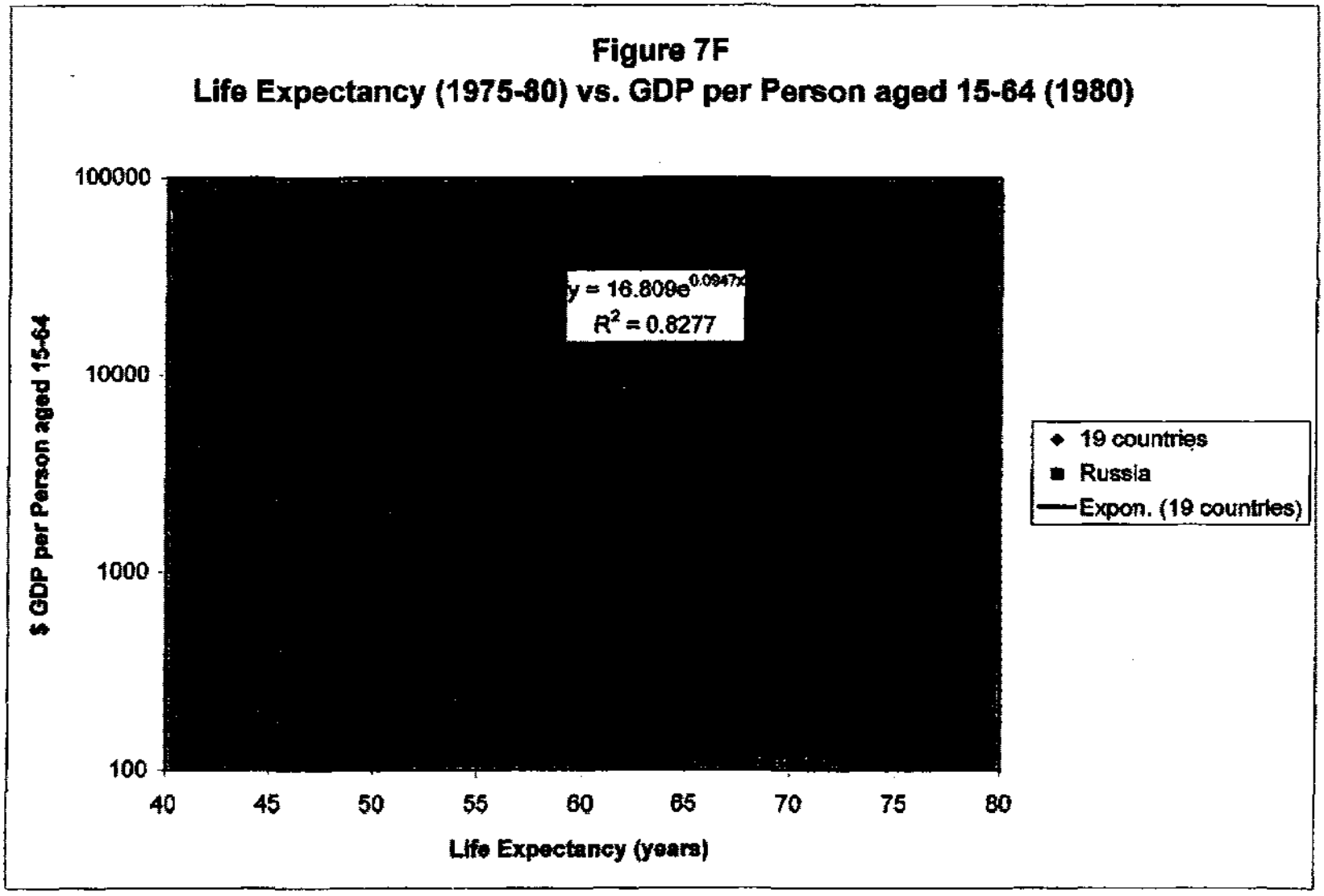


Figure 7G
Life Expectancy (1980-85) vs. GDP per Person aged 15-64 (1985)

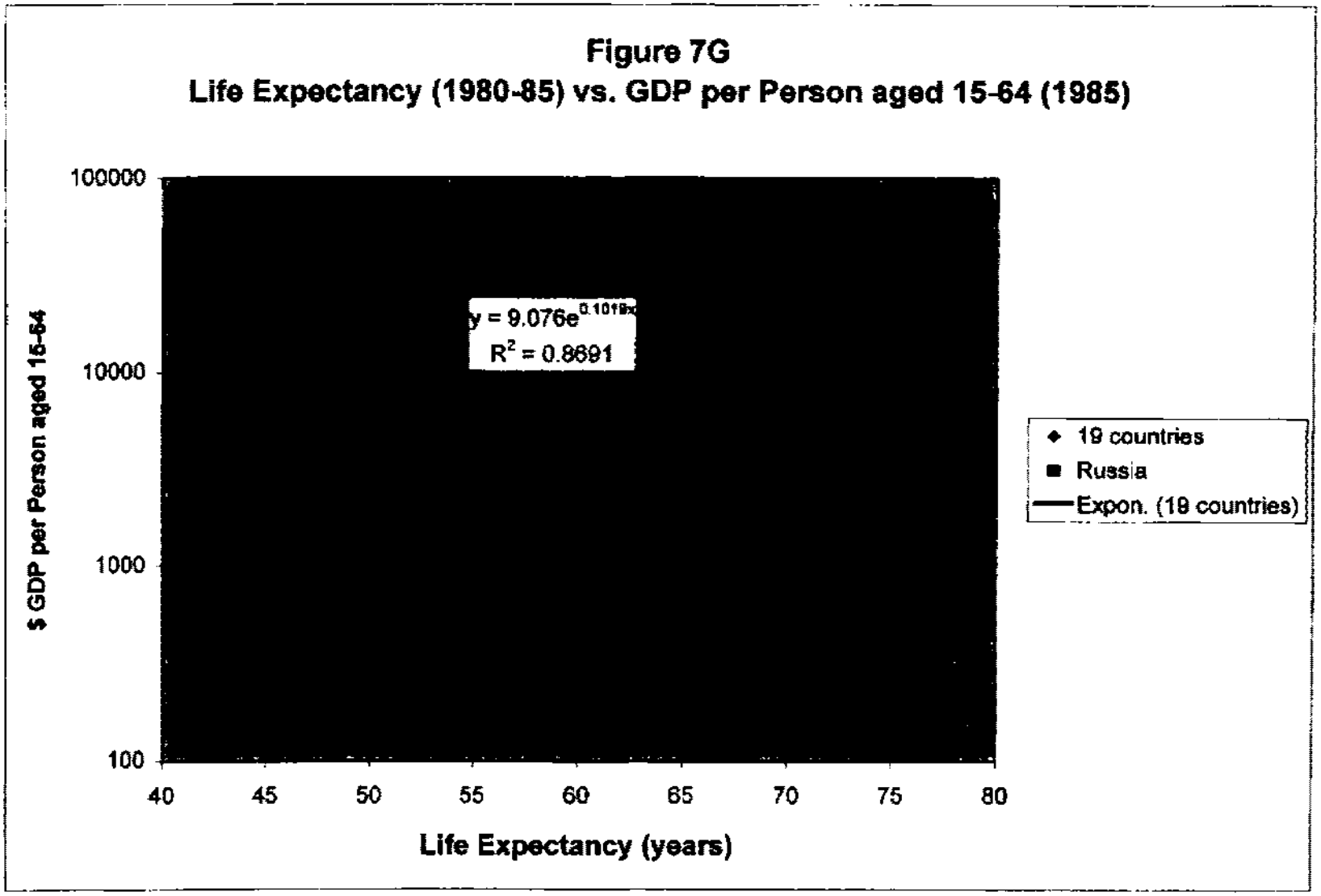


Figure 7H
Life Expectancy (1985-90) vs. GDP per Person aged 15-64 (1990)

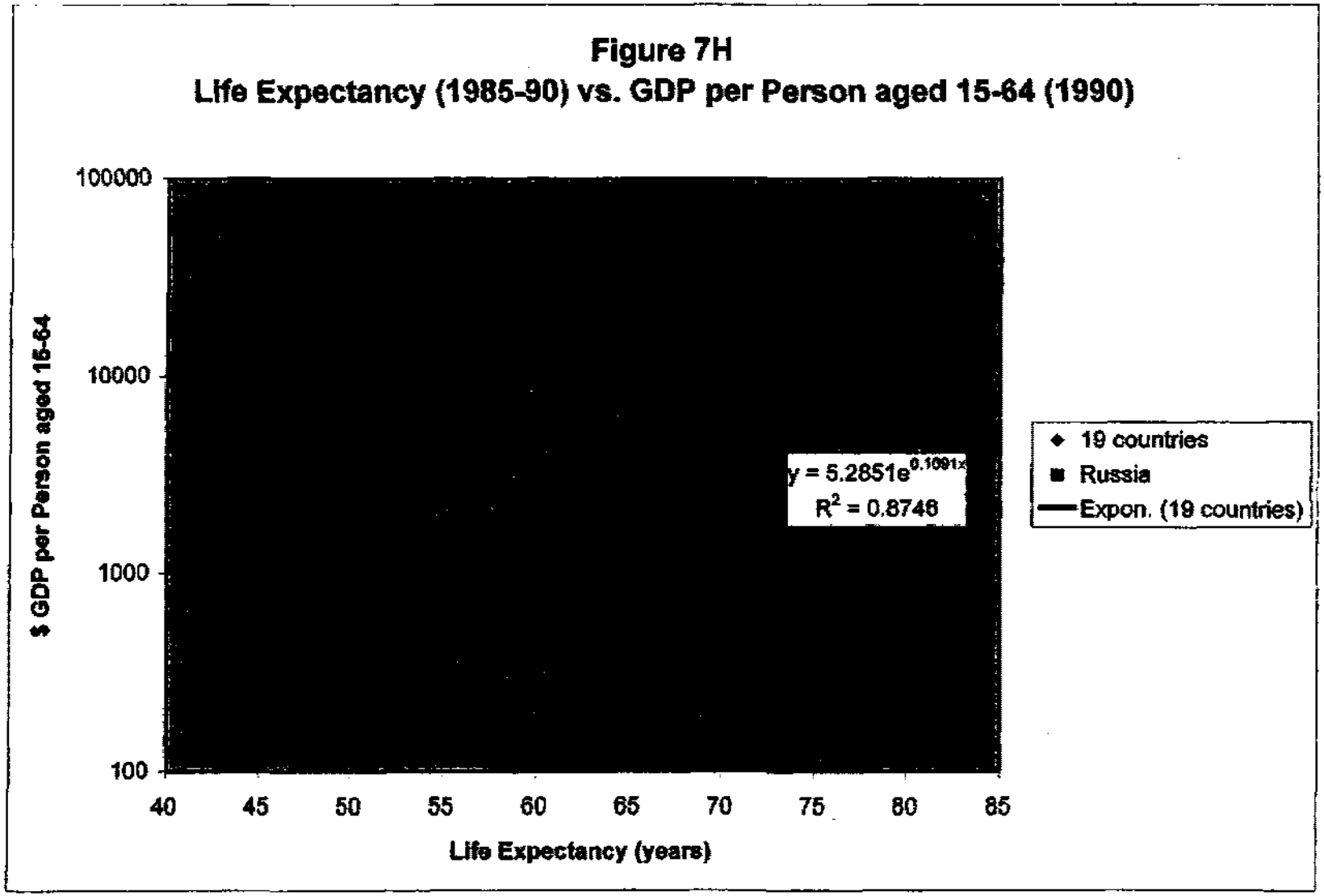


Figure 8
R Squareds for Regressions in Figs 7A-H

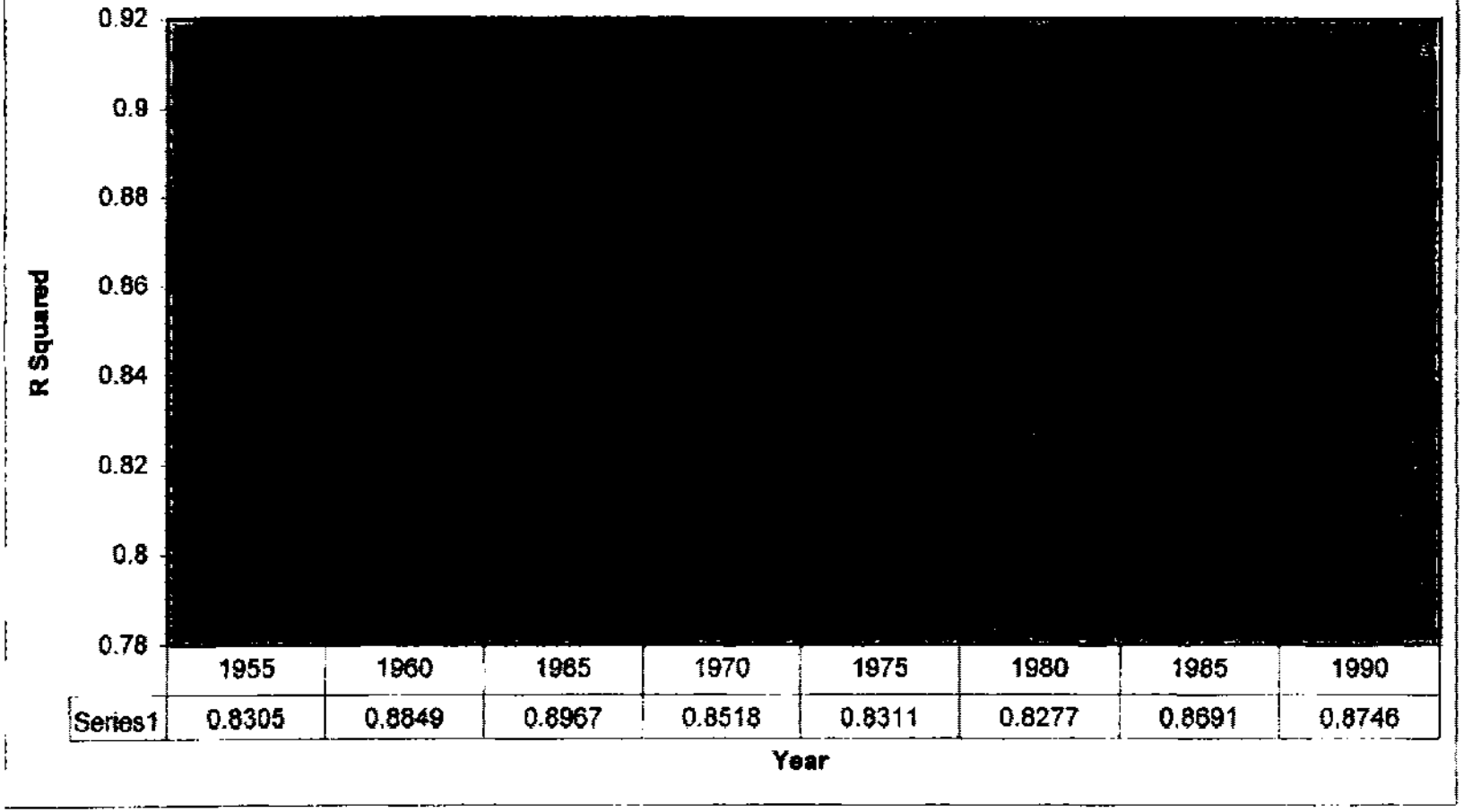


Figure 9
Regressions (exponential) of GDP per Person aged 15-64 vs. Life Expectancy, 1955-90, Set of 19 Populous Countries

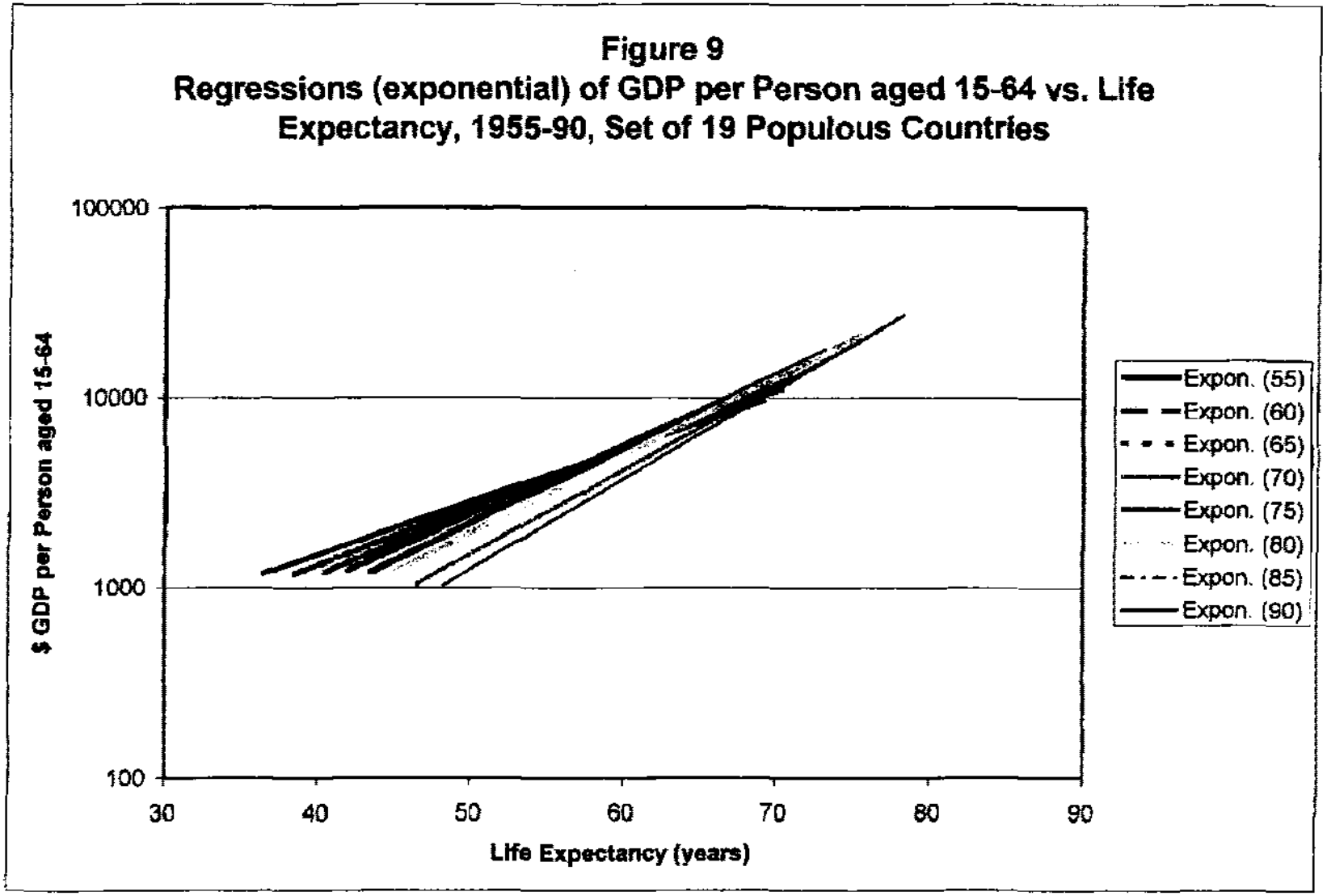


Figure 10
Life Expectancy vs. GDP per Person aged 15-64
Time Series for India, Japan, and US, 1955-1990

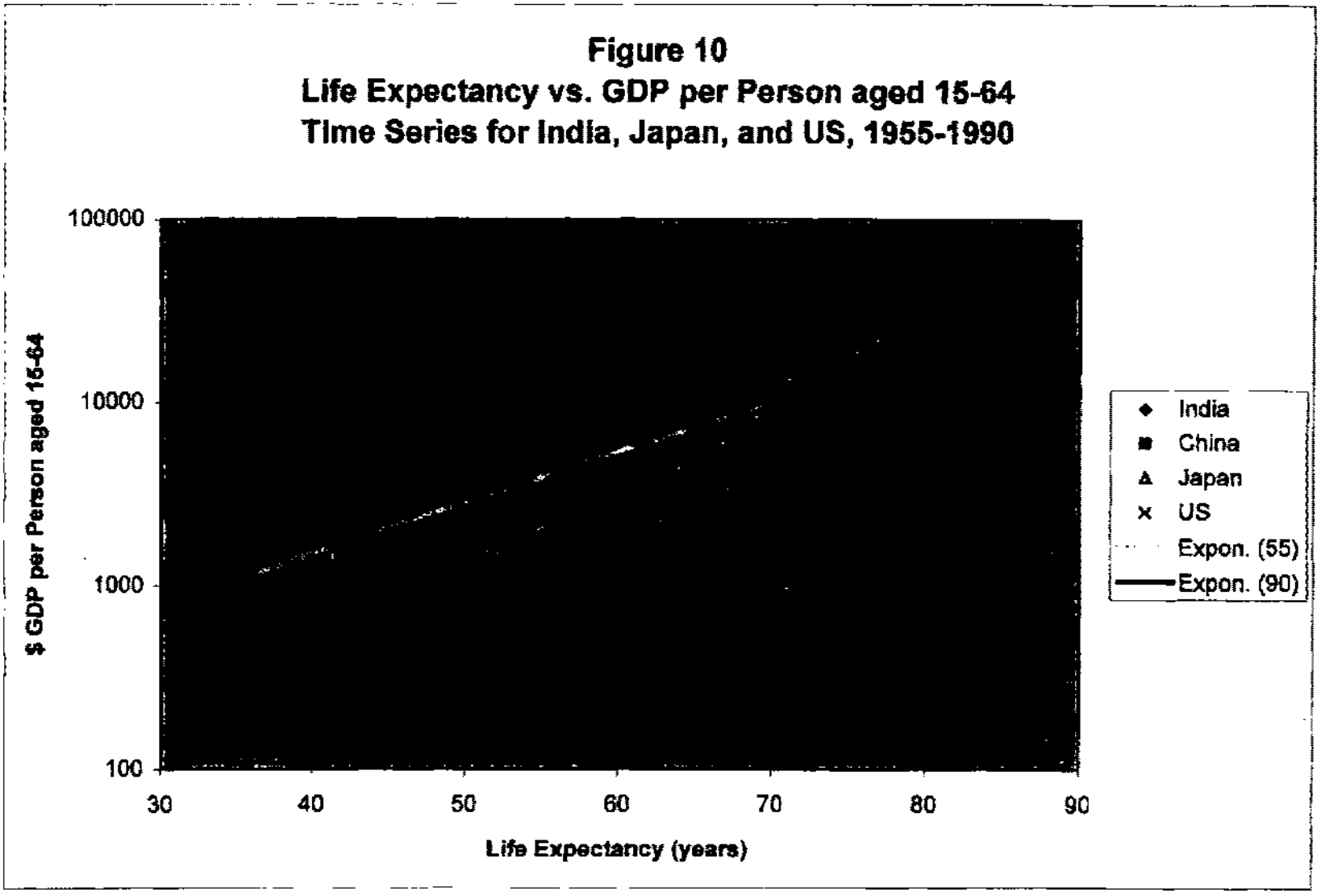
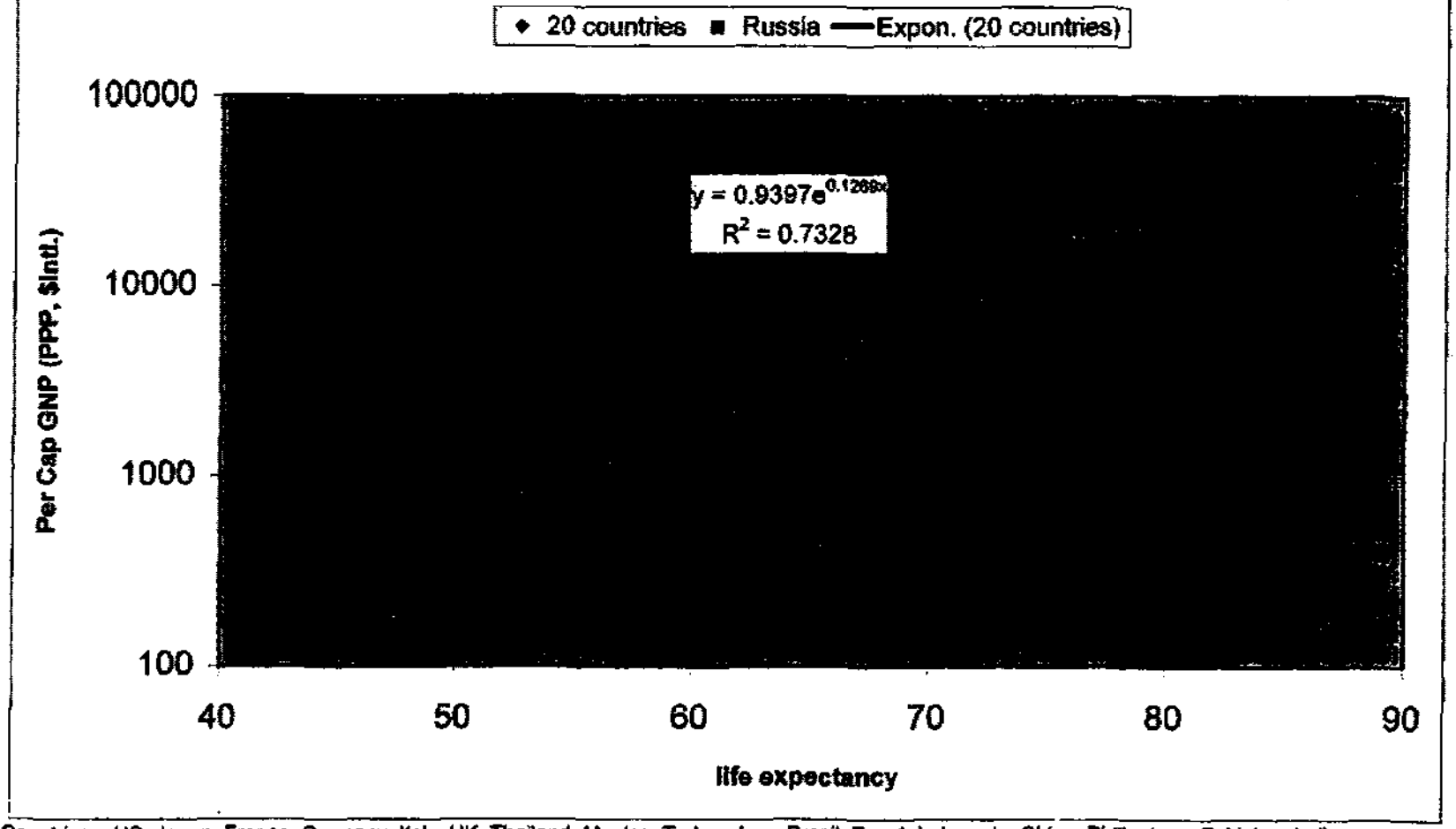


Figure 11
Life Expectancy (1990-95) vs. Per Capita GNP (1995 PPP)



Countries = US, Japan, France, Germany, Italy, UK, Thailand, Mexico, Turkey, Iran, Brazil, Egypt, Indonesia, China, Philippines, Pakistan, India, Bangladesh, Nigeria, Vietnam

Source: UN, Population Prospects; World Bank, World Development Indicators

SUPPLEMENT A

PROGRESS REPORT
FUTURE HEALTH OF RUSSIA'S WORKFORCE PROJECT
September 1997

This report summarizes the research the team has completed to date on the project, the research tasks immediately ahead, and manner in which we would propose to proceed.

DEMOGRAPHIC PROJECTIONS OF RUSSIA'S FUTURE MANPOWER POTENTIAL

The first step of Nick Eberstadt's research has been to prepare demographic projections of the future size and composition of the population aged 15-64 for the Russian Federation through the year 2020. Note that this is not the same as a projection of the future size of the Russian workforce. In Russia and elsewhere, there are economically active members of the labor force who are less than 15 and over 65. Conversely, a substantial proportion of the 15-64 cohort in every modern society lies outside the workforce for a variety of reasons. The 15-64 group, nonetheless, is typically used as a proxy for the population of "economically active ages" -- arbitrarily, but not unreasonably. Projecting these numbers will give us a reasonable approximation of the prospective trends in total manpower potential -- even if that potential will not be fully utilized.

Population projections require assumptions about future trends in fertility, mortality and migration.

Given the nature of this exercise, fertility assumptions will have only a minor impact on the totals we calculate. All of the Russians who will comprise the economically active age group in the year 2010, after all, have already been born. And perhaps nearly 90 percent of the Russians who will be aged 15-64 in the year 2020 are already alive today. In his projections, Eberstadt has assumed that the current level of fertility reported in Russia (TFR 1.4 -- that is, roughly 1.4 births per woman per lifetime), will continue through the year 2005 (the last year for which fertility estimates are necessary here). This level is low by historical perspective. On the other hand, it is about the same as the level now prevailing in the European Union and Eastern Europe. Even in the unlikely event that Russian fertility would skyrocket up or plummet down in the next few years, such dramatic changes would have only a marginal impact on our projections for the population of economically active ages for the year 2020.

Migration assumptions could be important. Over the past few years, the Russian Federation has been absorbing more immigrants than it has been losing in out-migrants (the net balance working out to a gain of few hundred thousand persons per year). There are large Russian populations within the "near abroad" that might conceivably move to Russia under various circumstances in the decades immediately ahead. Conversely, circumstances could arise in the years ahead under which many younger Russians might be prompted to migrate abroad (for example, to Western Europe). Having no particular intuition about future migration patterns, Eberstadt has not built in any special

assumptions here – in other words, he has posited a net zero migration for Russia through the year 2020. That assumption, of course, will almost surely be proved wrong. On the other hand, it is not clear to him whether it is too "optimistic" or too "pessimistic". Moreover, given the size of the group we are analyzing--roughly 100 million Russians are currently 15-64 years of age – it would take fairly major shifts in migration patterns to affect projected totals appreciably.

The most important assumptions in these projections concern mortality patterns in the period ahead. Eberstadt has used two extremes to bracket what he believes to be the range of plausible possibilities. The "pessimistic" variant assumes that the unusually high level of mortality that has been reported in Russia over the past several years (with male life expectancy under 60, and female life expectancy just over 70) will continue through the year 2020 with no improvements. The "optimistic" assumption, by contrast, holds that Russia's mortality patterns will rapidly improve, and that life expectancy in Russia in the year 2020 will resemble life expectancy in Sweden today (with males living to 74, and females to 80 or over).

In preparing these projections, Eberstadt used a 1995 estimated age-sex breakdown for the Russian Federation supplied by the United Nation's Population Division. (He also obtained one from the US Census Bureau; the differences between the two were quite minor for our purposes.) He has used two different demographic software packages (DOS-based FIVFIV and MAC-based IPSS) in running these projections. (See Appendices A and B for data output)

The results of these projections were somewhat surprising. Despite the seemingly radical differences in mortality assumptions embodied in the "pessimistic" and "optimistic" variants, even these disparate presumptions about future health progress had relatively little impact on the projected size and composition of Russia's 15-64 age group in 2020.

In absolute terms, the "optimistic" scenario did of course result in a larger total cohort size--but the difference in the year 2020 was barely 4%. Much of the difference in projected overall population totals involved the cohort 65 years of age and older--under the "optimistic" scenario, there would be many more persons in Russia in 2020 who would be of pensionable age. Big divergences would ultimately be seen in the size and composition of the 15-64 group if we permitted these two alternative scenarios to continue – but not until well after the year 2020.

The demographic projection exercise seems to underscore a central fact: the anticipated total size and composition of Russia's population 15-64 years of age in the year 2020 is not terribly sensitive to our assumptions about the future fertility or mortality trends within that nation. Under almost any plausible assumptions about fertility, mortality, and migration, there will be more than 90 million--but less than 100 million--men and women aged 15-64 in Russia in 2020.
Although total numbers for the "optimistic" and "pessimistic" scenarios for 2020 might be fairly similar, this could nevertheless imply big differences in the size of the Russian workforce. With a healthy population, after all, a rather higher fraction of the population of economically active ages might be capable of participating productivity in the modern economy. The implications of such health differences, moreover, could well extend to differences in productivity per worker employed. In short, similar total numbers of people "of working age" could be consistent with markedly different levels of national output for Russia in the year 2020.

An Approach To Quantitative Estimates Of Health Status For Russia

The next step, consequently, is to attempt to present some reasonable quantitative measures of health status for Russia today, and in the years ahead. Through such measures, it should be possible to compare Russia today (and in our imagined futures) to other countries, and furthermore to inquire through comparative international data about any relationships that are currently evident between health status of a "workforce" and economic potential of a nation.

For obvious general reasons -- and more particular and specific reasons outlined above -- summary statistical measures of a nation's health are to some inescapable degree arbitrary and thus problematic. To deal with this inescapable dilemma, Eberstadt has proposed to use a variety of alternative approaches to this quantification task.

He is currently working with two rather different methodological approaches. The first--initially developed at the Harvard School of Public Health -- is the "disability adjusted life years" (DALY) technique. This approach places a valuation on the severity of various illnesses or disabilities, and on that basis arrives at a total "burden of disease" attributed to a given population at a given time. The method can be criticized for the boldness of its assumptions: is cancer twice as "burdensome" as diabetes, etc. But for what it is worth, the DALY specialists have prepared international estimates of the current "burden of disease" against which similar computations for Russia could be compared and contrasted. These would also permit us to examine the international correspondences today (if any) between estimated levels of "burden of disease" and productivity or economic output per capita/worker -- and thus perhaps provide some greater insights into the constraints that poor health might play in Russia in the years ahead.

The second technique, which has been promoted by an international network of health specialists known as REVES, estimates the "disability-free life expectancy" (DFLE) or the "impairment-free life expectancy" (IFLE) for various groups and populations. This approach is quite similar to the demographic techniques used in building a "life table" -- instead of mortality schedules, one uses the probability of not being injured or debilitated over the time horizon in question. Although DFLE and ILFE computations require fewer heroic assumptions than DALY, the assessment of disability and impairment is nonetheless also inescapably subjective. For what it is worth, though, the REVES network has produced a number of consistently computed estimates of DFLE and IFLE for various OECD countries and low-income countries. (One of the most interesting of these exercises involves such computations for Western and Eastern Germany.) Data on disability and impairment for Russia today are, of course problematic. Some such data, however, do exist. On the basis of those figures, it should be possible to produce DFLEs for Russia that are comparable to the other REVES studies. With these in hand, it may be further possible to examine the correspondence between disability -- or impairment-free life expectancy for populations of working ages and international 1) labor force participation rates and 2) output per worker. These indications may help us gain a clearer picture of the constraints that health problems may pose to the revival and development of the Russian economy in the years ahead.

Economic Carrying Costs

Vladimir Kontorovich has been interacting with Eberstadt regularly over the past four months to keep abreast of the life expectancy analysis. Kontorovich's task is to put a price tag on the impact of the demographic crisis and assess how intervention at various stages of the crisis could influence the short and long term carrying costs and Russia's potential for future economic growth. He currently is developing a set of assumptions about the Russian government's willingness and ability to intervene and address deteriorating demographic conditions. He will consider the potential costs of both prophylactic and remedial efforts by the government, examining a range of government intervention scenarios, for example 100%, 50%, 0% levels of government intervention.

Kontorovich will have more data after Eberstadt conducts his analysis of the burden of disease and completes his computations of "disability-free life expectancy" (DFLE) and "impairment-free life expectancy" (IFLE). When he receives this data, Kontorovich will calculate both the immediate economic carrying costs of the calculated burdens and the long-term economic implications.

APPENDIX A

DATA: HEALTH CRISIS CONTINUES SCENARIO

FERTILITY

Sex ratio at birth: 105.0 Males per 100 Females

DISTRIBUTION BY AGE OF FERTILITY (Percent)

AGE	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030
15-19	17.6	17.7	17.7	17.7	17.7	17.7	17.7
20-24	42.6	42.8	42.8	42.8	42.8	42.8	42.8
25-29	24.3	24.4	24.4	24.4	24.4	24.4	24.4
30-34	10.9	10.6	10.6	10.6	10.6	10.6	10.6
35-39	3.9	3.9	3.9	3.9	3.9	3.9	3.9
40-44	.7	.7	.7	.7	.7	.7	.7
45-49	.0	.0	.0	.0	.0	.0	.0
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0

AGE SPECIFIC FERTILITY SCHEDULE

AGE	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030
15-19	.050	.050	.050	.050	.050	.050	.050
20-24	.121	.121	.121	.121	.121	.121	.121
25-29	.069	.069	.069	.069	.069	.069	.069
30-34	.031	.030	.030	.030	.030	.030	.030
35-39	.011	.011	.011	.011	.011	.011	.011
40-44	.002	.002	.002	.002	.002	.002	.002
45-49	.000	.000	.000	.000	.000	.000	.000
TOT*5=TFR	1.420	1.420	1.420	1.420	1.420	1.420	1.420
GRR	.693	.693	.693	.693	.693	.693	.693
NRR	.664	.664	.664	.664	.664	.664	.664
MEAN AGE	24.648	24.620	24.620	24.620	24.620	24.620	24.620

MORTALITY

EAST	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030
E(0) FEMALES	71.40	71.40	71.40	71.40	71.40	71.40	71.40
E(0) MALES	57.16	57.16	57.16	57.16	57.16	57.16	57.16
E(0) BOTH	64.11	64.11	64.11	64.11	64.11	64.11	64.11
IMR FEMALES	22.77	22.77	22.77	22.77	22.77	22.77	22.77
IMR MALES	26.59	26.59	26.59	26.59	26.59	26.59	26.59
IMR BOTH	24.73	24.73	24.73	24.73	24.73	24.73	24.73
E(5) FEMALES	68.41	68.41	68.41	68.41	68.41	68.41	68.41
E(5) MALES	54.03	54.03	54.03	54.03	54.03	54.03	54.03
E(5) BOTH	61.04	61.04	61.04	61.04	61.04	61.04	61.04

POPULATION PROJECTION

FEMALES	1995	2000	2005	2010	2015	2020	2025	2030
0-4	4104.5	3691.3	3796.9	3793.5	3440.3	2960.7	2675.8	2540.5
5-9	5971.4	4088.5	3676.9	3782.1	3778.7	3426.9	2949.2	2665.4
10-14	5999.4	5956.9	4078.6	3668.0	3772.9	3769.5	3418.6	2942.0
15-19	5555.7	5981.8	5939.5	4066.6	3657.2	3761.8	3758.5	3408.6
20-24	5341.8	5531.7	5956.0	5913.9	4049.1	3641.5	3745.6	3742.3
25-29	4956.1	5312.2	5501.1	5923.1	5881.2	4026.7	3621.3	3724.9
30-34	6030.7	4922.9	5276.7	5464.3	5883.5	5841.8	3999.8	3597.1
35-39	6649.0	5979.0	4880.7	5231.5	5417.5	5833.0	5791.8	3965.5
40-44	6189.1	6572.4	5910.1	4824.5	5171.2	5355.1	5765.8	5725.0
45-49	5009.3	6086.3	6463.2	5811.9	4744.3	5085.3	5266.2	5670.1
50-54	3239.0	4885.5	5935.9	6303.5	5668.3	4627.1	4959.7	5136.0
55-59	5563.8	3119.4	4705.2	5716.8	6070.8	5459.0	4456.3	4776.6
60-64	4168.1	5240.1	2937.9	4431.4	5384.2	5717.6	5141.4	4197.0
65-69	4899.4	3765.1	4733.6	2653.9	4003.0	4863.7	164.9	4644.4
70-74	3263.1	4098.3	3149.5	3959.6	2220.0	3348.5	4068.4	4320.4
75+	1899.6	3265.1	4514.6	4413.1	4954.0	3944.5	4289.4	4974.9
TOTAL	78839.9	78496.8	77456.5	75957.7	74096.3	71662.9	69072.7	66030.7

MALES	1995	2000	2005	2010	2015	2020	2025	2030
0-4	4182.7	3859.7	3970.1	3966.5	3597.3	095.8	2797.9	2656.4
5-9	6048.2	4119.6	3801.5	3910.2	3906.7	3543.0	3049.1	2755.7
10-14	6031.8	5941.5	4046.9	3734.4	3841.2	3837.7	3480.5	2995.3
15-19	5544.6	5929.7	5840.9	3978.4	3671.2	3776.1	3772.8	3421.6
20-24	5328.2	5403.1	5778.4	5691.8	3876.8	3577.5	3679.8	3676.5
25-29	5033.6	5164.2	5236.8	5600.5	5516.6	3757.5	3467.4	3566.5
30-34	5972.6	4869.0	4995.3	5065.5	5417.3	5336.2	3634.6	3353.9
35-39	6423.7	5744.4	4682.9	4804.4	4871.9	5210.3	5132.2	3495.7
40-44	5792.3	6118.5	5471.5	4460.4	4576.2	4640.5	4962.8	4888.4
45-49	4532.5	5441.4	5747.9	5140.1	4190.3	4299.0	4359.4	4662.2
50-54	2687.5	4173.3	5010.2	5292.3	4732.7	3858.2	3958.3	4013.9
55-59	4297.7	2401.0	3728.4	4476.1	4728.2	4228.2	3446.9	3536.3
60-64	2902.6	3667.6	2049.0	3181.8	3819.9	4035.0	3608.3	2941.5
65-69	2856.6	2303.1	2910.1	1625.8	2524.7	3030.9	3201.6	2863.1
70-74	1214.4	2019.0	1627.8	2056.9	1149.1	1784.4	2142.2	2262.9
75+	602.2	931.2	1522.3	1511.9	1758.6	1319.5	1528.6	1814.6
TOTAL	69451.5	68086.4	66420.0	64497.1	62178.6	59329.8	56222.2	52904.4
GRAND TOTAL	148291.4	146583.2	143876.5	140454.8	136274.9	130992.7	125294.9	118935.0

MIDPERIOD INDICES FOR FIVE-YEAR TIME PERIODS

	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030
POPULATION SIZE	147434.8	145223.6	142155.4	138349.1	133607.7	128112.1	122073.6
YEARLY BIRTHS	1552.5	1596.9	1595.5	1447.0	1245.2	1125.4	1068.5
YEARLY DEATHS	1894.2	2138.3	2279.8	2283.0	2301.7	2265.0	2340.5
NET YEARLY MIGRANTS	0	.0	.0	.0	.0	.0	.0

YEARLY RATES PER THOUSAND POPULATION

	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030
GFR=BIRTHS/FEM(15-44)	45.0	47.1	49.2	47.1	42.6	40.8	42.0
BIRTH RATE	10.5	11.0	11.2	10.5	9.3	8.8	8.8
DEATH RATE	12.8	14.7	16.0	16.5	17.2	17.7	19.0
NATURAL INCREASE	-2.3	-3.7	-4.8	-6.0	-7.9	-8.9	-10.4
NET MIGRATION	.0	.0	.0	.0	.0	.0	.0
POP INCREASE	-2.3	-3.7	-4.8	-6.0	-7.9	-8.9	-10.4

RATES OF CHANGE IN POPULATION BY AGE GROUP (Percent per year)

AGE	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030
FEMALES							
0-4	-2.12	.56	-.02	-1.95	-3.00	-2.02	-1.04
5-9	-7.58	-2.12	.56	-.02	-1.95	-3.00	-2.02
10-14	-.14	-7.58	-2.12	.56	-.02	-1.95	-3.00
15-19	1.48	-.14	-7.58	-2.12	.56	-.02	-1.95
20-24	.70	1.48	-.14	-7.58	-2.12	.56	-.02
25-29	1.39	.70	1.48	-.14	-7.58	-2.12	.56
30-34	-4.06	1.39	.70	1.48	-.14	-7.58	-2.12
35-39	-2.12	-4.06	1.39	.70	1.48	-.14	-7.58
40-44	1.20	-2.12	-4.06	1.39	.70	1.48	-.14
45-49	3.89	1.20	-2.12	-4.06	1.39	.70	1.48
50-54	8.22	3.89	1.20	-2.12	-4.06	1.39	.70
55-59	-11.57	8.22	3.89	1.20	-2.12	-4.06	1.39
60-64	4.58	-11.57	8.22	3.89	1.20	-2.12	-4.06
65-69	-5.27	4.58	-11.57	8.22	3.89	1.20	-2.12
70-74	4.56	-5.27	4.58	-11.57	8.22	3.89	1.20
75+	10.83	6.48	-.45	2.31	-4.56	1.68	2.97
TOTAL	-.09	-.27	-.39	-.50	-.67	-.74	-.90
MALES							
0-4	-1.61	.56	-.02	-1.95	-3.00	-2.02	-1.04
5-9	-7.68	-1.61	.56	-.02	-1.95	-3.00	-2.02
10-14	-.30	-7.68	-1.61	.56	-.02	-1.95	-3.00
15-19	1.34	-.30	-7.68	-1.61	.56	-.02	-1.95
20-24	.28	1.34	-.30	-7.68	-1.61	.56	-.02
25-29	.51	.28	1.34	-.30	-7.68	-1.61	.56
30-34	-4.09	.51	.28	1.34	-.30	-7.68	-1.61
35-39	-2.24	-4.09	.51	.28	1.34	-.30	-7.68
40-44	1.10	-2.24	-4.09	.51	.28	1.34	-.30
45-49	3.66	1.10	-2.24	-4.09	.51	.28	1.34
50-54	8.80	3.66	1.10	-2.24	-4.09	.51	.28
55-59	-11.64	8.80	3.66	1.10	-2.24	-4.09	.51
60-64	4.68	-11.64	8.80	3.66	1.10	-2.24	-4.09
65-69	-4.31	4.68	-11.64	8.80	3.66	1.10	-2.24
70-74	10.17	-4.31	4.68	-11.64	8.80	3.66	1.10
75+	8.72	9.83	-.14	3.02	-5.74	2.94	3.43
TOTAL	-.40	-.50	-.59	-.73	-.94	-1.08	-1.22
BOTH	-.23	-.37	-.48	-.60	-.79	-.89	-1.04

The quality of information on rates of increase by age is safeguarded when genuine irregularities of the age distribution at the base date are preserved, while irregularities due to age shifting and heaping are removed.

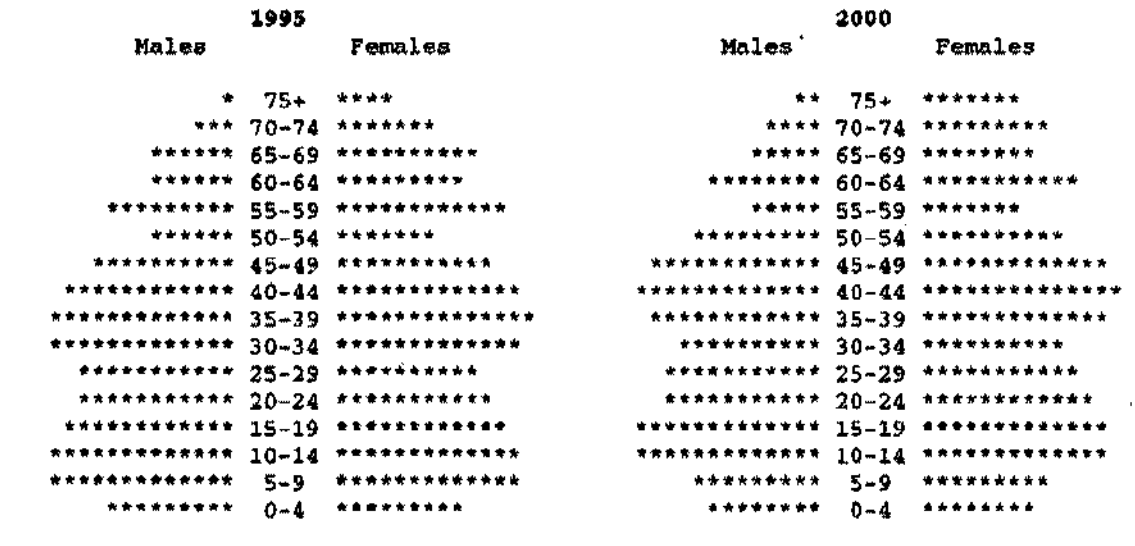
PROPORTIONS OF TOTAL POPULATION BY SEX (Percent)

FEMALES	1995	2000	2005	2010	2015	2020	2025	2030
0-4	5.21	4.70	4.90	4.99	4.64	4.13	3.87	3.85
5-9	7.57	5.21	4.75	4.98	5.10	4.78	4.27	4.04
10-14	7.61	7.59	5.27	4.83	5.09	5.26	4.95	4.46
15-19	7.05	7.62	7.67	5.35	4.94	5.25	5.44	5.16
20-24	6.78	7.05	7.69	7.79	5.46	5.08	5.42	5.67
25-29	6.29	6.77	7.10	7.80	7.94	5.62	5.24	5.64
30-34	7.65	6.27	6.81	7.19	7.94	8.15	5.79	5.45
35-39	8.43	7.62	6.30	6.89	7.31	8.14	8.39	6.01
40-44	7.85	8.37	7.63	6.35	6.98	7.47	8.35	8.67
45-49	6.35	7.75	8.34	7.65	6.40	7.10	7.62	8.59
50-54	4.11	6.22	7.66	8.30	7.65	6.46	7.18	7.78
55-59	7.06	3.97	6.07	7.53	8.19	7.62	6.45	7.23
60-64	5.29	6.68	3.79	5.83	7.27	7.98	7.44	6.36
65-69	6.21	4.80	6.11	3.49	5.40	6.79	7.48	7.03
70-74	4.14	5.22	4.07	5.21	3.00	4.67	5.89	6.54
75+	2.41	4.16	5.83	5.81	6.69	5.50	6.21	7.53
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

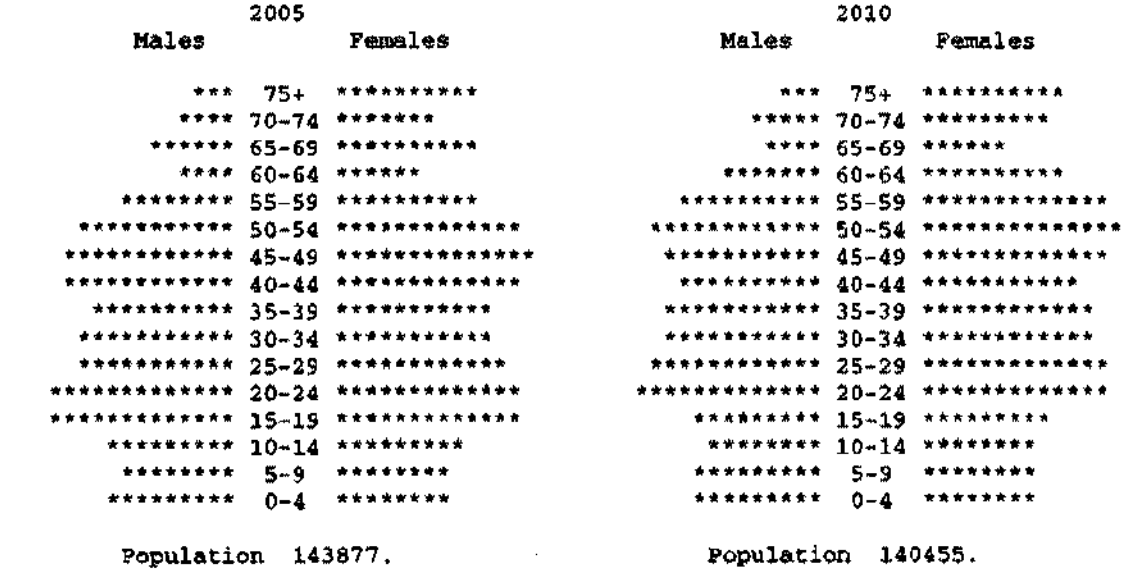
MALES	1995	2000	2005	2010	2015	2020	2025	2030
0-4	6.02	5.67	5.98	6.15	5.79	5.22	4.98	5.02
5-9	8.71	6.05	5.72	6.06	6.28	5.97	5.42	5.21
10-14	8.68	8.73	6.09	5.79	6.18	6.47	6.19	5.66
15-19	7.98	8.71	8.79	6.17	5.90	6.36	6.71	6.47
20-24	7.67	7.94	8.70	8.82	6.23	6.03	6.55	6.95
25-29	7.25	7.58	7.88	8.68	8.87	6.33	6.17	6.74
30-34	8.60	7.15	7.52	7.85	8.71	8.99	6.46	6.34
35-39	9.25	8.44	7.05	7.45	7.84	8.78	9.13	6.61
40-44	8.34	8.99	8.24	6.92	7.36	7.82	8.83	9.24
45-49	6.53	7.99	8.65	7.97	6.74	7.25	7.75	8.81
50-54	3.87	6.13	7.54	8.21	7.61	6.50	7.04	7.59
55-59	6.19	3.53	5.61	6.94	7.60	7.13	6.13	6.68
60-64	4.18	5.39	3.08	4.93	6.14	6.80	6.42	5.56
65-69	4.11	3.38	4.38	2.52	4.06	5.11	5.69	5.41
70-74	1.75	2.97	2.45	3.19	1.85	3.01	3.81	4.28
75+	.87	1.37	2.29	2.34	2.83	2.22	2.72	3.43
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

AGE		1995	2000	2005	2010	2015	2020	2025	2030
FEMALES	0-14	20.39	17.50	14.91	14.80	14.83	14.17	13.09	12.34
	15-64	66.85	68.32	69.08	70.68	70.08	68.86	67.33	66.55
	65+	12.76	14.18	16.01	14.52	15.08	16.96	19.58	21.11
MALES	0-14	23.42	20.45	17.79	18.00	18.25	17.66	16.59	15.89
	15-64	69.86	71.84	73.08	73.94	73.02	72.00	71.19	70.99
	65+	6.73	7.72	9.12	8.05	8.74	10.34	12.22	13.12
BOTH	0-14	21.81	18.87	16.24	16.27	16.39	15.75	14.66	13.92
	15-64	68.26	69.96	70.93	72.18	71.42	70.28	69.06	68.52
	65+	9.94	11.18	12.83	11.55	12.19	13.96	16.28	17.56
'Both' is calculated from a table for both sexes, which is not shown.									
MALES/FEMALES		.881	.867	.858	.849	.839	.828	.814	.801

POPULATION PYRAMIDS (Percent)

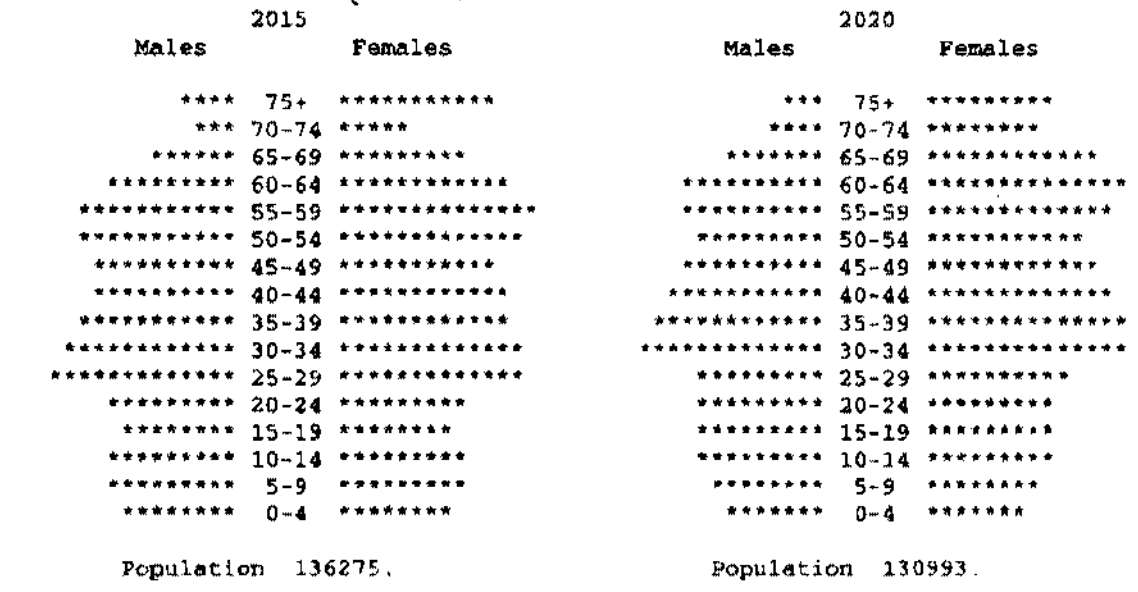


Each symbol represents .32 percent of the total population size.



Each symbol represents .32 percent of the total population size.

POPULATION PYRAMIDS (Percent)



Each symbol represents .32 percent of the total population size.

APPENDIX B

DATA: RAPID HEALTH RECOVERY

FERTILITY

Sex ratio at birth: 105.0 Males per 100 Females

DISTRIBUTION BY AGE OF FERTILITY (Percent)

AGE	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030
15-19	17.6	17.7	17.7	17.7	17.7	17.7	17.7
20-24	42.6	42.8	42.8	42.8	42.8	42.8	42.8
25-29	24.3	24.4	24.4	24.4	24.4	24.4	24.4
30-34	10.9	10.6	10.6	10.6	10.6	10.6	10.6
35-39	3.9	3.9	3.9	3.9	3.9	3.9	3.9
40-44	.7	.7	.7	.7	.7	.7	.7
45-49	.0	.0	.0	.0	.0	.0	.0
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0

AGE SPECIFIC FERTILITY SCHEDULE

AGE	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030
15-19	.050	.050	.050	.050	.050	.050	.050
20-24	.121	.121	.121	.121	.121	.121	.121
25-29	.069	.069	.069	.069	.069	.069	.069
30-34	.031	.030	.030	.030	.030	.030	.030
35-39	.011	.011	.011	.011	.011	.011	.011
40-44	.002	.002	.002	.002	.002	.002	.002
45-49	.000	.000	.000	.000	.000	.000	.000
TOT*5=TFR	1.420	1.420	1.420	1.420	1.420	1.420	1.420
GRR	.693	.693	.693	.693	.693	.693	.693
NRR	.664	.674	.677	.680	.682	.684	.684
MEAN AGE	24.648	24.620	24.620	24.620	24.620	24.620	24.620

MORTALITY

EAST	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030
E(0) FEMALES	71.40	75.00	76.25	77.50	78.75	80.00	80.00
E(0) MALES	57.16	60.42	64.97	68.29	70.87	73.88	73.88
E(0) BOTH	64.11	67.53	70.47	72.78	74.72	76.87	76.87
IMR FEMALES	22.77	15.29	12.38	9.46	7.74	6.01	6.01
IMR MALES	26.59	16.40	13.07	13.07	10.37	7.67	7.67
IMR BOTH	24.73	15.86	12.73	11.31	9.08	6.86	6.86
E(5) FEMALES	68.41	71.44	72.43	73.41	74.51	75.62	75.62
E(5) MALES	54.03	56.65	61.03	64.41	66.80	69.61	69.61
E(5) BOTH	61.04	63.87	66.59	68.80	70.56	72.54	72.54

POPULATION PROJECTION

FEMALES	1995	2000	2005	2010	2015	2020	2025	2030
0-4	4104.5	3691.3	3831.7	3848.6	3508.8	3033.0	2758.9	2635.5
5-9	5971.4	4088.5	3681.5	3823.1	3841.7	3503.4	3029.2	2755.4
10-14	5999.4	5956.9	4082.9	3677.0	3819.2	3838.2	3500.7	3026.8
15-19	5555.7	5981.8	5947.2	4076.9	3672.2	3814.5	3834.0	3496.8
20-24	5341.8	5531.7	5967.1	5933.9	4068.7	3665.5	3808.3	3827.7
25-29	4956.1	5312.2	5514.0	5950.2	5919.3	4059.6	3658.1	3800.7
30-34	6030.7	4922.9	5291.2	5494.8	5932.3	5903.0	4049.5	3649.1
35-39	6649.0	5979.0	4896.3	5265.5	5471.2	5909.6	5883.2	4035.9
40-44	6189.1	6572.4	5932.0	4861.3	5231.5	5439.6	5879.6	5853.3
45-49	5009.3	6086.3	6491.6	5865.6	4812.2	5184.3	5396.4	5832.9
50-54	3239.0	4885.5	5971.1	6379.1	5773.3	4744.6	5120.2	5329.7
55-59	5563.8	3119.4	4745.6	5814.3	6226.7	5650.2	4655.5	5024.0
60-64	4168.1	5240.1	2977.6	4549.5	5597.9	6020.8	5486.7	4520.8
65-69	4899.4	3765.1	4847.8	2776.4	4275.2	5299.9	5742.8	5233.4
70-74	3263.1	4098.3	3287.3	4291.7	2491.7	3888.4	4884.4	5292.6
75+	1899.6	3265.1	4913.6	5286.3	6461.6	5798.4	6761.0	8183.8
TOTAL	78839.9	78496.8	78378.5	77894.1	77103.6	75753.3	74448.5	72498.4

MALES	1995	2000	2005	2010	2015	2020	2025	2030
0-4	4182.7	3859.7	4018.6	4037.9	3669.0	3175.0	2891.3	2762.0
5-9	6048.2	4119.6	3814.0	3994.9	4028.2	3655.9	3169.6	2886.4
10-14	6031.8	5941.5	4065.5	3787.2	3980.9	4018.6	3651.5	3165.7
15-19	5544.6	5929.7	5861.8	4031.6	3768.0	3966.3	4008.6	3642.4
20-24	5328.2	5403.1	5808.5	5785.3	3998.8	3745.4	3948.5	3990.7
25-29	5033.6	5164.2	5270.1	5717.5	5729.0	3970.1	3725.1	3927.1
30-34	5972.6	4869.0	5029.2	5182.9	5658.8	5685.9	3947.6	3704.0
35-39	6423.7	5744.4	4720.2	4931.9	5120.4	5609.0	5649.1	3922.1
40-44	5792.3	6118.5	5523.5	4601.9	4852.1	5058.5	5556.5	5596.3
45-49	4532.5	5441.4	5810.0	5330.3	4488.8	4758.1	4983.3	5474.0
50-54	2687.5	4173.3	5069.0	5511.2	5120.0	4341.8	4642.4	4862.1
55-59	4297.7	2401.0	3776.8	4682.5	5168.6	4841.5	4173.3	4462.3
60-64	2902.6	3667.6	2080.9	3355.9	4239.8	4731.0	4549.0	3921.2
65-69	2856.6	2303.1	2970.0	1741.7	2880.9	3715.2	4283.0	4118.2
70-74	1214.4	2019.0	1673.3	2256.6	1369.9	2358.9	3162.0	3645.3
75+	602.2	931.2	1584.1	1739.4	2293.2	2123.4	2899.9	3915.2
TOTAL	69451.5	68086.4	67075.4	66688.5	66366.4	65754.4	65240.9	63995.1

GRAND TOTAL							
148291.4	146583.2	145453.9	144582.6	143470.0	141507.6	139689.4	136493.5

MIDPERIOD INDICES FOR FIVE-YEAR TIME PERIODS

	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030
POPULATION SIZE	147434.8	146017.5	145017.6	144025.2	142485.4	140595.6	138082.2
YEARLY BIRTHS	1552.5	1598.6	1600.2	1454.0	1254.6	1139.1	1088.2
YEARLY DEATHS	1894.2	1824.4	1774.5	1676.6	1647.0	1502.8	1727.4
NET YEARLY MIGRANTS	.0	.0	.0	.0	.0	.0	.0

YEARLY RATES PER THOUSAND POPULATION

	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030
GFR=BIRTHS/FEM(15-44)	045.0	47.1	49.1	47.0	42.5	40.8	42.0
BIRTH RATE	10.5	10.9	11.0	10.1	8.8	8.1	7.9
DEATH RATE	12.8	12.5	12.2	11.6	11.6	10.7	12.5
NATURAL INCREASE	-2.3	-1.5	-1.2	-1.5	-2.8	-2.6	-4.6
NET MIGRATION	.0	.0	.0	.0	.0	.0	.0
POP INCREASE	-2.3	-1.5	-1.2	-1.5	-2.8	-2.6	-4.6

RATES OF CHANGE IN POPULATION BY AGE GROUP (Percent per year)

AGE	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030
FEMALES							
0-4	-2.12	.75	.09	-1.85	-2.91	-1.89	-.92
5-9	-7.58	-2.10	.76	.10	-1.84	-2.91	-1.89
10-14	-.14	-7.55	-2.09	.76	.10	-1.84	-2.91
15-19	1.48	-.12	-7.55	-2.09	.76	.10	-1.84
20-24	.70	1.52	-.11	-7.55	-2.09	.76	.10
25-29	1.39	.75	1.52	-.10	-7.54	-2.08	.76
30-34	-4.06	1.44	.76	1.53	-.10	-7.54	-2.08
35-39	-2.12	-4.00	1.45	.77	1.54	-.09	-7.54
40-44	1.20	-2.05	-3.98	1.47	.78	1.56	-.09
45-49	3.89	1.29	-2.03	-3.96	1.49	.80	1.56
50-54	8.22	4.01	1.32	-2.00	-3.92	1.52	.80
55-59	-11.57	8.39	4.06	1.37	-1.94	-3.87	1.52
60-64	4.58	-11.30	8.48	4.15	1.46	-1.86	-3.87
65-69	-5.27	5.05	-11.15	8.63	4.30	1.61	-1.86
70-74	4.56	-4.41	5.33	-10.87	8.90	4.56	1.61
75+	10.83	8.17	1.46	4.02	-2.17	3.07	3.82
TOTAL	-.09	-.03	-.12	-.20	-.35	-.35	-.53
MALES							
0-4	-1.61	.81	.10	-1.92	-2.89	-1.87	-.92
5-9	-7.68	-1.54	.93	.17	-1.94	-2.85	-1.87
10-14	-.30	-7.59	-1.42	1.00	.19	-1.92	-2.85
15-19	1.34	-.23	-7.49	-1.35	1.03	.21	-1.92
20-24	.28	1.45	-.08	-7.39	-1.31	1.06	.21
25-29	.51	.41	1.63	.04	-7.34	-1.27	1.06
30-34	-4.09	.65	.60	1.76	.10	-7.30	-1.27
35-39	-2.24	-3.93	.88	.75	1.82	.14	-7.30
40-44	1.10	-2.05	-3.65	1.06	.83	1.88	.14
45-49	3.66	1.31	-1.72	-3.44	1.17	.92	1.88
50-54	8.80	3.89	1.67	-1.47	-3.30	1.34	.92
55-59	-11.64	9.06	4.30	1.98	-1.31	-2.97	1.34
60-64	4.68	-11.34	9.56	4.68	2.19	-.78	-2.97
65-69	-4.31	5.09	-10.67	10.06	5.09	2.84	-.78
70-74	10.17	-3.76	5.98	-9.98	10.87	5.86	2.84
75+	8.72	10.63	1.87	5.53	-1.54	6.23	6.00
TOTAL	-.40	-.30	-.12	-.10	-.19	-.16	-.39
BOTH	-.23	-.15	-.12	-.15	-.28	-.26	-.46

The quality of information on rates of increase by age is safeguarded when genuine irregularities of the age distribution at the base date are preserved, while irregularities due to age shifting and heaping are removed.

PROPORTIONS OF TOTAL POPULATION BY SEX (Percent)

FEMALES	1995	2000	2005	2010	2015	2020	2025	2030
0-4	5.21	4.70	4.89	4.94	4.55	4.00	3.71	3.64
5-9	7.57	5.21	4.70	4.91	4.98	4.62	4.07	3.80
10-14	7.61	7.59	5.21	4.72	4.95	5.07	4.70	4.18
15-19	7.05	7.62	7.59	5.23	4.76	5.04	5.15	4.82
20-24	6.78	7.05	7.61	7.62	5.28	4.84	5.12	5.28
25-29	6.29	6.77	7.04	7.64	7.68	5.36	4.91	5.24
30-34	7.65	6.27	6.75	7.05	7.69	7.79	5.44	5.03
35-39	8.43	7.62	6.25	6.76	7.10	7.80	7.90	5.57
40-44	7.85	8.37	7.57	6.24	6.79	7.18	7.90	8.07
45-49	6.35	7.75	8.28	7.53	6.24	6.84	7.25	8.05
50-54	4.11	6.22	7.62	8.19	7.49	6.26	6.88	7.35
55-59	7.06	3.97	6.05	7.46	8.08	7.46	6.25	6.93
60-64	5.29	6.68	3.80	5.84	7.26	7.95	7.37	6.24
65-69	6.21	4.80	6.19	3.56	5.54	7.00	7.71	7.22
70-74	4.14	5.22	4.19	5.51	3.23	5.13	6.56	7.30
75+	2.41	4.16	6.27	6.79	8.38	7.65	9.08	11.29
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

MALES	1995	2000	2005	2010	2015	2020	2025	2030
0-4	6.02	5.67	5.99	6.05	5.53	4.83	4.43	4.32
5-9	8.71	6.05	5.69	5.99	6.07	5.56	4.86	4.51
10-14	8.68	8.73	6.06	5.68	6.00	6.11	5.60	4.95
15-19	7.98	8.71	8.74	6.05	5.68	6.03	6.14	5.69
20-24	7.67	7.94	8.66	8.68	6.03	5.70	6.05	6.24
25-29	7.25	7.58	7.86	8.57	8.63	6.04	5.71	6.14
30-34	8.60	7.15	7.50	7.77	8.53	8.65	6.05	5.79
35-39	9.25	8.44	7.04	7.40	7.72	8.53	8.66	6.13
40-44	8.34	8.99	8.23	6.90	7.31	7.69	8.52	8.74
45-49	6.53	7.99	8.66	7.99	6.76	7.24	7.64	8.55
50-54	3.87	6.13	7.56	8.26	7.71	6.60	7.12	7.60
55-59	6.19	3.53	5.63	7.02	7.79	7.36	6.40	6.97
60-64	4.18	5.39	3.10	5.03	6.39	7.19	6.97	6.13
65-69	4.11	3.38	4.43	2.61	4.34	5.65	6.56	6.44
70-74	1.75	2.97	2.49	3.38	2.06	3.59	4.85	5.70
75+	.87	1.37	2.36	2.61	3.46	3.23	4.44	6.12
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

AGE	1995	2000	2005	2010	2015	2020	2025	2030
FEMALES 0-14	20.39	17.50	14.79	14.57	14.49	13.70	12.48	11.61
15-64	66.85	68.32	68.56	69.57	68.36	66.52	64.17	62.58
65+	12.76	14.18	16.65	15.86	17.16	19.78	23.36	25.81
MALES 0-14	23.42	20.45	17.74	17.72	17.60	16.50	14.89	13.77
15-64	69.86	71.84	72.98	73.67	72.54	71.03	69.26	67.98
65+	6.73	7.72	9.28	8.60	9.86	12.47	15.86	18.25
BOTH 0-14	21.81	18.87	16.15	16.02	15.93	15.00	13.60	12.62
15-64	68.26	69.96	70.60	71.46	70.29	68.62	66.54	65.11
65+	9.94	11.18	13.25	12.51	13.78	16.38	19.85	22.26
'Both' is calculated from a table for both sexes which is not shown.								
MALES/FEMALES	.881	.867	.856	.856	.861	.868	.876	.883

POPULATION PYRAMIDS (Percent)

```
                 1995
     Males                 Females

          *  75+  ***
         ** 70-74 ******
      ***** 65-69 ********
      ***** 60-64 *******
    ******* 55-59 *********
      ***** 50-54 *****
   ******** 45-49 ********
 ********** 40-44 **********
*********** 35-39 ***********
 ********** 30-34 **********
   ******** 25-29 ********
  ********* 20-24 *********
  ********* 15-19 *********
 ********** 10-14 **********
 **********  5-9  **********
    *******  0-4  *******

   Population  148291.
```

```
                 2000
     Males                 Females

         **  75+  ******
        *** 70-74 *******
       **** 65-69 ******
     ****** 60-64 *********
       **** 55-59 *****
    ******* 50-54 ********
  ********* 45-49 **********
 ********** 40-44 ***********
 ********** 35-39 **********
   ******** 30-34 ********
  ********* 25-29 *********
  ********* 20-24 *********
 ********** 15-19 **********
 ********** 10-14 **********
    *******  5-9  *******
    *******  0-4  ******

   Population  146583.
```

Each symbol represents .40 percent of the total population size.

```
                 2005
     Males                 Females

        ***  75+  ********
        *** 70-74 ******
      ***** 65-69 ********
       **** 60-64 *****
     ****** 55-59 ********
  ********* 50-54 **********
 ********** 45-49 ***********
 ********** 40-44 **********
   ******** 35-39 ********
  ********* 30-34 *********
  ********* 25-29 *********
 ********** 20-24 **********
 ********** 15-19 **********
    ******* 10-14 *******
    *******  5-9  ******
    *******  0-4  *******

   Population  145454.
```

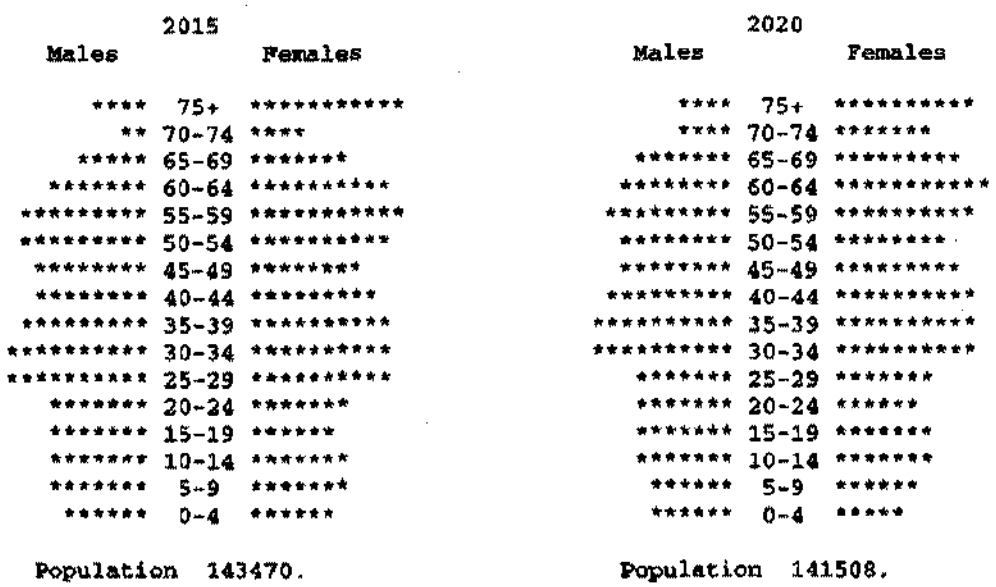
```
                 2010
     Males                 Females

        ***  75+  *********
       **** 70-74 *******
        *** 65-69 *****
     ****** 60-64 ********
   ******** 55-59 **********
 ********** 50-54 ***********
  ********* 45-49 **********
   ******** 40-44 ********
  ********* 35-39 *********
  ********* 30-34 **********
 ********** 25-29 **********
 ********** 20-24 **********
    ******* 15-19 *******
    ******* 10-14 ******
    *******  5-9  *******
    *******  0-4  *******

   Population  144583.
```

Each symbol represents .40 percent of the total population size.

POPULATION PYRAMIDS (Percent)



Each symbol represents .40 percent of the total population size.

APPENDIX C

BIBLIOGRAPHY

Alter, George and James C. Riley. "Frailty, Sickness, and Death: Models of Morbidity and Mortality in Historical Populations." *Populations Studies* 43: 1989, 25-45.

Barendregt, J. J., L. Bonneux and P. J. Van der Maas. "DALYs: The Age-weights on Balance." *Bulletin of the World Health Organization* 74(4): 1996, 439-443.

Barendregt, Jan J., Luc Bonneux, and Paul J.Van der Maas. "Health Expectancy: an Indicator for Change?." *Journal of Epidemiology and Community Health* 48: 1994, 482-487.

Barr, Donald A. and Mark G. Field. "The Current State of Health Care in the Former Soviet Union: Implications for Health Care Policy and Reform." *American Journal of Public Health* 86(3): March 1996, 307-12.

Bloom, Barry R. and Christopher J. L. Murray. "Tuberculosis: Commentary on a Reemergent Killer." *Science* 257: August 21, 1992, 1055-1064.

Branch, Laurence G., Jack M. Guralnik, Daniel J. Foley, Frank J. Kohout, Terrie T. Wetle, Adrian Ostfeld and Sidney Katz. "Active Life Expectancy for 10,000 Caucasian Men and Women in Three Communities." *Journal of Gerontology: MEDICAL SCIENCES* 46(4): 1991, M145-50.

Cassileth, Barrie R., Vasily V. Vlassov and Christopher C. Chapman. "Health Care, Medical Practices, and Medical Ethics in Russia Today." *JAMA* 273(20): May 24/31, 1995, 1569-1573.

Charman, Tony and Irina Pervova. "Self-Reported Depressed Mood in Russian and UK Schoolchildren: A Research Note." *Journal of Child Psychology* 37(7): 1996, 879-883.

Chen, Lincoln C., Allan G. Hill, Christopher J. L. Murray, and Michel Garenne. "A Critical Analysis of the Design, Results and Implications of the Mortality and Use of Health Services Surveys." *International Journal of Epidemiology* 22(5, Supplement 1): 1993, S73-80.

Chen, Lincoln, Friederike Wittgenstein and Elizabeth McKeon. "The Upsurge of Mortality in Russia: Causes and Policy Implications." *Population and Development Review* 22(3): September 1996, 517-530.

Crimmins, Eileen M., Mark D. Hayward, Yashiko Saito. "Changing Mortality and Morbidity Rates and the Health Status and Life Expectancy of the Older Population." *Demography* 31(1): February 1994, 159-175.

Crimmis Eileen M., Mark D. Hayward and Yasuhiko Saito. "Differentials in Active Life Expectancy in the Older Population of the United States." *Journal of Gerontology: SOCIAL SCIENCES* 51B(3): 1996, S111-S120.

Davis, Clarence E., Alexander D. Deev, Dmitiri B. Shestov, Natalia V. Perova, and Herman A. Tyler. "Correlates of Mortality in Russian and US Women." *American Journal of Epidemiology* 139(4): 1994, 369-379.

"Demographic Disaster: Death/Birth Gap Widens." *The Current Digest* 46(28): 1994, 8-11.

"Diphtheria Acquired by U.S. Citizens in the Russian Federation and Ukraine – 1994." *Morbidity and Mortality Weekly Report* 44(12), 237-245.

"Diphtheria Epidemic—New Independent States of the Former Soviet Union, 1990-1994." *JAMA* 273(16): April 26, 1995, 1250-1252.

"Diphtheria Epidemic—New Independent States of the Former Soviet Union, 1990-1994." *Morbidity and Mortality Weekly Report* 44(10): March 17, 1995, 177-181.

"Diphtheria in Russia a Reminder of Risk." *JAMA* 273(16): April 26, 1995, 11245.

Ducleep, Harriet Orcutt,."Mortality and Income Inequality Among Economically Developed Countries." *Social Security Bulletin* 58(2): Summer 1995, 34-50.

"East Meets West to Cure Russia's Ills." *JAMA* 277(8): February 26, 1997, 613-4.

Ellman, Michael. "The Increase in Death and disease under 'Katastroika'." *Cambridge Journal of Economics* 18: 1994, 329-355.

Evans, J. Grimley. "Hypothesis: Healthy Active Life Expectancy (HALE) as an Index of Effectiveness of Health and Social Services for Elderly People." *Age and Ageing* 22: 1993, 297-301.

Feshbach, Murray. "The Diphtheria Zone." *The Atlantic Monthly* 46(2): 1995, 87.

Fleming, P.M., A. Meyroyan and I. Klimova. "Alcohol Treatment Services in Russia: A Worsening Crisis." *Alcohol & Alcoholism* 29(4): 1994, 357-362.

Guralnik, Jack M., Kenneth C. land, Dan Blazer, Gerda G. Fillenbaum and Laurence G. Branch. "Educational Status and Active Life Expectancy Among Older Blacks and Whites." *The New England Journal of Medicine* 329(2): July 8, 1993, 110-116.

Harris, Tamar, Mary Grace Kovar, Richard Suzman, Joel C. Kleinman and Jacob J. Feldman. "Longitudinal Study of Physical Ability in the Oldest-Old." *AJPH* 79(6): June 1989, 698-702.

"Health Care: Mandatory Insurance Isn't Working." *The Current Digest* 46(38): 1994, 7-8.

Heleniak, Timothy. "Economic Transition and Demographic Change in Russia." 1989-1995," *Post-Soviet Geography* 36(7): 1995, 446-458.

Hurt, Richard D. "Smoking in Russia: What do Stalin and Western Tobacco Companies Have in Common?." *Mayo Clinical Proceedings* 70: October 1995, 1007-1011.

Jow-Ching Tu, Edward and Kuanjeng Chen. "Changes in Active Life Expectancy in Taiwan: Compression or Expansion." *Social Science Medicine* 39(12), 1657-1665.

Juster, F. Thomas and Richard Suzman. "An Overview of the Health and Retirement Study." *The Journal of Human Resources* 30(Supplement): 1995, S7-S56.

Korolenko, Caesar, Vladimir Minevich, and Bernard Segal. "The Politicization of Alcohol in the USSR and its Impact on the Study and Treatment of Alcoholism." *The International Journal of the Addictions* 29(10): 1994, 1269-1285.

Kumar, Gopalakrishna B. "Low Mortality and High Morbidity in Kerala Reconsidered." *Population and Development Review* 19(1): March 1993, 103-121.

Land, Kenneth C., Jack M. Guralnik, Dan G. Blazer. "Estimating Increment-Decrement Life Tables with Multiple Covariates from Panel Data: The Case of Active Life Expectancy." *Demography* 31(2): May 1994, 297-319.

Manton Kenneth G. and Eric Stallard. "Cross-sectional Estimates of Active Life Expectancy for the U.S. Elderly and Oldest-Old Populations." *Journal of Gerontology: SOCIAL SCIENCES* 46(3): S170-182.

Manton, Kenneth and Eric Stallard. "Longevity in the United States: Age and Sex-specific Evidence on Life Span Limits from Mortality Patterns, 1960-1990." *Journal of Gerontology: BIOLOGICAL SCIENCES* 51A(5): 1996, B362-B375.

Manton, Kenneth G. "Forecasting Health: Data Needs and Implications for Model Structure." *World Health Statistics Quarterly* 45(1992), 80-88.

Manton, Kenneth G., Eric Stallard, and Korbin Liu. "Forecasts of Active Life Expectancy: Policy and Fiscal Implications." *The Journals of Gerontology* 48(Special Issue): 1993, 11-26.

Maurice, John. "Russian Chaos Breeds Diphtheria Outbreak." *Science* 267: March 10, 1995, 1416-7.

Meselson, Matthew, Jeanne Guillemin, Martin Hugh-Jones, Alexander Langmuir, Ilona Popova, Alexis Shelokov and Olga Yampolskaya. "The Sverdlovsk Anthrax Outbreak of 1979." *Science* 266: November, 18 1994, 1202-8.

Monton, Kenneth G., and James W. Vaupel. "Survival After the Age of 80 in the United States, Sweden, France, England and Japan." *The New England Journal of Medicine* (Special Report) 333(18): November 2, 1995, 1232-1235.

Moscow's Pollution Crisis Is Getting Worse." *The Current Digest* 45(34): 1993, 15-16.

Murray, C. J. L. and A. D. Lopez. "Global and Regional Cause-of-Death Patterns in 1990." *Bulletin of World Health Organization* 72(3): 1994, 447-480.

Murray, C. J. L. and A. D. Lopez. "Quantifying Disability: Data, Methods and Results." *Bulletin of World Health Organization* 72(3): 1994, 481-494.

Murray, C. J. L. "Quantifying the Burden of Disease: The Technical Basis of Disability-Adjusted Life Years." *Bulletin of World Health Organization* 72(3): 1994, 429-445.

Murray, C. J. L. and A. D. Lopez, ed. *The Global Burden of Disease*. Cambridge, MA: Harvard University Press, 1997.

Idem. *Global Health Statistics*. Cambridge, MA: Harvard University Press, 1997.

Murray, C. J. L., A. D. Lopez and D. T. Jamison. "The Global Burden of Disease in 1990: Summary Results, Sensitivity Analysis and Future Directions." *Bulletin of World Health Organization* 72(3): 1994, 495-509.

Murray, C. J. L., J. Kreuser and W. Whang. "Cost-effectiveness Analysis and Policy Choices: Investing in Health Systems." *Bulletin of World Health Organization* 72(4): 1994, 663-674.

Murray, Christopher J.L. and Alan D. Lopez. "Evidence-Based Health Policy—Lessons from the Global Burden of Disease Study." *Science* 274: November 1, 1996, 740-743.

Mutafova, Margreta, Harry P. A. Van de Water, Rom J. M. Perenboom, Hendriek C. Boshuizen and Christo Maleshkov. "Occupational Handicap-free Life Expectancy in Bulgaria 1976-1992 on the Data of the Medical Expert Commissions." *Social Science Medicine* 43(4): 1996, 537-542.

Nusselder, Wilma J., Koos Van der Velden, Jan L. A. Sonsbeek, Maria E. Lenior, and Geertrudis A. M. Van den Bos. "The Elimination of Selected Chronic Disease in a Population: The Compression and Expansion of Morbidity." *American Journal of Public Health* 86(2): 1996, 187-194.

Olshansky, S. Jay. "Mortality Crossovers and Selective Survival in Human and Nonhuman Populations." *The Gerontologist* 35(5): 1995, 583-587.

Partanen, Juha. "Failures in Alcohol Policy: Lesson from Russia, Kenya, Truk and History." *Addiction* 88(Supplement): 1993, 129S-134S.

Popkin, Barry M., Marie K. Richards and Carlos A. Montiero. "Stunting is Associated with Overweight Children of Four Nations That are Undergoing the Nutrition Transition." *The Journal of Nutrition* 126(12): December 1996, 3009-3016.

Popkin, Barry M., Namvar Zohoori, Alexander Baturin. "The Nutritional Status of the Elderly in Russia, 1992 through 1994." *American Journal of Public Health* 86(3): March 1996, 355-360.

Posner, Barbara Millen, Mary Franz, Paula Quatromoni and the INTERHEALTH Steering Committee. "Nutrition and the Global Risk for Chronic Disease: The INTERHEALTH Nutrition Initiative." *Nutrition Review* 52(6): June 1994, 201-207.

"Public Health Assessment—Russian Federation." *JAMA* 267(10): March 11, 1992, 1323-4.

Raviglione, M.C., H. L. Riedel, K. Styblo, A. G. Khomenko, K. Esteves and A. Kochi. "Tuberculosis Trends in Eastern Europe and the Former USSR." *Tubercle and Lung Disease* 75(6): December 1994, 399-468.

Reseau Esperance de vie Ensante (REVES): J. M. Robine et al, *Global Assessment in Positive Health* (Montpellier:REVES, 1995).

Rennert, Gad. "Implications of Russian Immigration on Mortality Patterns in Israel." *International Journal of Epidemiology* 23(4), 751-56.

"Rich-Poor Income Gap Widens Dramatically." *The Current Digest* 46(3): 1994, 13-14.

Riba, Tomas J.F. "Missing: Mortality in the Transformation of Former Socialist Countries." *International Journal of Social Economics* 21(10/11/12): 1994, 10-31.

Riley, James C. "The Risk of Being Sick: Morbidity Trends in Four Countries." *Population and Development Review* 16(3): September 1990, 403-432.

Riley, James. "The Prevalence of Chronic Disease during Mortality Increase: Hungary in the 1980s." *Population Studies* 45: 1991, 489-496.

"Rise in Drinking Shortens Life Expectancy." *The Current Digest* 46(29): 1994, 13.

Ritchie, Karen, Jean-Marie Robine, Luc Letenneur and Jean-Francois Dartigues. "Dementia-Free Life Expectancy in France." *American Journal of Public Health* 84(20): February 1994, 232-236.

Rogers, Richard G. "Sociodemographic Characteristics of Long-lived and Healthy Individuals." *Population and Development Review* 21(1): March 1995, 33-58.

Rogot, Eugene, Paul D. Sorlie and Norman J. Johnson. "Life Expectancy by Employment Status, Income, and Education in the National Longitudinal Mortality Study." *Public Health Reports* 107(4): July-August 1992, 457-461.

Rush, David and Kathleen Welch. "The First Year Hyperinflation in the Former Soviet Union: Nutritional Deprivation among Elderly Pensioners, 1992." *American Journal of Public Health* 86(3): March 1996, 361-367.

"Russia's Demographic Crisis: A Long-range View." *The Current Digest* 48(13): 1996, 11-20.

Ryan, Michael. "Alcoholism and Rising Mortality in the Russian Federation." *The British Medical Journal* 310: 1995, 646-8.

Ryan, Michael. "Russian Report: Priorities for the New Health Minister." *British Journal of Medicine* 304: 1992, 563-5.

Schroll, Maranne. "Does Increased Life Expectancy Imply Active Life Expectancy." *Danish Medical Bulletin* 39(37): 1992.

Sherman, Igor. "Forming the System of Health Insurance in the Russian Federation." *Social Science Medicine* 39(10): 1994, 1425-1432.

"The Daunting Alcohol Problem is Getting Worse." *The Current Digest* 47(49): 1995, 12-14.

"The High Price of Freedom." *Science* 267: January 13.

"The Human Costs of Obstetric Malpractice." *The Current Digest* 49(3): 1997, 12-13.

Trovato, Frank and N. M. Lalu. "Narrowing Sex Differentials in Life Expectancy in the Industrialized World: Early 1970s to Early 1990s." *Social Biology* 43(1-2), 20-37.

Tulchinksy, Theodore H. and Elena A. Varavikova. "Addressing the Epidemiologic Transition in the Former Soviet Union: Strategies for Health System and Public Health Reform in Russia." *American Journal of Public Health* 86(3): March 1996, 313-20.

"Update: Diphtheria Epidemic—New Independent States of the Former Soviet Union, January 1995-March 1996." *Morbidity and Morality Weekly Report* 45(32): August 16, 1996, 693-7.

"Vital and Health Statistics: Russian Federation and United States, Selected Years 1980-1993." *International Vital and Health Statistics Reports*, Series 5, No. 9: June 1995, 1-28.

Weiss, Kenneth M. "The Biodemography of Variation in Human Frailty." *Demography* 27(2): May 1990, 185-206.

Westoff, Wayne W., Klaus Klein, Robert J. McDermott, Wolf-Dieter Schmidt and Derek R. Holcomb. "Sexual Risk-Taking by Muscovite Youth Attending School." *Journal of School Health* 66(3): March 1996, 102-105.

Wyon, John B. "Comment: Deteriorating Health in Russia—A Place for Community-Based Approaches." *American Journal of Public Health* 86(3): March 1996, 321-323.

Zhuravlev, Sergie M., Pavel E. Novikov and Costas A. Theodoridis. "Mortality Caused by Polytrauma." *Clinical Orthopaedics and Related Research* 320: November 1995, 43-5.

APPENDIX III

REAPING THE WHIRLWIND: CHILD HEALTH IN RUSSIA AND ITS FUTURE

Prepared By:
Murray Feshbach, Ph.D.
Georgetown University
July 1998

Prepared For:
Hicks & Associates Inc.
Science Applications International Corporation

A. Introduction

After several years of research by Russian and world authorities, there is enough evidence to conclude that Russia is currently facing a grave health crisis among its newborn children and its childbearing population. More and more children are being born with a variety of birth defects and other health disorders that will impair their ability to become healthy, productive members of Russian society. The primary cause of this increase in unhealthy births is the alarming amount of environmental degradation occurring in Russia. The ill effects of pollution are exacerbated by the Russian medical establishment's increasingly reduced ability to carry out certain basic health practices, especially infant inoculations. The consequences for Russian society in general and, by extension, its military power, could be severe.

Given current conditions, it is not unusual to hear statements from such authorities as Deputy Minister of Health Nikolay Vaganov on the acute nature of Russia's health crisis. In 1994, he observed that "For the first time in its centuries old history, there is a danger of the nation's physical degeneration, of irreparable damage to its genetic fund." Apocalyptic statements are not hard to find. Witness the statement of a geneticist, Dr. Yevgeny Lilyin, who heads the Center for Rehabilitation of Congenital Pathology in Russia. He stipulates the "If it goes on like this, we will lose our children."

Regardless of the exaggeration in the negative status of some young persons, some of this deterioration is reflected in the declining quality of potential draftees 18 years later. For new reasons (especially drugs and STDs) and old reasons (childhood stress leading to psychoses) more and more of these potential draftees are rejected from active duty service. Again the extent of the change in both old and new reasons, combined with unexpected deterioration of the child population changes the long-term situation dramatically.

B. Causes of the Problem

The official *Gosdoklad* (State Report on Health) in recent years has included a number of statements directly addressing the issue of the health of Russian children and newborns. The latest *Doklad* for the year 1996 provides data showing a two to three times differential in sickness for the children born in industrial regions compared with a non-industrialized rural control group. "Congenital defects among children born in chemical, petrochemical and heavy industrial centers range from 108-152 for every 10,000 births, while in rural areas the rate is 39-54." Russia's Chief Pediatrician of the Country, Dr. A. A. Baranov and, his colleague, Dr. L. A. Shcheplyagina, reveal the link between environmental pollution and health problems in a 1998 book. While noting the difficulty in establishing "connections between concrete ecological toxins and resulting diseases," they note that the "parallels between environmental pollution and digression of the condition of child health...[lead to] rising rates of allergies, infectious diseases, bronchial pathologies, disruptions in mental and physiological development, congenital developmental defects (*vrozhdennye poroki razvitiya*) and

malignant cancers."

Following up on the negative impact of pollution and children's health, then Minister of Environment Viktor Ivanovich Danilov-Danilyan and his co-editor V. N. Kotlyakov, wrote that "In the past 25 years there has been an increase in the number of congenital deformities. Because of the poor health of pregnant women, more than 10 percent of children every year are born prematurely in the seventh to eighth month with malformations of the central nervous system and weakened defenses." Poor health of newborns is linked to the poor condition of pregnant women in numerous ways. The State Report on Child Health in 1996, lists information on such illnesses of young females and women. A sampling of its observations includes such alarming figures as: "gynecological disease among teen age girls has grown by 3 times since 1991," "13 percent of women were sick with endometriosis" "seven percent had developmental diseases of their reproductive organs," and "six percent had complicated pregnancies, deliveries and [difficulties in] the postpartum period." How bad is it? We cannot tell yet but because of data inadequacies we know that the 6 percent is an imperfectly derived figure given poor diagnostics and erroneous medical treatment. Danilov-Danilyan and Kotlyakov also note that "The total number of genetically maimed persons is carefully hidden, and only severely disabled persons were officially registered as having birth disabilities...." There is some indication that some of this is hyper-diagnosis, or excess designation of certain categories of birth anomalies. Once a child is categorized as oligophrenic or mentally retarded, it is almost impossible to have it withdrawn from this category and treated as having a learning disability.

Perhaps the best summary of the situation is provided by Yuri Komarov, head of the Public Health Research Institute of the Ministry of Health and a member of the Gore-Chernomyrdin (now Kiriyenko) Commission on Health. He writes that: "Official statistics show only one-quarter of children are born unhealthy. However, it appears that the opposite is true--only one-fourth are born healthy." If accurate, this statement is alarming indeed! It should be noted, however, that Russian official data for the number and rates of healthy newborns is given only for those weighing 1000 grams or more. This is one possible source for figures cited by some authorities that show a higher share of healthy children. Elsewhere, Komarov indicates that many newborn children are not only unhealthy but also weak in terms of their endocrine system and their ability to fight off disease.

The facts seem to underscore the current and growing problem for children in Russia and therefore for Russian society in all its aspects--economic, social, military, etc. Economic problems in the Federation no longer even allow the production of iodized salt, a key element in preventing mental retardation. Hypothyroidism, if not detected within a few months of birth, to allow treatment with thyroid hormones, can lead to mental retardation. This lack of natural or artificially added iodine in salt or other foods throughout the country (not just in the Chernobyl impact area, which has experienced serious increases in thyroid cancer) is the key to many other children's health issues. Yet another problem is the spread of iron deficiency anemia among pregnant women, which also impacts on the health of the fetus. The lack of vital micronutrients such as Vitamin A, Vitamin D, folate acid, and others, has even come to alarm the Gore-Chernomyrdin Commission, which in turn

has begun to give this issue higher priority.

Given the firing of the Russian Minister of Health, the replacement of Prime Minister Chernomyrdin by Kiriyenko (who is now concerned primarily with economic issues in his country), and the reduction in funds for USAID projects dealing with health issues in the Former Soviet Union, it is unclear just how these problems can be properly addressed and remedied. Availability of fungible assets for health issues is limited; the private assistance of George Soros has helped to overcome this deficit, but even his organization has had trouble in overcoming Russian reality. Alex Goldfarb, head of the Soros office in Moscow, had to convince Russian Ministry of Health to dismiss Andrey Primyak, Russia's chief tuberculosis specialist. Primyak wanted to continue Russia's outdated method of long-stay hospital procedures for tuberculosis treatment and not apply the WHO's approach of Directly Observed Treatment (DOTs) for non-hospitalized tuberculosis patients. This is but one example of how much of the Russian medical establishment, with certain exceptions, is still far behind the developed world in approaches to treatment, medication, and equipment.

The Russian government is seeking to avoid confronting yet another health problem: the potential impact of the release of some 400,000 prisoners, many of whom have tuberculosis (TB). The savings to the Ministry of Interior from not having to treat tuberculosis among "their" prisoners are now to be transferred to the Ministry of Health's budget line. Unfortunately, the Ministry of Health's budget remains inadequate for this task. Each TB infected prisoner released will become a threat to his or her new community.

At this point, it would be useful to examine some additional public health concerns medical problems that are not usually viewed in terms of their larger impact on Russia's society, economy, and military establishment.

Sexually Transmitted Diseases (STD)

Syphilis and other sexually transmitted diseases are a growing concern in Russia. Dr. Loseva, head of Syphilis Research in the Central Dermatological-Venereal Institute of the Ministry of Health, has been monitoring the increased rate of syphilis incidence in Russia, especially among children--the potential progenitors of the next generation. She believed that the official number of new cases last year – 450,000 – was greatly understated. (To put this in perspective, the United States recorded some 8,000 cases (50 times fewer than the official figure for Russia) in a population of 269 million. The Russian population is 147 million or 45 percent smaller than that of the United States; thus, the comparative rates per 100,000 people are even more disparate.) The figures for gonorrhea, genital herpes and chlamydia also are also similarly underestimated.

The rate of increase of STDs in Russia is not so much the issue as is the impact such diseases have on mothers and their children. Reproductive health of females has been impaired by illness, by growth of hard drug abuse, by sexual promiscuity, and by the very high incidence of serious illness among pregnant women. All of these cannot but have a deleterious effect on mothers and their

fetuses and newborns. Some 75 percent of all pregnant women in Russia experience serious illnesses (eclampsia, preeclampsia, anemia, sepsis and others) during their pregnancies. Moreover, new data on the growth of gynecological illness among women and young females is striking and may well be linked to the increased rate of STDs. For example, syphilis among females aged 0 to 4 years has grown dramatically since 1992, according to Goskomstat and Loseva's more recent data. Between 1992 and 1997, the number of cases (including the relatively small number of congenital syphilis) grew from 123 cases to 3,387 cases, an increase of 27.5 times. The long-term effects on childbirth of infections among such a young population remain to be seen, but the explosion of syphilis cases among 15-17 year olds and older will have an immediate effect. In 1994, the ratio of new cases of syphilis among 15-17 year-old females was almost 66 times greater than among 0-14 year-olds (per 100,000 population), and syphilis incidence among 18-19 year-olds is more than twice as high among 15-17 year-olds. There is a high probability of reproductive health problems and/or sterility in these young women and their newborns.

The medical consequences of each STD mentioned above are severe. Syphilis, when left untreated can lead to permanent malformations in the newborn child, as well as blindness, heart disease and brain damage in the mother. Gonorrhea can lead to pelvic inflammatory disease, which can in turn cause sterility, ectopic pregnancies and serious infections of the womb. Chlamydia, largely asymptomatic or manifest only at a late stage, often spreads to the uterus and fallopian tubes producing infertility. Finally, genital herpes, among other STDs, can lead to serious brain damage as well as mental retardation, cerebral palsy, seizures, blindness or deafness. This list leaves out HIV/AIDS, but the recent explosion of HIV (and then AIDS) in Russia, Ukraine and other Former Soviet Union (FSU) countries, will cause further deterioration in the health of newborn children.

Reports that 15 percent of the population is sterile (males and females) is not surprising from the background data now available. *Agence France Presse*, in a June 17, 1998 report, indicates that infertility affects 20 percent of Russian couples. ITAR-TASS, of the same date, reports 20 percent infertility among Ukrainian couples as well. In a *Moscow Times* interview, Dr. Tatyana Ovsyannikova, Director of the Infertility Clinic of the Center for Obstetrics and Gynecology in Moscow, calculates that the Russian infertility rates are five times the world average. Irina Leonova, Director of Family Planning and Reproduction Center No. 3, notes in the same article that STDs and abortions are the two main causes of infertility.

Micronutrients

The subject of micronutrients is new, but is one that has recently been raised due to recent increases in mental retardation in some areas of Russia. UNICEF's annual report on world nutrition discussed the horrific impact deficiencies in Iodine, Iron, Vitamin A, and Vitamin D are having on the health of the Former Soviet Union. UNICEF cites a study which links a widespread iodine deficiency "recently detected," to the lowering of IQ in Georgia by 500,000 points in the 50,000 babies born in 1996. The UNICEF report notes that such deficiencies wreak "havoc on the human body:"

> "**Iodine deficiency** can damage intellectual capacity; anemia is a factor in the

> pregnancy and childbirth complications that kill 585,000 women annually [throughout the world]; folate deficiency in expectant mothers can cause birth defects in infants, such as spina bifida; and vitamin D deficiency can lead to poor bone formation, including rickets." ...."Vitamin A deficiency was long known to cause blindness. But it has become increasingly clear that even mild vitamin A deficiency also impairs the immune system....new findings strongly suggest that vitamin A deficiency is a cause of maternal mortality as well, especially among women in impoverished regions."

Numerous reports on malnutrition throughout Russia note that it is contributing to many potential negative health sequelae among all but the most privileged segments of the population. Another approach to addressing malnutrition imbalances is to look at vitamin and other nutrient shortages. The *Gosdoklad* on *sanitarno-epidemiologicheksoy situatsii* in Russia in 1994, directly addresses this issue. According to this *State Report*, children manifest a 25 percent protein deficiency, a 20-30 percent deficiency of group B vitamins, a 30 percent deficiency of Vitamin A, and a 30-40 percent shortage of calcium. If so, the citation from UNICEF, rings particularly true for Russia.

The health effects of micronutrient deficiencies can be severe. Vitamin A deficiency has been linked to problems in the immune system, while deficiency in vitamin B complex, depending on the specific adequacy or shortage, has been known to impair brain functioning and cause convulsions, anemia, some psychiatric disorders, poor vision, and other conditions. Protein shortages could lead to energy loss and starvation. Lack of calcium ingestion can impair bone formation, blood clotting, and normal heart function. The health damage from malnutrition and anemia, as well as the deleterious effects of vitamin deficiencies seem to have been ignored by American doctors unable to appreciate the magnitude of the problem in Russia be so conducive to such and such illnesses. In Central Asia and Kazakhstan, 60 percent of pregnant women and children are anemic. But many American physicians do not understand the depth of the Russian health crisis, and miss the importance of even such evidence, let alone the medical implications of such high levels and rates of growth of anemia among Russian women.

UNICEF, in summary, states that malnourished children face lifetime disabilities, weakened immune systems, and a reduced capacity for learning. In young children, it impairs mental and cognitive development, while malnutrition among pregnant women can produce varying degrees of mental retardation in their unborn. Iron deficiency anemia can cause psychomotor developmental problems and impair cognitive development, lowering IQ by about 9 points. The average IQs of low-birth weight children is five points below that of healthy children. The link to child health is found in the 1998 UNICEF report *The State of the World's Children*, where it is clearly noted that the proportion of children ages 6 to 11 (in particular) "is an indicator of iodine deficiency, which causes brain damage and mental retardation."

A map showing iodine deficiency across space and degree would be very useful to determine the number and perhaps quality of children in combination with population size and degree of

deficiency, which according to Shcheplyagina's research, has important effects on the degree of illness. More important, of course, would be restoration or construction of a factory that produces iodized salt. A report from the Far Eastern region of Russia indicates that in 1990, the plan for iodized salt production was cut to slightly over 50 percent of the demand, leading to an "epidemic breeding ground" in the region. Given economic constraints, the problem may remain for some time.

Nonetheless, the UNDP reports in its *Habitat and the Human Environment* report for 1996, that the Ukraine, at least, hopes to eliminate Iodine Deficiency Disorders in the country by the year 2000. The Ukraine is particularly sensitive to the issue of iodine deficiency in the post-Chernobyl period because of the magnified effects of ionizing radiation on an already deficient thyroid, but even this may not be enough without outside funding. The 1996 Russian *Gosdoklad* on Health specifically blames the reduction in production in the country as well as the reduction in imports from Eastern Europe as the cause of unavailability of iodized salt in the country. The interview with Baranov, as published in *Nezavisimaya gazeta* in March of this year, quoted him as saying that "measures [to correct the inadequate supply of iodized salt] have not been carried out for more than 10 years." In the past "no salt and baked goods were sold that had not been iodized. Now almost all of the plants that used to enrich salt with iodine either no longer exist or stand idle." In part this is due to the devolution of authority to the regions which has occurred. Many local authorities "simply deemed it unnecessary to continue the program."

The threat from such deficiencies remains serious. Speaking on the threat to national health, Baranov asserted that "the nation is undergoing both psychological and physical decline. The intellectual potential of our youngsters is failing. Today only about half of the younger generation in the Russian Federation meets the standard for mental development."

Iron-deficiency Anemia

The rate of iron-deficiency anemia among pregnant women in Russia increased threefold between 1990 (12.1 percent) and 1996 (35.8 percent), a mere five years. Between 1995 and 1996 alone, the increase was over 10 percentage points alone. This is likely due to malnutrition-based anemia. It can result from poor diet, from impaired iron absorption, from blood loss, and from repeated or multiple pregnancies. In Russia, the latter can be associated also with high rates of abortion and accompanying blood loss. But more likely, poor diet makes it more difficult for women to replace iron losses during pregnancy. Possible consequences of anemia during pregnancy include premature labor, the need for blood transfusion after delivery, and increased susceptibility to infection.

Infants invariably are anemic if born to anemic mothers, often having low birthweight, and nutritional deficiencies. Iron-deficient, anemic children under 2 years of age have coordination and balance problems, are withdrawn, and hesitate to interact with other children. This may hinder their ability to learn from and interact with their environment, and may, most importantly, lead to lower intellectual capability. With malnutrition still high among the one-third of the population below the poverty line, and anemia still increasing among pregnant women, it is likely that this type of anemia

will persist and continue to have a negative effect on children in the future. In truth, malnutrition may also exist among all school age children. Baranov, again, notes that school meals are almost nonexistent today. In the past, 75 percent of all children were provided meals at school, but currently only 25 percent do so, a situation that contributes to wasting and malnutrition.

Heavy Metals

Without question, lead pollution of the air, soil, and drinking water has had an impact on the health of the Russian population, particularly on children. Given smaller body sizes, and frequently impaired immune systems for the reasons discussed previously, exposure to lead at levels far above reasonable, let alone maximal permitted levels, has resulted in intellectual deficits of astonishing degree. In the city of Krasnoural'sk alone, Russian environmental authorities, working in collaboration with CDC, EPA and USAID, found a staggering 76.5 percent of children under age 15 to be mentally retarded. Krasnoural'sk's factories produce lead car batteries. Industrial enterprises in many towns emit lead into the air, which then settles into the soil and is introduced to the food chain.

Yet this extraordinary level of mental retardation in Krasnoural'sk is not surprising given the official report that lead content in the blood of children in this city is 13.1 +/- 0.5 mcg/dg. The international maximum level at which health begins to be affected is 8-9 mcg/dg. Long after the developed world has outlawed such production processes, the countries of the FSU, none of which can afford to change such methods on its own, continue such lead-emitting production processes, and the population continues to suffer. Research into the lead content of food in Belovo in Kemerovo Oblast, finds that 70-90 percent of the potatoes and vegetables in the sample had lead above the official maximum allowable level of 9.9 +/- 0.5 mcg/dg. Most illnesses among newborns in Belovo were diseases of the nervous system, primarily encephalopathy and convulsive syndrome.

It is not only the metallurgical industries which are responsible for lead pollution, but also many others, including the defense industries, which had no environmental restrictions on their production emissions, the hunters using lead jacketed bullets, and many others. In all, some 14,000 tons of lead were emitted into the atmosphere or found in the waters of Russia in 1995. Lead in the urine, hair, and teeth of children was excessive throughout the country. Mental retardation from this cause alone adds to the burden on the population. Efforts specifically designed to reduce lead content, such as plastics substitution, have been initiated, which in combination with drops in overall lead production, and some conversion to unleaded gasoline, have reduced the amount of lead emitted into the air. But there is still a long way to go.

Well-known excesses, as well in the dumping of mercury, cadmium, and other toxic heavy metals, has only added to the list of sources of learning disabilities and other illnesses among children who are more susceptible to such materials than adults. Again these exposures add to the burden of children already affected by such nutritional deficiencies as iodine, iron, vitamin B-complex, magnesium, and/or zinc.

Rubella

Lack of rubella shots among mothers of infants who contract German measles (rubella) in the first trimester of their pregnancy is a major contributor to birth defects. Since rubella is easily preventable by immunization, it is perhaps surprising to Westerners that rubella shots are not given to infants at the proper time. If 50 to 80 percent (depending on which medical source is used) of children born to women who contract German measles in the first trimester of their pregnancy have birth defects then this is a serious matter. CDC recorded about 250 cases of rubella in the United States in 1996; *Goscanepidnazdzor* recorded 170,000 cases in Russia in 1996. The potential for a large number of birth defects in Russia is manifest. So far an MMR (Mumps, Measles and Rubella) vaccine is not available because Russian authorities do not want to use hard currency to purchase the vaccine from Merck, the principal producer of this vaccine. Until it is required to give a rubella shot in Russia, then the number of birth defects from this source will continue.

Pesticides

In the past, spraying of pesticides such as Butifos on children while they were gathering the cotton crop in Uzbekistan reportedly led to serious medical problems. DDT, which was banned in all countries by 1972, is still found throughout the agricultural regions of Russia. A 1995 survey of soils by agricultural region found the presence of DDT in the soils varying from 8 to 20 percent in the spring, summer (peak) and fall periods. Illness among children may be related to the illegal continued use of this material. Aleksey Yablokov, the former environmental and health advisor to President Yeltsin, is currently updating and expanding his previous book on the topic. It is likely that his research will provide new insights into the use and health effects of pesticides in the country.

Stunting and Wasting

New information published in the various annual State Reports on health in Russia shows that both stunting (based on height for age) and wasting (based on weight for age) have increased dramatically since 1985. Simultaneously, the percentage of underweight children has increased from 8.8 to 14.2 percent. The official health report states that this "demonstrates the serious breakdown in the physical status of children." For Russia, the prevalence of stunting among children less than two years old (those more than two standard deviations below the average height for age) increased from nine percent in 1992 to 15 percent in 1994. Again, Chief Pediatrician Baranov, who is also the head of the International Foundation for Mother and Child Health, has written that this pattern is in large part due to malnutrition throughout the country. It is not only height or weight by age that should be looked at, but also smaller chest measurements (by 5 to 6 cm), and reduced arm strength (5 to 6 kg. in dynamometric measurement).

C. Conclusions

It is impossible to estimate the full magnitude of the problem, but as the number of births continues to decline, and the share of congenital health problems continues to increase, Russia will have to

bear the cost of supporting a larger number of citizens with defects, disabilities, and deterrents to their full participation in Russian civic and economic life. Is Russia's gene pool at risk? I believe so, as do a number of senior Russian medical personnel. But much remains to be investigated before solid conclusions can be drawn.

The cumulative effect of such health defects among the young population, must therefore reduce economic productivity, impair family formation, and lower the quality of military draftees. What will be the impact on new recruits in Russia's armed forces? In this case, reports indicate that fully one-third of draftee cohorts is rejected for medical reasons, and one-half of these for psychological reasons. Even allowing for fraudulent claims and bribes, this is a serious problem. The overall health of the population is important in any assessment of the future of the Russian state. Should this pattern continue for many years it could be considered an indication of the breakdown of Russia's society and economy.

Writing in *The Boston Globe* earlier this year, Dr. Benjamin Sachs, Chief of Obstetrics and Gynecology, described some of the inefficient medical practices still carried out in the FSU. He initially found an inordinate number of mothers who bled heavily during labor, and of children being born with brain damage. Local doctors blamed the war with Azerbaijan. He later concluded that the cause was Prostaglandin F, a drug administered to expectant mothers to speed up labor. He noted that use of this drug was discontinued by Western doctors many years ago. Sachs also found that when Ukrainian gynecologists found "redness in a woman's cervix," they diagnosed it as early cervical cancer without being absolutely sure. A pap test could easily tell for sure–if they were available and used properly. But they are not available to this day! Instead, Ukrainian doctors classify the condition as "erosion" and remove the cervix as a cure. Abandoned long ago by the developed world, this procedure is often unnecessary and can cause infertility according to Sachs. Fear of unwanted attention from the Kiev medical establishment resulting from a decrease in the rate of diagnosis of the most common gynecological illness, Sachs indicates, prejudices the doctors against honest diagnosis. Clearly, updating, improving, and providing appropriate testing materials would help dramatically.

An article in *Novyye Izvestiya* written by two investigative reporters who investigated Neuro-Psychological Residential Institution No. 5 in 1998, sheds some light on the plight of mentally retarded people in Russia. Institution Number 5 houses 810 mentally retarded inmates transferred at age 18 from childrens' homes and boarding schools for mentally retarded children. The issue is not only the "warehousing" these children and then adults, but also one of over- or hyper-diagnosis. After even a very brief examination, children diagnosed in the FSU to this day as weak or small minded, (i.e., oligophrenic), are considered incurable, and are not educated at an appropriate level. That is, they are treated as imbeciles or even idiots, and not as persons with learning disabilities to a greater or lesser degree. Rather than absolving all such incorrect diagnoses, however, the reporters cite psychologists who find that "one-third or even two-thirds of such children are within the average range of aptitudes. The research of David Hoffman of *The Washington Post*, indicates that only one-half of the children "incarcerated" are actually suffering from this disability.

Can any society bear all of these burdens? Can one already facing tremendous economic and political difficulties? There is no doubt a link between Russia's severe economic and political malaise and its dire health condition, but Russia now faces the scary prospect of falling deeper and deeper into a vicious circle in which a failed economy and corrupt government allows health problems to go unchecked which in turn contribute to Russia's poor economic situation. This vicious circle can be broken at the political, economic, or public health level, but to do so will require a tremendous effort, and one which will doubtless require aid from outside Russia. Will Russia make the necessary appeal? If it does, will foreign benefactors respond? Will it be too late? These questions have yet to be answered.

APPENDIX IV

DEMOGRAPHIC SHOCK AND ECONOMIC DEVELOPMENT: HISTORICAL PRECEDENTS FOR THE RUSSIAN DEMOGRAPHIC CRISIS

Prepared By:
William Young
Strategic Assessment Center
Science Applications International Corporation
May 1998

Prepared For:
Hicks & Associates Inc.
Science Applications International Corporation

A. Summary

Trends in Russian demographics indicate that the Russian Federation will experience negative population growth well into the next century. Negative population growth will led to policy challenges for the Russian government but such a pronounced demographic shock could seriously impair the long-term prospects for the country's economic recovery and eventual growth. This paper analyzes four periods of demographic shock experienced in the 20th Century – the Federal Republic of Germany and Japan from 1945 to 1955, the Republic of Korea from 1945 to 1975, and Spain from 1940 to 1975 – to discern the relationship between demographic shock and economic growth. Additionally, the study considered the possible public policy crises that followed instances of demographic shock and how those instances affected economic development of the countries examined.

Of the countries presented in this paper, the case of the Federal Republic of Germany (FRG) from 1945 to 1955 illustrated the immediate hazards posed by a demographic shock clearest of all. While the German population decreased as a result of the Second World War, a census of the population of the newly founded FRG taken in 1949 revealed a different kind of demographic shock. The population of the laender (federal states) that composed the FRG was higher than under any previous period of the German Reich. That, combined with the devastated state of West Germany in the immediate aftermath of war, produced considerable strain upon the United States Military Government (USMG), West German officials, and the process of reform and rehabilitation they had undertaken. The problems posed by the German demographic shock threatened national stability and the USMG's ability to implement reforms and restructure the economy. Meeting the increased requirements for food and health became the USMG's top priority and only after it did so did the USMG devote serious attention to agriculture, labor, currency, and economic reforms.

Japan's experience from 1945 to 1955 followed a similar course of the FRG's. The USMG in Japan had a similar experience concerning the need for food and health care after the occupation began in late August 1945. The demographic shock was not as pronounced as in the FRG, but population statistics quickly rebounded by 1950. The increase in the Japanese population strained the resources of the USMG and the Japanese authorities. The USMG placed a high emphasis on dealing with the problems of disease and famine in Japan as it had in Germany. The process of reforms in Japan was less momentous than those of the FRG. Agriculture and land reforms had some effect in Japan, but the country had long surpassed its peak of agricultural productivity and was a net importer of food before the war. Labor reform designed to dismantle the zaibatsu system from the ground up while the USMG pursued a policy of deregulation with limited effects. While reforms did lead to the successful creation of labor unions and achieved more parity in labor-management relations than had existed before, the USMG did not achieve its goal of complete deregulation of key industries. However, the USMG found the right blend of policies to address the demographic shock and pursue reforms so as to poise the Japanese economy for growth.

The ROK's case departs from the quick recoveries and rapid periods of growth experienced by the FRG and Japan. Like the FRG and Japan, South Korea experienced a period of economic and political transition under the guidance of the USMG. After that, however, comparisons between the three become few. South Korea was a colony of Japan for over thirty years during which time the Japanese oriented the Korean economy around agricultural production. The bulk of Korean production went to Japan. Under Japanese guidance, the Korean economy remained in a static state

concerning industrialization. The USMG departed from South Korea after elections occurred, as mandated by the United Nations. The South Korean government struggled with both public policy and financial crises from 1947 to 1950 and the outbreak of the Korean War.

The Korean War resulted in both a demographic shock and a financial crisis for South Korea. Population growth, already relatively slow, dropped to minuscule percentages during 1950 to 1953 while inflation skyrocketed as a result of the war economy. Only after the war's end did population growth slowly recover. Simultaneously, South Korea experienced the first stages of economic growth. Its export-led strategy gave rise to the architects of the plan who later dominated South Korean economic planning strategies in ensuing years. Led by its manufacturing sector, South Korea industrialized at a faster rate than Japan and Sweden did between the late 19th and early 20th centuries.

Spain emerged from its civil war in 1940 with marginal population growth rates. Under Franco's guidance in the 1940s, the Spanish economy stagnated. Industrial production shrunk to 1911 levels and the standard of living dropped to 19th century levels. Its fascist leanings led the United States to embargo Spain during the Second World War that earned the Soviet block's ire as well. The US' powerful position after the Second World War ensured that Western Europe would shun trade with Spain throughout the decade. The Cold War changed US opinion toward Spain, and in 1950 the United States signed a basing agreement with Spain that led to the lifting the embargo on Spain. Capital inflow gradually followed the influx of millions of dollars in construction in the 1950s. Franco tried to maintain the protectionist policies he had installed during Spain's period of autarky in the forties, but mounting pressure to deflate the Spanish currency led to a financial crisis at the end of the decade. The Spanish crisis prompted the World Bank and IBRD to devise a plan for recovery that tapped young economists and business in Spain to revise the economy toward competitiveness and efficiency. International attention compelled Franco to accept the advice of the young Spaniards and he instituted a policy of economic openness. Fueled by tourism and related industries, the Spanish economy grew annually between 1962 and 1975. Spain enjoyed the highest growth rates in Europe in that period. Capital inflow provided the necessary impetus for further industrialization and Spain became a more urban country in this period as well. Economic growth slowed in the mid-1970s, compounded by the population growth that has resumed the pre-civil war pace in the mid-1940s and 1950s. Population increases in the '40s and '50s meant larger workforces in the '70s and '80s. That further pressured the Spanish economy as it cooled off after thirteen years of rapid growth.

The relationship between demographics and economic growth as illustrated by these four cases suggests that demographics can influence economic growth directly and indirectly. The FRG from 1945 to 1955 demonstrated the direct causal links between demographics and economic growth. Unexpected population increases that occurred when the FRG formed, compared to previous pre-war population levels in those given regions, enhanced the dangers of food and health that threatened social and political leadership in the fragile post-war West German state. Demographics can influence economic growth at the end of a period of development, as illustrated by South Korea and Spain. As their periods of economic development progressed, their population statistics moved closer to their respective pre-war levels, and as growth peaked, population levels surpassed pre-war growth rates. As South Korea and Spain had long periods of economic growth, demographics affected their economies at a later stage of each country's economic development. The population increases that occurred annually during South Korea and Spain's economic growth came to affect

their labor forces when the once-rapid rates of growth had slowed down. This in part led to high rates of unemployment that became a significant problem for Spain and a lesser, yet still substantial consideration for South Korea as well.

Demographics affected economic growth and posed challenges to public policy that could alter the government's approach toward economic development. In each case, reforms had to precede economic development and demographic shifts and trends complicated the respective government's task, making it more difficult for the means meet the ends. Thus demographic considerations had a crucial role as governments focused their attention on economic growth. Governments would first need to reconcile their reforms to match the demographic trends and related social shifts in each respective country. Baby booms, urban/rural population density ratios, shifts in employment between sectors, life expectancy, dietary changes and daily caloric intake, all were aspects of elements or determinants of demographics. Each government needed to match its reform policies to match the direction of the economy as gauged by those and other indicators. From those reforms the government could then determine its course for economic development. The cases of the FRG and Japan contrast against those of South Korea and Spain concerning the need for thorough and wide-reaching reforms and the relationship of reforms to demographics. The FRG and Japan enacted thorough reform programs that completely reformed the economy and poised it for growth. South Korea and Spain pursued a program of partial reforms due to domestic political constraints, ingrained business culture, or lack of extensive external support throughout the reform process. The success of the reforms in the FRG and Japan may coincide with the fact that the demographic concerns of the two countries and occurred at the outset of their periods of growth, possibly making the process of linking reforms to demographic trends more linear. South Korea's and Spain's demographic crises occurred at the end of their respective periods of growth, since the long periods of growth and gradual population increases created employment problems as the pace of economic growth slowed.

Each case study also highlighted the needs for thorough reforms to prepare for economic growth as well as the importance of external assistance through a period of reforms. The process of economic reform in the FRG and Japan enabled both countries to reconcile their demographic trends with economic development whereas South Korea and Spain did not enact reforms initially and as a result the path to growth required more time than in the first two instances. In each case also the role of foreign assistance stands out as an indispensable proponent of growth, most notably the United States. The United States directly guided the FRG and Japan and to a degree South Korea as those countries initiated wholesale changes political and economic changes. The United States played a central role in Spain's revitalization as the reversal of US policy toward Franco's Spain fostered capital inflows to that country, including the funds received by the Spanish government for the construction of US bases that started the process. Spain's predicament in the late fifties and its solutions also highlights the role of international financial institutions and the types of assistance that they can render.

Aspects of these case studies concerning demographics and economic growth provide insight as to the interaction between demographic crises and policy. For Russia, these cases serve as signposts for policy so as to gauge the depth of the Russian crisis to other drastic periods of shock in the 20th century and the likelihood of recovery and eventual growth. Russia's downward projected demographic spiral does not indicate a parallel between it and the cases presented. Further comparison places the examples of the FRG and Japan as best-case scenarios whose pattern it

would be impossible for Russia to follow. Russia contrasted against South Korea and Spain draw more favorable comparisons, however. If Russia can manage economic growth, it will be a long process as it was in South Korea and Spain. If Russia remains on course it can achieve real economic growth by 2001. The achievement of such growth ten years after formation would parallel the long period required by South Korea and Spain after the foundations of their new governments and when economic growth occurred. For Spain, growth occurred approximately twenty years after Franco won the civil war and established a new state.

B. Federal Republic of Germany, 1945-1955

Historical Context

Germany's surrender on 8 May 1945 marked the division between its wartime hardships and the burden of reconstruction that followed. Germany faced partition that included the loss of territory and occupation by the four European allies, proposed war reparations, and the prospect of a very harsh peace settlement. The Soviets controlled the eastern half of the former German Reich, the British the north-west, the US the south-west, and the French occupied the territory between the British and American zones. As a result of the Yalta Conference, Germany ceded land on its eastern frontier to Poland. War reparations after the Second World War would not be as serious as those that followed the First for Germany. It would pay some remittances for war guilt and damage, but the terms of peace itself would have a substantial cost all their own to Germany.

While the United States did not prefer US Treasury Secretary Henry Morgenthau's plan for Germany, which called for the de-industrialization and subsequent pasturalization of Germany, the adopted occupation plan was not much better. It vaguely stated that Germany's standard of living was not to exceed that of any of its neighbors. American officials would oversee strict production and consumption levels that would have drastic socio-economic consequences as attempts to politically rehabilitate and economically reinvigorate Germany.

Germany's Demographic Shock and Its Implications for the Period 1945-1955

Occupation and partition of the former German Reich that began in the spring and summer of 1945, by the fall of that year governing authorities assessed the war damage in human and material terms. Germany suffered approximately six million war dead.[1] Deaths grouped by sex and age reflected the war's effects; female cohorts over the age of eighteen registered little change due to the war while the male cohort aged 18-45 dropped approximately 22 percent which resulted from wartime casualties.[2] However, German demographic indicators from this period do not register a negative shock. Unusually high fertility rates canceled the artificially high death rates that resulted from the war. Additionally, migration from the Soviet zones bolstered the population yearly during the period of 1945 to 1955.[3] This suggests that the FRG experienced a positive demographic shock in the immediately after the Second World War rather than a protracted period of negative population growth.

Germany's geo-political situation added another dimension that clouded the demographic picture. The 1950 census, the country's first one, reported population density in the FRG that year exceeded any previous period of German history. Loss of territory due to partition compounded the effects

that stemmed from sheer population growth and yearly influxes of refugees. Seven laender that had once composed half of the territory of the German Reich became swollen as the territory of a new country.[4]

Population growth coupled with territory loss had serious implications for Germany in the immediate post-war years. Physical damage equaled the human loss in relative terms but in some perhaps exceeded it in magnitude. Few major German cities, if any, escaped the Allied bombing campaign that raided Germany day and night during the last three years of the war. German industry lay in ruins and German agriculture was virtually nonexistent. Lack of local administration, dismantled as part of de-Nazification, aggravated the public services and health problems.[5]

Germany 1945-1955: Crises and Decisions

The presence of the United States Military Government (USMG) and its policies laid the foundation of the German economic miracle that shortly followed the Republic's inception in 1949. Under the guidance of General Lucius Clay, the USMG quickly addressed the problems posed by the demographic shock, increased population density, and destroyed public infrastructure. Solutions to these problems became precursors to economic growth for the FRG whose continued presence would have stalled or derailed the rapid pace of the FRG's economic growth.

Nutrition and public health were the first concerns of the USMG when it assumed authority in the late summer of 1945. Strict rationing orders from Washington in the summer of 1945 stated that attention should be paid to health and public welfare only so as to only "prevent *serious cases* of disease and famine" (italics added).[6] Low domestic food production and restricted food imports decreased the average daily caloric intake of the normal consumer (NC) to less than half of that of the US (2,200 in US to approx. 980-1100 in the FRG).[7] Food shortages seriously threatened social stability and hamstrung economic output. General Clay wrote in his memoirs after he assessed the situation in September 1945 that "there is no choice in becoming a communist on 1500 calories a day and a believer in democracy on 1000 a day".[8]

Public health was another primary concern for the USMG in the FRG. In Germany, water systems were among the first installations repaired by US forces. The army immediately established field hospitals for the local population and formed detachments that dispose of corpses and mass graves that threatened sanitation. Housing shortages, the influx of refugees, and damaged water supplies threatened public health. Increases of diphtheria, tuberculosis, and typhoid fever increased, but epidemics never formed, as the army took great precautions to quarantine new arrivals and separate the healthy from the sick. The army also conducted mass vaccinations and provided large quantities of health supplies to combat tuberculosis and venereal diseases, which emerged as the two largest health concerns after the war. By 1950, both had dropped to a level on par with that of France and the United Kingdom.[9]

Clay's early confrontation with "famine and disease" linked the repercussions of public policy crises to stability that influenced the prospects for future recovery and economic growth. That experience led the USMG to more broadly consider the wide-reaching effects of their proposed economic and social reforms. As the occupations progressed, there was a direct correlation between caloric intake, output, and the success of reforms. The economies of FRG/Japan grew as their populations neared normal consumer daily levels, and increase in food consumption coincided with thorough reforms in

agriculture, land, labor, and business. Agricultural and land reforms, previously marginally part of the USMG's plan, became focal points that would not only solve the food crisis but also act as an agent of change. Labor and other economic reforms became necessary catalysts for the revitalization of the German economy as the country moved from its standstill in 1945.

Agriculture reform was one of the first reform issues addressed by the USMG and later local German authorities. Poor crop rotation and soil in general and simple neglect during the war combined with a severely harsh winter caused agricultural production to bottom out in 1945-1946. Prohibited industrial production initially adopted by the USMG proved to be a short-sighted policy that further compounded the problem as it restricted the manufacture of nitrogen, which was primarily used during the war for munitions but was also a vital component in fertilizers. Also, industrial production had shifted away from consumer goods in the last years of the war and modern farm machinery was scarce. Additionally, without currency reform, there was little financial incentive for farmers to produce.

The USMG addressed these problems through a combination of macro and micro planning. It first delegated responsibility to local officials at lower levels and only supervised agriculture policy after 1946. The USMG created agro banks that assisted farmers in planning long-term strategies and provided loans and established an agricultural education system that proved to be extremely useful as farm production rebounded in the early 1950s. Finally, successful currency reform provided real incentive that stimulated farm production.

While agricultural reform had a larger effect in Germany, **land reform** nonetheless assisted the agricultural turnaround of the country and furthered the process of socio-economic change as well as influenced attempts at labor reforms. **Labor reform** proved a subject whose problems and prospects would have far-reaching effects. Occupational authorities viewed unions as vehicles that would help instill democracy in the previously authoritarian state as unions contributed to the formation of civil society and the decentralization of the economic structure.

Restructuring labor and land laws and getting agricultural production on track paved the way for **economic reform** in Germany. There were distinct goals to economic reform in both cases: 1) dismantling cartels in industry, banking, and insurance, 2) currency reforms, 3) managed prices and inputs as well as external accounts. Both Germany and Japan had extensive conglomerates that controlled vast sectors of the economy. Decentralization of German businesses split its three largest banks into twenty-eight and its twelve largest steel and coal companies (which possessed 90 percent of the nation's steel and 50 percent of its coal capacities) into eighteen. The government created tax incentives for private capital accumulation. Also, the government maintained price and wage controls until 1948, after which it gradually reduced them, and tightly controlled Germany's external account sinuation 1949 as Germany enacted currency reform. Currency reform was successful, which provided incentives for German production in every sector of the economy.

The Relationship Between Demographic Shock, Public Policy Crises, and Rapid Economic Growth

The German case illustrates the causal interconnectedness between demographic shocks, public policy crises, and the potential for rapid economic growth. That the policy decisions made by the USMG after the occupation began had a broader scope than initially planned reflect the second and third-order consequences that arose from the demographic shock sustained by the FRG after the

Second World War. Increased population statistics in the years that followed the Second World War that resulted from high birth rates and refugees did not directly lead to Germany's economic miracle. The dilapidated state of Germany's public infrastructure and administration was a potential disaster that could have paralyzed its politico-economical situation that would have forfeited any chance of economic recovery. Public policy decisions carefully selected and implemented at the macro and micro levels by the USMG enabled Germany to ameliorate its precarious position of its burgeoning population and the political, social, and economic contexts in which it would operate.

Public policy measures designed to address major socio-economic problems related to the Germany's population increase proved to be the foundation for its economic growth. Without the immediate attention to hunger and disease at the outset of the occupation, the USMG might have very likely found itself suppressing food riots or fighting epidemics. As the occupation progressed and the government assessed the long-term prospects for political and societal change, the need for comprehensive reforms in agriculture, land, and labor became indistinguishable from the need for economic and financial reforms. Reform in each sector affected, either directly or indirectly, those enacted in other areas and the USMG concluded that it could not pursue one course of reform while neglecting others.

C. Japan, 1945-1955

Historical Context

Japan's war ended in August 1945, but it faced like Germany a series of hardships that would extend beyond its surrender. While Japan did not experience partition as Germany, Japan did lose 81 percent of the former Empire's territory, some of which were vitally important to the Japanese economy. The US armed forces occupied Japan as they did Germany and established a military government to establish rule of law and oversee Japan's transformation politically, economically, and socially. Japan's situation immediately after the Second World War and subsequent occupation and path toward rapid economic growth mirrored the German experience in those regards. Years of US strategic bombing gradually destroyed Japan's industrial and agricultural capacities that included the destruction of its fishing fleet and urban centers. While Japan did not receive as many refugees as did Germany in this period, 1.3mn expatriated Japanese citizens returned from its former overseas possessions.

Japan's Demographic Shock and Implications for the Period 1945-1955

Despite war-related casualties that reached into the millions, Japan's demographic situation in the post-war period reflected steady birth rates and the influx of nationals from former territories against markedly decreased death rates. Combined, they had the effect of creating a positive demographic shock as Germany had experienced. Although the birth rate did not reach pre-war levels and was below that of other Asian nations, Japan experienced years of population growth due to the sharp drop in the mortality rate. Economic historians cite the immediate deaths of the sick and invalid in the war's aftermath, the rapid recovery (with US assistance) of its health care system, or the advent of "wonder drugs" in the late 1940s as reasons as to the Japanese death rate's decrease.

Japan's food and agriculture situations presented the first serious challenges to stability in light of the demographic shift that occurred after the war. While technological advancements in Japan had increased rice production by 20 percent since the Meiji Restoration (1868), Japan's population increases, diet changes, and technological shift away from agriculture toward production of manufactured goods forced it to import food since the late 19th century. Agricultural production did not increase in efficiency in this time period, and as a result, Japan found itself increasingly dependent on food imports. Japan relied upon its overseas territories for such imports, and their loss after the war heightened its food problem. Similarly, the destruction of Japan's industrial base and fishing fleet, the fact that mountainous Japan only can farm on 15 percent of its land, the small size and low productivity of Japanese farms all countered Japanese the demographic shift that occurred simultaneously. Combined, these elements produced widespread food shortages in 1945 led Mac Arthur to write to the State Department, after it refused his request to increase daily food rations, that it should "either give me bread or give me bullets".

Japan's infrastructure at the time compounded the delicate food situation and further threatened to negate whatever positive effects Japan's demographic shock might contribute to its economic recovery. The US war effort had obliterated Japan's industries, railways, and commercial shipping. It had likewise laid waste to Japan's housing situation.

Mac Arthur's focus on public health had a similarly drastic effect. While the Japanese had suffered periodic epidemics throughout history and accepted it as part of their fate, Mac Arthur, however, took a different approach. He established a health section within the Japanese government and began massive immunization and vaccination programs. The focused campaign on disease had wiped out cholera, and deaths related to disease dropped as follows: tuberculosis down by 88 percent, diphtheria 86 percent, dysentery 86 percent, and typhoid by 90 percent. The Yoshida government estimated that Mac Arthur's health drives saved approximately 2.1mn lives, more than the number of the country's combat deaths in the war, including Nagasaki and Hiroshima. Another survey, taken in the mid 1950s, revealed that Japanese life expectancy had risen, eight years for men and fourteen for women.

With food and disease addressed in Japan, the USMG could proceed toward the reforms it had devised for the occupation. While Mac Arthur originally stated that ultimate responsibility should lay with the Japanese, as the reform process unfolded, he discovered that the USMG' responsibility would inevitably increase. Japan had not yet fully recovered from the aftershocks of war and only the organizational and logistical capacities of the USMG could oversee the broad range of reforms envisioned.

The USMG in Japan had less success with agricultural reform than its German counterpart. After a brief period of pragmatic experimentation, it decentralized control to the local level by 1946-7 and only managed macro agricultural policy. Even before the war, Japan was not an efficient producer of food. Japan's consistent population growth since the Meiji Restoration, urbanization and industrialization, produced the need to import food even before the Second World War. The occupational government faced a difficult challenge as it approached agricultural reform. It developed a system of farm subsidies and fostered the conversion of some industries into production of agricultural machinery. Japanese agriculture rebounded quickly in part due to the rebirth of its fishing fleet (which by the early 1950s was the largest catcher in the world, doubling the catch of its nearest competitor, the US), but nevertheless, Japan had to import food.

Land reform had a major role in economic transformation in Japan, and while it did not drastically reverse Japan's poor agricultural output, land reform did enhance farm output. US authorities also viewed land reform as a stimulator of production and democratization. The size of farms and the price of land were other obstacles to revitalizing that sector of the economy. Land ownership in Japan before the war was limited and the farms, mostly rented, were small. Seventy percent of farmers rented their land, and rent was 50 to 70 percent the value of the crops. An immediate goal of the occupational government was to broaden the base of land ownership and lower the price of land. This worked to an extent, as the government bought 4,531,387 acres of land in January 1949 and by the spring of that year had sold all but 274,120 acres. The price of land fell by 87 percent of the January price.

Labor reform, likewise, provided a major impetus in Japan's economic revitalization and social change. The USMGs in Japan and Germany viewed unions as vehicles that would help instill democracy in these previously authoritarian states, but Mac Arthur believed that a strong labor union introduced into the business culture would have a greater influence upon Japan. Unions contributed to the formation of civil society, but perhaps had a greater influence on Japan than in Germany. Existing labor laws in Japan prior to the occupational government's focus on the issue addressed some abuses, but the actual system as well as the culture made the laws ineffective. The "labor boss" system, which amounted much to an indentured servant was not a phenomenon unique to Japan, but remained a part of the business culture up to the occupation. Soon after the occupation began, 49 percent of non-farm labor was unionized. In 1945, the occupational government established the Labor Law.

Restructuring labor and land laws and increasing agricultural production paved the way for **economic reform** in Japan. These economic reforms had distinct goals to economic reform in both cases: 1) dismantling cartels in industry, banking, and insurance, 2) currency reforms, 3) managed prices and inputs as well as external accounts. The occupational government first attempted to dismantle the Japanese conglomerates in October 1945, but this proved to be a daunting task. The conglomerates were so integrated and ingrained in the Japanese economy, both vertically and horizontally, that the occupational government had to postpone the dismantling of some vital companies (Mitsui and Mitsubishi). The government brought down many conglomerates but then had trouble forming successor companies with private capital stock. Japan's middle class was small compared to that of United States. Japan's banking and insurance sectors were controlled by large conglomerates. After the war, Nippon Savings Bank controlled 99 percent of all savings banks assets and banks controlled by zaibatsus owned 56.6 percent of total banking assets and zaibatsus owned 70 percent of all insurance assets. By 1948, the occupational government decided that any further attempt to decentralize the economy could seriously derail the economy.

Demographic Shock, Public Policy Decisions, and Rapid Economic Growth in Japan

Japan's demographic shock resulted from the markedly decreased death rates that immediately followed the end of the Second World War. Attention to the reinstitution of the Japanese health system ended the deaths of invalids and the seriously ill that occurred during the closing days of the war. Mac Arthur's struggle against epidemics paid large dividends to the long-term prospects of the occupational forces and to the Japanese people. Japan's birth rate during this period was above wartime averages, but remained below its pre-war levels and low compared against other contemporary Asian states. Increased abortions and general public acceptance of contraceptives are

some reasons for lower birth rates. Average family size shrunk decreased as a result in the period 1945-1955, which suggests that Japan entered the final stage of economic development.

Japan's mild demographic boom was an ongoing process that had begun in the late 19th century, only interrupted during the years 1941-1945. Wartime devastation that seriously threatened public health, when alleviated by the efforts of the USMG, created a backdrop against which the post-1945/1946 demographic figures drastically contrasted. The sharp discrepancy between the mortality rates in the last years of the Second World War and the first few years of the occupation masked the mild birth rate increase over the same time period and the overall trend of population growth that had existed in Japan for approximately seventy years.

Demographic indicators did, however, pose threats of immediate and second order consequence to Japan's post-war economic growth. Problems posed by disease and famine immediately threatened Japan's potential recovery; however, assistance from the USMG quickly ameliorated the situation. With basic food needs and those of health and sanitation comprehensively met, the USMG could initiate its reforms. That the reforms did not proceed as originally conceived in that the USMG assumed greater responsibilities than anticipated did not result from any problems that might have been caused by Japan's demographic shock. Rather, the Japanese were not prepared to take the lion's share of the duties in their reform and recovery. Only later did the Japanese undertake reforms themselves, and then, only with the guidance of the USMG.

Another difficult aspect of Japan's reforms was that many countered traditional culture or societal elements. Land reform changed the composition of holdings that had previously existed unaltered for decades. Labor reform and the encouragement of unions was a major departure from business culture that had previously existed in Japan. Labor unions, seen by the USMG as agents of political and cultural change as well as economic, became widely popular amongst Japanese workers so that membership increased yearly at a remarkable pace and that unions became an integral part of several key industries. The USMG' attack on Japan's big business had mixed success. While the USMG dismantled several conglomerates, Mac Arthur realized that the concept itself was crucial to vital aspects of the economy, which explains his decision to avoid certain corporations.

As in the German case, demographic shocks produced major public policy crises related to food and public health. Japan's demographic situation in this period demonstrates how a modest increase in birth rate can appear to have the effect of a population boom when there is a drastic fall off in the mortality rate. Japan's experience with reforms illustrates the successes and limits of such measures when introduced in a different political, economical, and societal context. Land and labor reforms introduced new perspectives to existing Japanese concepts of farming and labor relations. Decartelization ran into serious obstacles when the USMG went after corporations vital to a particular industry or sector of the economy.

D. Republic of Korea, 1945-1975

Historical Context

The fall of Japan's empire in 1945 brought the period of colonial rule in Korea to end. After the Sino-Japanese War (1894), Korea shifted from the Chinese sphere of influence to that of the Japanese, culminating in Japan's annexation of Korea in 1910. Japan's growing empire and

subsequent population increases couple with the decreased productivity of the Japanese agriculture forced Japan to look abroad for food. Under Japanese occupation from 1910 to 1945, Korea remained a predominantly agricultural society that served as the Japanese bread basket.

General Mac Arthur's General Order No. 1 of 10 August 1945 decreed that the Japanese would surrender to US forces in the south of Korea and to the Red Army in the north as agreed upon in the 1943 Cairo Declaration. The Japanese's dual surrender, demarcated by the 38th parallel, effectively partitioned the country. In southern Korea, the US Army Force in Korea (ASAFK) led by General John Hodge conducted a poorly operated occupation that in some respects differed little from that of the Japanese. Luckily for the Americans Kim Il-Sung ascended to power in the north and governed in an iron-fisted manner. Mac Arthur, occupied with his own reform efforts in Japan, tolerated Hodge's incompetent governance as the US government and public devoted much more attention to Japan than Korea. Two years after the United Nations held elections in Korea in 1947, the ASAFK disbanded and the occupation ended. The first president of the Republic of South Korea (ROK) Syngman Rhee ruled in such a belligerent manner that produced much concern in the United States.

In 1950, North Korean forces invaded the south. The war that followed lasted for three years and resulted in enormous damage both in terms of men and material. The war destroyed 400 bn wons' worth of property, which adjusted by current prices equals the sum of Korean GDP for 1955-1960. Inflation, already a growing concern for Korea in the years priot to the war, skyrocketed during the war, as Rhee increased the army to 650,000 men in 1951 from 100,000 in 1950. Agricultural production and textiles, the country's two leading industries, dropped sharply in this period.

South Korea also suffered considerable losses in human terms, both civilian and military. Civilian war casualties were 166,000 killed, 98,000 executed by North Korean forces, 78,000 abducted (mostly returned), and 253,000 missing or unaccounted for. Among the UN forces, South Korea casualties were nearly three-fourths of total losses. South Korea lost 48,000 dead, 186,000 wounded, and 119,000 missing, and 67,000 captured.

The Republic of Korea and Its Demographic Shock 1945-1975

The ROK's casualties had a noticeable impact on its demographic figures. The ROK's population after its first census in May 1949 totaled approximately 20.2 mn. A census taken in September 1955 numbered the South Korean population at 21.5. During the war, the South Korean population compounded at a growth rate of one percent and demographers after the 1960 census, which totaled 29.99mn. The growth rate between 1955 and 1960 was 2.88 percent. By 1962, the ROK's population was 26.27mn with a higher population density than Japan. Life expectancy rose in this period as well. Birth rates rose and mortality rates dropped.

Recovery and Growth, 1953-1975

The ROK's economic recovery began after the Korean War and lasted well into the 1970s. South Korea's economic growth occurred in different stages. The first lasted from 1953 to 1955. This period is best thought of as a stage of basic recovery from the war. Growth in this period was at a rate of 4.1 percent a year. At that time, the Koreans were trying to piece together the basic industries, such as textiles and agriculture. The next phase of growth occurred from 1955 to 1960 in which the growth rate increased marginally each year. This was the phase where the South Korean government began its export-led strategy. Mounting social pressure manifested in the form of

student protests in 1960 and culminated in a military coup in 1961 that produced a new government. The new government carefully plotted its economic course that enabled the Korean economy to grow at an average rate of 9.2 percent from 1960 to 1972.

South Korea's economic growth was not an over-night miracle like Germany's. It was the product of years of slow reforms that began in the immediate years following the Second World War interrupted by three years of costly and bloody war. After the war, the government slowly moved back toward the reform process but either did not fully embrace the necessary measures or did fully comprehend the situation. What resulted were years of small GDP growth that addressed particular issues or aspects of the economy without taking into consideration the need to integrate or better coordinate its efforts. Thus the South Korean economy in this period did not reach its full potential. In this period of recovery, social tensions increased due to socio-economic trends such as urbanization, increased literacy rates, and considerable population growth that occurred after the Korean War ended. Urbanization had the biggest impact on South Korea socio-economically, especially in the period between 1960 and 1975 as the urban population increased from 28 percent in 1960 to 48 percent in 1975, with 27 percent of the total population living in South Korea's two largest cities, Seoul and Pusan. Increased literacy rates also played an important role in South Korea's growth. Literacy rates dramatically increased between 1948 and 1968. Increases in the average level of education enhanced worker productivity. Population growth and unemployment were two further problems that confronted the Rhee government in its last years.

The government that followed the military coup was careful to not to seriously derail the economic progress and in fact honed in upon key aspects of the economy. The focus upon the areas of the economy produced higher rates of growth than the Rhee administration had in the past. It was in this period when the South Korean government guided the policies of growth that harnessed the major facets of the economy that favored growth. Industrial and agricultural production increased, but it was the growth of manufacturing in this period that made the most difference. Guided by a series of five-year plans, the economy grew at a stable rate on average of 9.1 percent per annum between 1960 and 1970. Compared with the forty-year periods of industrialization of Japan (1878-1882 to 1923-1927) and Sweden (1861-1865 to 1901-1905), that of South Korea only took twenty years.

Economic growth occurred so rapidly in South Korea that by the mid-1960s the country's experience had redefined the model of development that resulted from West Germany and Japan. Growth fell into sub-stages in the process that reflected the implementation of five-year plans by the government. Those five-year plans guided the pattern of growth in South Korea and capitalized in turn on key facets of the economy in each phase.

The Implications for Economic Growth 1945-1975

The demographic situation of the ROK did not foreshadow its eventual economic recovery. Slow population growth during the war added with considerable military and civilian casualties compounded by losses of physical capital throughout the country strained government resources. The population growth that resulted after the 1950s did not place much strain on public resources. Disease and famine remained in check through the war years. Gradual industrialization that occurred from the end of the Second World War to the end of the Korean War served as more of a catalyst for economic growth in South Korea than population growth that occurred after the Korean War's end. With industrialization came shifts in employment in the ROK's economy from agriculture to

manufacturing. These shifts poised South Korea for its period of growth that lasted from the mid-1950s the mid 1970s.

Policy Considerations: Republic of South Korea 1945-1975 and Russia in the 1990s and Beyond

The South Korean case represents only one parallel with the Russian situation in the 1990s. Like the other cases, South Korea experienced population growth during the period immediately following the Korea War. Unlike Russia presently, South Korea still experienced marginal population growth. Possible similarities for the Russian case come mostly from South Korea's path to development. Its period of economic growth did not occur for at least ten years after the end of the Second World War. During this period, the South Korean economy languished as the Americans imposed a free market economy overnight, perhaps the first case of "shock therapy". While prices and wages adjusted the country remained largely agrarian, and South Korea suffered food shortages and years of low production. The installation of the Syngman Rhee and the removal of US troops in 1947 did little to improve the situation. The South Korean economy staggered under Rhee's mismanagement as the government slowly enacted land reform and brought the free market system under control.

The Korean War threatened the economic stability of South Korea. Rampant inflation followed the South Korean military buildup, which drove consumer priced up by 150 percent between 1950-1951. War damage to physical capital significantly reduced South Korea's manufacturing and industrial output until the rebuilding process began in earnest in 1954. Mismanagement and the slow pace of growth from 1945 to 1955, exacerbated by the Korean War, paved the way for a new wave of South Korean economic planners to come to the forefront. As these planners analyzed South Korea's position, they sought to maximize on the economy's most promising sector – manufacturing – and devised a plan for economic development that centered on that area. Its position weakened by the war, the Rhee administration had little choice but to accept the policies put forward by the economic reformers. While economic planning provided the blueprint for economic growth after 1955, the Rhee administration's land reforms enacted between 1947 and 1950 laid some of the foundation for growth, although not as thoroughly nor as widely in the cases of the FRG and Japan.

E. Spain, 1940-1975

Historical Context

Spain's rapid economic growth that occurred in the 1960s resulted from the recovery in terms of human and physical capital from its civil war (1936-1939) and the gradual economic plans implemented by Francisco Franco's regime. Spain's civil war ended at the beginning of the Second World War, which meant that any economic reforms that would occur in Spain would do so without much attention or assistance from the international community, thus promising to slow the pace of possible economic growth and reform further. That the new Spanish government was fascist did not help either. Although to Spain's credit or perhaps good fortune, it did not formally ally itself with either Hitler's Germany or Mussolini's Italy.

After the war's conclusion, the newly formed United Nations, at the behest of the United States, imposed sanctions on Spain and further isolated it from the international community. As a result, the 1940s for Spain was a decade of imposed isolationism in which its economy and living standards

regressed to 19th century levels. Spain remained overwhelmingly agricultural as Franco's government struggled to find the right mix of policies that could stimulate growth and sectoral transformation of the economy. As the decade drew to an end and the Cold War settled in, Franco's virulent anti-communist stance, which had been his lone redeeming quality in the eyes of many Western European and American statesmen, led to a shift in the West's position on Spain.

Franco signed basing agreements with the United States in 1950 and six years of construction pumped over $1bn into the Spanish economy. International barriers on trade and financial dealings with Spain relaxed, and more importantly for Spain, tourists flooded the country year-round. Franco kept to his course of autarky throughout this period that drained Spain's foreign reserves and led to a major financial crisis in 1959. Franco acquiesced to international pressure and a young team of businessmen and bankers devised an economic plan to guide the Spanish economy and poised it for growth in the 1960s. The 1959 plan, which became known as the Stabilization Plan, paved the way for the 1964 plan devised by the World Bank. The 1964 plan called for increased spending on infrastructure and encouraged foreign investment.

Growth in the 1960s continued into the mid-1970s. In that period, GDP had risen considerably in comparison to previous decades and had improved the Spanish economy in relation to those of its European neighbors. Although Spain's period of growth in the 1960s did not lift its economy to a level of West Germany, Spain did have the highest relative GDP growth per annum in real terms compared to any other Western European country from 1959 to 1971. In that period, Spain boosted its capital/labor productivity ratio, annual level of investment, and produced a standard of living that advanced yearly.

Spain's Demographic Shock, 1940-1975

Precise numbers of deaths during the Spanish Civil War are unknown. Approximately 500,000 Spaniards lost their lives due to the conflict. Of the 500,000 deaths incurred by the war, 200,000 came in combat, 130,000 resulted from murders and executions, 10,000 from air raids, 25,000 from disease and malnutrition, and 100,000 post-war retributions against Republicans. The 500,000 figure does not take into consideration emigrants or Republicans who went into exile.

Physical damage was just as exacting. Two hundred cities in Spain lost 60 percent of their buildings. Railways lost 45 percent of rolling stock (including 41 percent of locomotives, 40 percent of goods wagons, and 61 percent of passenger cars), and one-third of its merchant marine tonnage.

Spain's population, which had grown by 1.31mn from 1930 to 1935, from 23.44mn to 24.75mn increased by 830,000 people during the civil war to 25.57mn in 1940. Modest population growth resumed after 1959 and high birth rates in the 1960s (20 per 1000s) increased Spain's population from 30.4mn in 1960 to 35.4mn in 1965. Growth rates slowed as the decade drew to a close. Spain's demographic indicators came more into line with those in Western Europe.

Spain's Demographic Shock and Economic Growth, 1940-1975 and Beyond

Spain's demographic trends from the period of 1940 to 1975 produced a shock that is counter-intuitive when considered with its rate of economic growth. High Spanish birth rates in the 1960s provided the human capital necessary to sustain economic growth. However, Spain's birth rates produced an opposite effect. High birth rates of the 1960s led to a large labor force in the late 1970s/early 1980s that as the Spanish economy slumped resulted in high unemployment rates.

Spain's demographic trends from this period also reveal other social considerations that influenced its economic development. Gradual employment shifts from agriculture to industry led to internal migration from rural to urban areas. Whereas in 1960 only 30 percent of the population lived in cities, by 1975 this number had changed to 45 percent. While increased urbanization helped to drive down the nation's birthrate, larger urban populations forced the government to seriously address the country's public health care system. The quality of the public health care system often came under scrutiny, and consequently, modern sanitation and hospital services were established only to the cities but to rural areas as well. Those measures, in combination with a healthier diet, increased their average life expectancy from 1960-1975.

Foreign economic assistance marked Spain's turnaround and eventual growth in subsequent decades that concluded in the mid-1970s. American money poured into the country as a result of the basing agreements. Foreign currency also came in the form of tourism. In the late 1950s and early 1960s, Spain was the most frequently visited country in Western Europe. Yet Franco's position on competition, especially foreign, remained, and the pressure on Spain's foreign reserves led the country to a financial crisis. Again, international assistance saved the country from potential disaster through the efforts of the World Bank and the IBRD in the early 1960s. Foreign attention forced Franco to reconsider his economic policies, and although he kept several of his old, traditional controls in place, he gradually opened Spain to foreign competition and encouraged foreign direct investment.

Spain 1940-1975 and Russia in the 1990s and Beyond: Policy Implications and Considerations

Spain's long road to recovery and growth from 1940 to 1975 draws the closest similarities to Russia's situation in the 1990s than any of the previous cases. Spain languished in a position of imposed isolation in the 1940s due to the defeat of fascism. Only after the change of the international political environment did the United States and West European countries offer assistance, first from geostrategic considerations and later through international financial institutions like the World Bank and IBRD.

In the period before Spain opened up to the West, the Spanish government managed the economy in a manner not unlike the Russian economy of the 1990s. While certain initiatives began in earnest or in the spirit of real reform, the bureaucratic system of the Spanish government either bogged the reform effort down or paralyzed it so that in practice the reform was only partially effective. The Spanish government's protectionist policies fostered inefficient industries that hindered output as well as reform and modernization of the industrial and manufacturing sectors of the economy.

Concerning policy implications, these two comparisons raise questions concerning the need for foreign assistance, the receptiveness of the home country to foreign investment as well as prescribed financial and economic measures by international organizations. Spain slowly opened up to foreign investment and the pressure that resulted from its financial crisis produced favorable conditions for the emergence of young cadre of businessmen and government officials to take the helm on some of these issues. Gradually, Spain moved away from Franco's path of authoritarianism and traditionalism and toward a progressive style that brought it in-line with many Western European countries.

More so than previous cases, Spain 1940-1975 resembles Russia's current position. From the Spanish experience comes the reiteration of the need for external support throughout the process of economic recovery as well as the necessity for the removal of the old business culture. Aspects of Spain's economic situation after the civil war to the early 1960s mirrors that of Russia after the fall of the Soviet Union. The 1940s was a period marked by economic stagnation, inflation, and unemployment. The 1950s saw Spain slowly emerge from its doldrums and establish a partnership with the United States. Assistance from the United States was key to the economic turnaround in Spain. With American assistance came the relaxation of its trade and financial restrictions that had been imposed by Franco's regime. Spain gradually opened up, but Franco's insistence on maintaining the old economic order, protecting the privileged business elite, hindered further progress. Its financial crisis focused international attention on the Spanish economy. Further reform plans devised by the World Bank and the IBRD set forth patterns for development and economic management. Most importantly, Franco's government accepted the plans, although some vestiges of the pre-planning days remained, specifically the close relationship between big business and government. As in the South Korean case, crises incurred due to economic policy mismanagement highlighted the need for real reform and created the necessary circumstances to bring the right people to the forefront of the governments' economic planning. While South Korea focused on its manufacturing sector and export-led growth, Spain concentrated its efforts on its tourist sector and the areas of the economy that supported it while industrialization occurred at a constant pace.

F. Conclusion: Relationship between Demographic Shock and Economic Growth

The demographic shock of each case presented in this study contrasts sharply with the current and anticipated demographic trends of the Russian Federation. The nature of demographic shock of the FRG and Japan in 1945, the ROK in 1953, and Spain in 1940 differ from the nature of the current Russian demographic shock in that the four demographic shocks analyzed resulted from war-time casualties. Negative population growth in Russia has not occurred as a result of extraneous circumstances. In post-war Japan, population growth resumed within five years of the surrender. In the ROK and Spain, population growth occurred during wartime, albeit marginally. The FRG's case is the most difficult to evaluate due to the problems posed by the occupation and partition of the country after 1945. While the population of the former Reich certainly contracted due to wartime casualties, the 1949 of the territories of the FRG revealed the highest population ever within those laender in the history of the German state. In Russia's case, there is no brief period of demographic relapse or higher populations due to loss of territory or empire. This separates the Russian case apart from those considered in this study.

While the inherent circumstances of the demographic shocks and that of the Russian Federation are different, policy challenges posed by the demographic shocks to economic growth in each case provide lessons for Russia as it approaches a period of anticipated growth. Demographic shocks can influence the economic development of a country either from the outset by posing policy challenges that become preconditions for growth or demographic shocks can have an effect toward the end of a period of growth that could threaten its sustainability. The cases of the FRG and Japan and those of the ROK and Spain illustrate the different relationships between demographic shock

and economic growth. In FRG and Japan, the demographic shock was more evident in the public policy problems it posed the USMG. In both instances, increased populations or at least higher levels of population density threatened food and nutrition levels and health concerns. Those problems seriously jeopardized the Americans' mission from the standpoint of domestic stability in the occupied territories. In the cases of the ROK and Spain, population growth posed a different kind of threat to stability at a different time. Population growth occurred for the ROK approximately 1953-1955 and for Spain between the mid-1950s to mid-1960s. In both instances, these boom generations matured at the time when the periods of rapid economic growth slowed down. This led to higher rates of unemployment than previously experienced and as a result, social unrest in that age group. Demographic shocks can produce immediate or short-term threats to stability that can in turn impede economic growth.

The set of public policy crises posed by demographic shocks in each of the cases highlight a second parallel with Russia's current situation. Each country had embarked in a transition phase that marked a departure from previous forms of government and economic systems to completely new ones. The FRG and Japan entered a reformation process that saw it change from totalitarian regimes with tightly controlled economies to democracies with a more decentralized economies. The ROK's transformation occurred in the wave of decolonization of 1945. Franco deposed the monarchy in Spain and inserted a fascist regime in its place. All countries underwent a period of radical political change in this period and introduced new economic systems.

Further analysis of policy challenges to economic growth also reveals the integral role that economic reform had as precursor for successful economic growth. In the cases of the FRG and Japan, successful economic growth followed the implementation of a thorough program of reforms that addressed every aspect of the economy. The comprehensive economic reforms in the FRG and Japan produced an overlapping effect that spurred economic growth in each case. In the FRG, agriculture and land reform worked to enhance the number, size, and output, of private farms. Currency reform gave the farmers incentive to produce as the stabilization of the mark curbed inflation and gave value to their labor. Labor reform in both the FRG and Japan dissolved some of the power of pre-war oligopolies and redesigned the labor forces of both countries to fit a capitalist system. The experiences of the ROK and Spain illustrate how partial reform attempts can impede economic growth. The ROK under Rhee before the Korean War did not approach the reform process in the same manner. The USMG in South Korea implemented a free market system overnight and departed only two years after its implementation. The South Koreans struggled to adapt to the immediate economic crises. The country remained primarily agricultural with low national productivity until after the Korean War. Spain followed a similar path. After its civil war, Spain pursued a path of autarky under Franco in the 1940s that did not foster reforms. Because Franco's policy favored particular privileged elements in Spanish government and society, economic growth was delayed by at least a decade, until a financial crisis force a more ambitious reform agenda.

Another distinction between these cases and that of Russia is the crucial role played by the international community, most notably the United States, in every instance examined. A noticeable difference between the cases of the FRG and Japan and those of the ROK and of Spain were the degree to which the United States participated in the reform process. The USMG played a critical role in the FRG and Japan, as it conducted the reforms at the macro level and guided local reform initiatives at the micro level. The USMG restored vital components of the socio-economic

infrastructure such as health care, transportation, energy, and public sanitation. In short, the USMG was the state. In the ROK, however, the relatively short duration of the USMG's presence there did not enable it to take as active role in the reconstruction. Economic reform in South Korea lacked the thorough guidance as the FRG and Japan had, and without such assistance, South Korean economic development languished for a decade. Spain's case in this regard underscores not only the valuable role that the United States had in its economic development but also the role that international financial institutions had in the process, which played a central role in Spain's economic turnaround. The 1950 basing agreement reversed US policy toward Spain, which led to access to capital and to a relaxation of theUS embargoes on trade and financial. With those removed, capital began to gradually flow into Spain. Franco's adherence to his currency regime threatened his country's stability. After a financial crisis Franco relented to international pressure from the World Bank and IBRD to loosen Spain's currency regime. Such international attention also brought to the forefront young Spanish economists and businessmen who implemented the reforms suggested by the World Bank and IBRD and engineered the decade-plus of growth Spain experienced between the early 1960s and mid 1970s.

These cases together illustrate the different challenges that demographic shocks can pose to economic growth at various times during the process of reform, the implications of reforms as preconditions for successful and sustainable growth, and the importance of the involvement of the United States and the external assistance throughout the process. While the nature of the demographic shock in each case differs fundamentally from that of Russia, the set of challenges or historical experience of each country examined offer some signposts for the possible problems for Russia's economic development as undergoes its demographic shock. The cases of the FRG and Japan appear as best-case scenarios, therefore, it is highly unlikely that Russia can emulate the rapid prosperity achieved by those countries. The ROK's situation from 1945-1975 relates to Russia more closely due to its stymied reform process and the fact that economic growth took ten years to materialize in South Korea. However, it is unlikely that the Russian Federation will be able to follow the South Korean strategy of export-led growth.

The example of Spain offers the closest semblance to the Russian case. After the Spanish Civil War, living standards in Spain fell to 19th century levels. The country regressed toward industrial output levels of 1910. Spain, isolated by the international community after the civil war, followed a course of autarky. The government enacted partial reforms that met with opposition within the government or business sectors that rendered the reforms ineffective. Franco's government adopted a policy of favoritism in Spanish business circles. As a result, businesses rose and fell not according to competitiveness or efficiency but along the lines of political connections. After international interest in Spain brought millions of dollars into the country and the ensuing financial crisis, this forced Franco to allow the young reformers to implement the plans devised by the World Bank and IBRD. While some favoritism remained, under the new leadership, competitiveness and efficiency came to the Spanish economy that in part spurred its economic growth. The course of Spanish economic development does not draw exact parallels with the Russian case, but it, like the examples of the FRG, Japan, and the ROK, have much to offer to further the understanding of the relationship between economic growth and demographic shocks.

[1] Jean Smith, The Papers of General Lucius Clay, Bloomington: Indiana University Press, 1974, pp. 65-77.
[2] Ministry of the Federal Republic of Germany for the Marshall Plan, Western Germany's Special Situation at the Beginning of the 1950s, Bonn: 1949, pg. 170.

[4] Klaus Bade, Population, Labor, and Migration in the 19th and 20th Centuries in Germany, New York: Berg Publishers, 1987, pp. 166-175.
[5] Smith, pp. 34-57.
[6] Lucius Clay, Decision in Germany, Garden City, NY: Doubleday and Co., 1950, pp. 52-76.
[7] Office of Military Government for Germany (US Zone) and Control Commission for Germany (UK Zone), Statistical Handbook of Bizonal Recovery Programs for Fiscal Years 1948/1949, 1949/1950, 1952-1953 and Summary of Economic Progress, Germany: 1949, pp. 66, 77-78, and 117.
[8] Clay, pg. 119.
[9] Gulgowski, Paul W., The American Military Government of the US Occupied Zones of post-World War Two Germany in Relation to Policies Expressed by its Civilian Governmental Authorities at Home During the Course of 1944/1945 through 1949, Frankfurt-am-Main: Haag and Herchen, 1983, pp. 131-144.

APPENDIX V

Russia: Too Sick To Matter?

Article published in *Policy Review*

By Nicholas Eberstadt

For Russia and its people, the nightmare of Soviet totalitarianism--that dreadful historical detour--has come to an end, only to be followed by a phenomenon much more familiar from Russian history : a "time of troubles". And although this current "time of troubles" is surely less brutal for ordinary Russians than the original "Time of Troubles" preceding the accession of the Romanov dynasty--likely milder, indeed, than any of the other designated "times of troubles" the Russian people have occasionally been obliged to endure during the intervening four centuries--today's episode shares with all its predecessors an overarching and indeed defining characteristic: a sudden, dramatic, and, from a Russian nationalist standpoint, distressing enfeeblement of the Russian state.

In barely a decade, Moscow has plummeted from the status of an imperial superpower to a condition of astonishing geopolitical weakness. To be sure: Soviet might, resting as it did upon the grotesque arrangements of a special tyranny, may be said to have been in some sense "abnormal". Even so: with today's spectacle, in which the Russian state's role in international affairs is so conspicuously diminished as to seem at times negligible, it would appear that the pendulum has swung toward another, almost equally "unnatural", extreme.

The symptoms of the Russian Federation's newly limited capabilities for influencing international events (or for that matter, events within its own borders) are of course both diverse and abundant. Politically, some would argue, the very existence in Russia of a constitutional democracy--any constitutional democracy--should be regarded as a triumph in itself. Perhaps so--but in Russia today, "real existing constitutional democracy" is, at least for now, an essentially moribund edifice. With its War Museum president; its alternately fractious and paralyzed legislature; its fictitious, "Dead Souls" approach to taxation and budgeting; its federalism of local unaccountability and central government decay; and its largely ineffectual judiciary, the present Russian political system is poorly suited to effecting decisions, mobilizing resources, or applying governmental will.

From an economic standpoint, Russia's present weaknesses are manifest, and are highlighted by international comparisons. Although a host of ambiguities attend both the old Soviet and the new Russian economic statistics, official data strongly suggest that the Russian Federation's economy today is amazingly small. In 1997, total reported exports of goods and services were almost identical in Russia (population: almost 150 million) and Sweden (population: 9 million). (Russia's trade ledgers are probably distorted by under-reporting, but her true export revenues may still not have

matched those of such miniature countries as Singapore and Belgium.[1]) At official exchange rates, Russia's GNP in 1997 just barely exceeded $400 billion--thus ranking ever so slightly above the Netherlands. "Purchasing power" adjustments alter the picture only to a degree: by that benchmark, according to World Bank calculations, Russia's 1997 economy would have been about as big as Spain's, although smaller than Canada's or Indonesia's. If accurate, those World Bank estimates would have meant that per capita output in 1997 was actually lower in Russia than in such places as Lebanon or Peru.[2] All of these figures, furthermore, refer to Russian conditions before the August 1998 collapse of the country's finances, since which time the country's economic performance has only worsened.

Then there is the matter of military strength. Since the collapse of Communism, Moscow's has evidently all but evaporated. Where the Red Army entertained once global ambitions, the Russian Army's conventional forces now find containing an insurrection in a small region within the nation's borders to be an almost overwhelming challenge. The dismal performance of the Russian Army in Chechnya attests to no less; the very fact that the military campaign to suppress Chechen rebels had to last nearly two years (1994-1996) speaks for itself.[3]

So straitened are Russia's current circumstances that the Western world has implicitly, but almost totally, redefined the nature of the external security problem that it presently expect to confront from the Russian state. No longer is that problem perceived to center upon Moscow's ability to project power abroad. Instead, it is believed to emanate primarily from the potential consequences of Russian internal political decay and military decline: the sell-off of military hardware to rising powers like China, or of nuclear technology to would-be proliferators like Iran; weakened controls over the government's arsenal of weapons of mass destruction; or internal convulsions with international repercussions. To the extent that Western governments today perceive a "Russian threat", it is not because they regard Moscow as a menace, but rather because they see it as a burden.

Many observers both within Russia and outside it take as self-evident the proposition that Russia's current condition of extreme weakness--virtual prostration--is only temporary, and will be inevitably corrected. Emblematic of this view is this assertion by Sergei Rogov, current director of Moscow's Institute of the USA and Canada: "Sooner or later, Moscow will again be a major international

---

[1] Derived from International Monetary Fund, International Financial Statistics, vol. 51, no. 1 (January 1999), and United Nations, World Population Prospects: The 1998 Revision, (New York: United Nations Population Division, forthcoming).

[2] World Bank, World Development Report 1998/99 (New York: Oxford University Press, 1998), pp. 190-191.

[3] See, for example, Anatol Lieven, Chechnya: Tombstone Of Russian Power, (New Haven, CT: Yale University Press, 1998). For background consult Pavel K. Baev, The Russian Army In A Time Of Troubles, (Thousand Oaks, Ca: Safe Foundation, 1996), and William E. Odom, The Collapse Of The Soviet Military, (New Haven, CT: Yale University Press, 1998).

player".[4]

There is an inherent plausibility to that expectation. Moreover, the sorts of developments that would be necessary for a Russian geopolitical recovery are easy enough to identify: they would include such things as coalescence of a rule of law; a policy-competent central government; creation of an attractive "business climate"; and reinvigoration of the leadership and institutions of the armed forces.

Many of these qualities, however, involve historical changes that could require correspondingly historical timespans to enact--and all of them are more slightly than dependent upon unforeseeable, unreliable contingency. For these reasons alone, Russia's international comeback could be a very slow and gradual affair--even under the best of circumstances.

Yet even such a qualified prognosis for a Russian comeback may prove to be overly optimistic: for it does not take into account a factor that could prove critical to an eventual Russian recovery. That factor is the health of the Russian people. Illness and mortality trends do not typically play a great role in world affairs. In Russia today, however, the nation's health conditions have become so degraded that it is possible to imagine these constituting an independent, and perhaps significant, constraint upon Moscow's prospects for re-attaining Great Power status.

Russia's ongoing crisis in public health--and "crisis" is hardly too strong a word--is historically unprecedented: no industrialized country has ever before suffered such a severe and prolonged deterioration during peacetime. In a number of other industrialized societies, cataclysmic "mortality crises" were followed first by rapid health recovery and then by further, even redoubled, health advances. Given the very different particulars of the Russian Federation's current mortality crisis, however, it would be highly unrealistic to expect analogous health progress for that country in the years immediately ahead.

For reasons we shall discuss, Russia's health decline promises to be especially difficult to reverse in the near term; even a decade or two from now, Russia will be faring well if it manages simply to re-attain the health levels it had known half a century earlier.

Such health trends augur ill for the Russian economy--and it is economic power that must ultimately underwrite any sustained resumption of international influence for Russia. Thus, "unnatural" as Russia's present weakness is held to be in many quarters, there is a real possibility that the country's startlingly adverse health trends will consign it to further relative economic decline for as much as another generation.

---

[4] James Meek, "U.S. Views Russian Bear As Largely Declawed", Washington Times, January 27, 199, p. A18.

Anatomy Of The Russian Health Crisis

Although the USSR's departure from the world stage was remarkably peaceful, the collapse of the Soviet system nevertheless brought on a veritable explosion of mortality in Russia. Between 1998/91 (the last years of Soviet rule) and 1994, crude death rates in Russia shot up by 40 percent.[5] Though the mortality situation appears to have improved somewhat since then, crude death rates in Russia in the first half of 1998 were still nearly 30 percent higher than they had been in the USSR's final years. This mortality shock (in tandem with a concomitant sudden drop in fertility levels) has pushed Russia into a continuing population decline for the first time since World War II. According to the most recent data available, Russia's deaths are exceeding its births by well over half--about 700,000, a year.

Although the fact has gone largely unrecognized, the loss of life from this quiet crisis in Russia has been absolutely catastrophic. In fact, it ranks as a catastrophe of historical proportions. The dimensions of the catastrophe are suggested by estimates from the World Health Organization (WHO).[6] The WHO has prepared "age standardized" death rates for Russia and many other countries. (These "standardized" rates differ from the crude rates in that they control for population aging and other such phenomena.) Against the benchmark of 1987--a relatively good year for personal survival in the old Soviet era--"excess mortality" in Russia during the four years 1992-95 would have amounted to nearly 1.8 million deaths. To put that figure in perspective: for the four years of World War I, the military death count for the Russian Empire is generally placed at 1.7 million.[7] And WHO has not yet published "age standardized" death rates for Russia for the years 1996-98; when it does, we are likely to find that Russia's "excess mortality" in the 1992-98 period alone exceeded three million deaths.

The abrupt worsening of Russian health conditions since the end of the Communist era is all the more noteworthy because health trends in fin de regime USSR were themselves so very poor. From the end of the Second World War to roughly 1960, the Soviet system presided over a swift and dramatic improvement in Union-wide health levels; by 1960, in fact, life expectancy at birth in Russia proper had caught up with America's, and was poised to exceed it. Just at that juncture, however, Russia began to experience broad health setbacks. Death rates began to rise--first among middle-aged men, then for a steadily spreading number of male and female age groups. (Even infant mortality reportedly went up.)

Initially, Soviet authorities responded to these unfavorable findings by suppressing information

---

[5] Goskomstat of Russia, The Demographic Yearbook Of Russia 1995, (Moscow: Goskomstat, 1996), p. 19.

[6] World Health Organization, World Health Statistics Annual, (Geneva: WHO), various editions.

[7] Anthony Bruce, An Illustrated Companion To The First World War, (London: Michael Joseph Ltd., 1989), p. 86.

about them; with Gorbachev's glasnost' policy, this veil of statistical secrecy was lifted. Official figures revealed that overall life expectancy for Russia was no higher in the late 1980s than it had been in the early 1960s--and that for adults, life expectancy was actually somewhat lower than it had been a quarter century earlier.[8]

After decades of stagnation, and now the recent, unmerciful retrogressions, Russia's health profile no longer remotely resembles that of a developed country; in fact, it is worse in a variety of respects than those of many "Third World" countries. For 1997--the most recent year for which such estimates are available--overall life expectancy in Russia was thought to be about 68 years. That would have been lower than Russia's life expectancy four decades before--but it would also be distinctly lower than the life expectancies today of such spots as Mauritius, Ecuador, or Azerbaijan. Mexico, for all its travails and troubles in the 1990s, now enjoys a life expectancy estimated to be over five years higher than Russia's.[9]

Throughout most of Latin America and the Caribbean and a growing number of countries in Asia, women can now expect to live longer than their Russian counterparts. But survival prospects happen to be especially poor for Russian men. According to the most recent figures available, life expectancy at birth for males in Russia today hovers around 60-61. That ranks well below the corresponding current estimates for such places as Egypt, Indonesia, or Paraguay.[10].

Among Russian men, moreover, health conditions are particularly bad for those in the working ages. In Australia today, by way of example, a 15 year old boy would, under current survival patterns, stand about an 80 percent chance of living to age 65. In the Russian Federation, by contrast, barely 40 percent of those same 15 year old youths would make it to 65. Although its records are limited to countries with relatively complete death registration since World War II, the WHO database cannot provide another instance of such bleak survival odds for "able bodied" men--even men from the African island of Mauritius in the late 1950s enjoyed better prospects than that.[11]

For every subsidiary age group between 15 and 65, death rates for Russian men today are frighteningly high. Youth may be the prime of life--but Russian men in their late teens and early twenties currently suffer higher death rates than American men twenty years their senior.[12] For their

[8] For more details, see Nicholas Eberstadt, The Poverty Of Communism, (New Brunswick, NJ: Transaction Publishers, 1988), and idem., The Tyranny Of Numbers: Mismeasurement And Misrule, (Washington, DC: AEI Press, 1995). See also Jose-Luis Bobadilla, Christine A. Costello, and Faith Mitchell, eds., Premature Death In The New Independent States (Washington, DC: National Academy Press, 1997).

[9] World Health Statistics Annual 1996.

[10] Estimates drawn from World Bank, World Development Report 1998/99, (New York: Oxford University Press, 1998).

[11] World Health Statistics Annual, 1993 and 1996 editions.

[12] Ibid.

part, Russian men in their forties and fifties are dying at a pace that heretofore may never have been witnessed in a society distinguished by urbanization, mass education and civil order. Death rates for men in their late forties and early fifties are, for example, over three times higher today in Russia than in Mexico. To approximate the current mortality schedule for Russian middle-aged men, one has to look to India--the India, that is, of the 1970s, rather than the much healthier India that we know today.[13]

How is the Russian health disaster to be explained[14]? The troubling fact is that international public health authorities have yet to come to any general agreement about the particular causes of Russia's health crisis--much less an understanding of the precise magnitude of the tolls being exacted by the different afflictions the Russian people presently endure. Reviewing available evidence, Dr. Lincoln Chen and colleagues from the Harvard School of Public Health concluded that "the root causes of the Russian health crisis remain uncertain"; they noted further that "if the effects of postulated individual factors [in the crisis]--environment, medical care, legacy of the past, economic impoverishment, social inequality, and political breakdown--were to be summed, they could together account for nearly twice the number of actual excess deaths".[15] And although their enumeration did not specifically mention behavioral factors (such as heavy drinking, heavy smoking, poor diet, and lack of exercise) or attitudinal factors (such as stress, outlook on life, or view of one's future prospects) these too are surely complicit in Russia's health current health troubles--even if only as proximate instruments through which other forces operate.

Although we may not be able to account conclusively for the roots of Russia's health crisis, we may nevertheless obtain important clues about its nature from the country's death statistics. Apart perhaps from infant deaths, mortality registration has been reasonably complete in Russia since at least the 1960s. And Russian statistics also classify deaths according to reported cause. While cause-of-death statistics are never perfect, and may be more than ordinarily problematic for Russia, those cause-of-death numbers for the time being may offer the most reliable hints as to what is ailing Russia today.

To begin, let us consider the role of environmental degradation. Many medical specialists within

---

[13] Ibid., United Nations Population Division, Model Life Tables For Developing Countries, (New York: UN, 1983).

[14] All Soviet-bloc countries seem to have suffered a measure of health stagnation between the early 1960s and the "revolutions of 1989". All of the former Warsaw Pact states, furthermore, were beset by measurable "health shocks" in the aftermath of the collapse of their Communist systems. [Cf. Nicholas Eberstadt, "Demographic Disaster: The Soviet Legacy", National Interest, Summer 1994.] But Russia's health trends have by far the most adverse within this amalgam.

[15] Lincoln C. Chen, Friederike Wittgenstein, and Elizabeth McKeon, "The Upsurge Of Mortality In Russia: Causes And Policy Implications", Population And Development Review, Vol. 22, no. 3 (September 1996), pp. 517-30, citations at 525, 523.

Russia itself would strongly agree with Georgetown University's Murray Feshbach that "environmental issues lurk behind much of the [Russian] public health problem".[16] The Soviet system's appalling destruction of nature--its casual and wanton poisoning of air, land, and water--has already been grimly documented.[17] But what fells forests or slays wildlife does not always necessarily kill people.

If severe air pollution were exacting a special toll on the Russian people, we might reasonably expect to find evidence of extraordinary respiratory afflictions--but Russia's death rate attributed to diseases of the respiratory system has reportedly declined slightly since the early 1980s, and is currently lower than in such countries as the Bahamas, Ireland, or Singapore. By the same token, while there is little doubt that radiation and other potentially deadly mutagens have been handled recklessly by the USSR (and now by the Russian Federation), the death rates attributed to cancer in Russia today are little changed for a decade or more--and in fact are essentially indistinguishable from those reported in such countries as the US, the UK, Germany or France.[18]

The human cost of Russia's "ecocide", to be sure, may yet be proved horrendous; but if we are to judge that cost by available data rather than anecdote, such a dire verdict cannot yet be rendered.

Then there is the question of communicable disease. In recent years, Russia has suffered outbreaks of typhus, typhoid, and cholera; diphtheria is reportedly rampant; and the identified incidence of tuberculosis, which has more than doubled since 1990, is--by WHO definitions--now formally epidemic.[19]

That Russia today should be so manifestly incapable of coping with contagious diseases so routinely controlled and suppressed in so many other regions of the world is surely suggestive of breakdown

---

[16] Murray Feshbach, "Dead Souls", Atlantic Monthly, December 1998.

[17] For example, Murray Feshbach and Alfred Friendly, Jr., Ecocide In The USSR: Health And Nature Under Siege, (New York: Basic Books, 1992), and Murray Feshbach, editor-in-chief, Environmental And Health Atlas Of Russia, (Moscow: Paims Publishing House, 1995).

[18] World Health Statistics Annual 1996.

[19] For background and local press reports, see John Maurice, "Russian Chaos Breeds Diphtheria Outbreak", Science, vol. 267, March 10, 1995, pp. 1416-1417; Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, no. 3 (May/June 1997), pp. 48-52, translated as "Russia: Infectious Morbidity In Russia" in United States Foreign Broadcast Information Service (hereafter, FBIS), FBIS-SOV-98-068, March 9, 1998 (electronic version); Interfax September 21, 1997, reprinted as "Russia: Typhoid Reported Spreading In Russia", FBIS-TEN-97-264, September 21, 1997 (electronic version); ITAR-TASS, February 2, 1998, translated as "Russia: Incidence Of Infectious Diseases Increasing In Russia", FBIS-TEN-98-033, February 2, 1998 (electronic version); ITAR-TASS, June 24, 1998, reprinted as "Russia: Russian Health Authority Reports Cholera Case In Moscow", FBIS-TEN-98-175, June 24, 1998 (electronic version); and ITAR-TASS, November 8, 1998, reprinted as "Russia: Physician Reports On National Tuberculosis Rates", FBIS-TEN-98-312, November 8, 1998 (electronic version).

in the country's public health system--and perhaps indicative as well of upheaval within, or serious fraying of, its social structure. But the impact of epidemic disease per se on Russia's health decline is easy to exaggerate. In 1995, deaths attributed to infectious and parasitic diseases comprised less than 2 percent of Russia's overall age- standardized death rate; while the level was almost four times as high as (say) Sweden's, that discrepancy accounted for less than one fiftieth of the overall mortality gap between the two countries. On the country's current mortality schedules, Russians face only about a 2 percent chance of eventually dying from a communicable disease--98 percent will die from something else. Obviously, then, the principal constituents of Russia's health disaster would seem to lie elsewhere.

But where? To go by cause-of-death statistics, the overwhelming majority of excess Russian deaths--by comparison both with Western countries today, and with Russia itself in earlier years--would seem to fall in two categories: "cardio-vasculat disease" (or CVD: heart attacks, strokes and the like) and "accidents and adverse effects" (injuries--including suicide and murder--and poisonings).

If cause-of-death statistics are to be believed, the world has never before seen anything like the epidemic of heart disease that rages in Russia today. For men and women alike, the standardized death rate in Russia today rate attributed to CVD alone is higher than the death rate in the United States for all causes combined. And although men the world over are prone to distinctly higher death rates from heart disease than women, Russia's female CVD mortality rate is currently roughly twice as high as the male rates in such countries as Canada, Italy, and Spain. In the West, CVD mortality peaked in the late 1950s and 1960s, and subsequently declined substantially; in Russia, however, already unrivaled rates have continued to climb.

As for deaths from "external causes", medical statistics have never before documented a plague of the proportions that wracks Russia today. The United States is widely regarded as a violence--and "injury"--prone society. Yet the US death rate attributed to injuries and poisonings currently stands at only half of the reported Russian rate of the Brezhnev and Gorbachev years--and Russia's rate has doubled again since then. At this juncture, despite the enormous worldwide disparity between men and women in deaths from violent causes, the mortality rate ascribed to injury and poisoning is higher for Russia's women than it is for America's men.

Russian men, for their part, have no peers in succumbing to deadly injuries. Although the Russian male mortality rate from "external causes" was reportedly significantly lower in 1995 than it had been in 1994, it was nevertheless nearly three times higher than in Mexico or Venezuela, and over half again as high as in Colombia--a country then convulsed by unchecked narco-terrorism and drug warlordism. Under prevailing cause-of-death patterns, a baby boy in Russia in 1995 stood almost a one-in-four chance of eventually dying from some sort of external trauma; in Britain, to provide some sense of contrast, the corresponding risk would have been about one-in-thirty.[20]

How to explain modern Russia's extraordinary disposition for injuries and cardiovascular disease?

[20] Data in preceding paragraphs drawn from World Health Statistics Annual, various editions.

The upsurge in deaths due to external trauma is surely influenced, after a fashion, by broad social trends from the ongoing Russian "transition". It is much easier now than in the past, for example, for Russians to buy a car--and by extension, to kill themselves on the roads. By the same token, with the virtual collapse of police authority and the corresponding rise of "mafiya capitalism", Russian citizens are more likely now than in the past to die from free-lance criminality.

In a much narrower sense, however, Russia's epidemic of deaths from external trauma is intimately linked to its staggering consumption of hard spirits. The heavy vodka drinking for which the USSR was so notorious has been replaced in post-Communist Russia by an even more extreme regimen of national alcohol abuse. Contemporary Russia's thirst for vodka, indeed, is almost impossible for Westerners to imagine. According to a 1993 national household survey, for example, over 80 percent of Russian men were drinkers; and their average intake of pure alcohol amounted to nearly 600 grams per day. That is equivalent to almost a liter and a half of vodka--that is to say, nearly two bottles--each and every day.[21]

Those drinking patterns have deadly consequences. In 1996, over 35,000 Russians died from accidental alcohol poisoning. (America is hardly a country of tea-totalers, yet in the United States--a country with almost twice Russia's population--the corresponding figure averages about 300 persons a year.[22]) Extraordinarily heavy drinking is also implicated in Russia's explosion of deadly injuries, for many of the fatal falls, crashes, suicides and murders in Russia today are thought to occur while the victim (or perpetrator) is drunk.

Alcohol abuse surely also plays a role in Russia's surfeit of deaths from coronary disease, since binge drinking is associated with CVD mortality. But other aspects of the Russian lifestyle undoubtedly contribute to the problem as well. Heavy smoking (prevalent in Russia today) contributes strongly to the risk of CVD--as do lack of exercise, diets too heavy in fatty foods, and obesity, all of which are rife among the Russian populace. At work together, these risk factors may disproportionately heighten vulnerability to cardiovascular threats.

In addition, there is evidence that attitudes, outlook and stress--what clinicians now term "psycho-social variables"--may also affect susceptibility to CVD. In a major recent study of Russian health conditions, researchers concluded that health risks were strongly associated with the perception that one had little control over one's own life.[23] Association, of course, does not establish causality--but

---

[21] David A. Leon et al., "Huge Variation In Russian Mortality Rates 1984-94: Artefact, Alcohol, Or What?", The Lancet, no. 9075, vol. 350 (August 9, 1997).

[22] Zdravookhraneniye Rossiyskoy Federatsii, May-Jun 1998, no. 3, translated as "Russia: State Report On Public Health (Part 1)", FBIS-TEN-98-341, December 7, 1998 (electronic version); National Center for Health Statistics, Vital Statistics Of The United States 1992 (Hyattsville, MD: US Department of Health and Human Services, Public Health Service, 1996), Volume II, Part A, p. 206.

[23] Bobak, Martin et al, "Socioeconomic Factors, Perceived Control And Self-Reported Health In Russia. A Cross-sectional Survey", Social Science And Medicine, vol. 47, no. 2 (July 1998).

it raises the possibility that the profound and apparently deepening pessimism about personal circumstances widely reflected in array of opinion polls and surveys is among the determinants underlying Russia's fearsome levels of cardiovascular death.

If a better medical system were currently in place, Russia's death rate from CVD would doubtless be reduced. That CVD epidemic, however, speaks to much more than the failure of a particular public health sector. For the risks that are resulting in these unparalleled levels of cardiovascular mortality are strongly behavioral--and perhaps also attitudinal--in nature. They are representative of, and appear to be deeply ingrained within, the current Russian lifestyle. Unless these behaviors and attitudes--call them "ways of life"--fundamentally change, it may be extremely difficult to change the health risks they generate in an appreciable manner.

Prospects For A Russian Health Recovery

The Russian people are not the only urbanized, educated populace in our era to experience sudden upward spikes in mortality, or precipitous and unexpected declines in general levels of health. At least four other countries--Spain (1936/39), Western Germany (1943/46), Japan (1944/45), and South Korea (1950/53)--record cruel plunges in countrywide life expectancy around the middle of the Twentieth Century.

Each of those mortality crises, however, proved transient. Following each of them, in fact, life expectancy at birth quickly recovered to pre-disaster levels. Thereafter, brisk tempos of further health progress ensued--almost as if disaster had never struck.

The most remarkable instance of such post-disaster health progress is undoubtedly Japan's. In 1944/45, male life expectancy at birth in Japan had been driven down essentialy to neolithic levels (under 25 years). Yet barely three decades later--in the late 1970s--Japan was estimated to enjoy virtually the highest male life expectancy in the world!

Can Russia hope for an analogous revitalization of health trends in the decades immediately ahead? From today's vantage point, such an outcome would seem entirely unlikely. In origin, duration, and character, Russia's present mortality crisis is fundamentally different from those others. And in every respect, Russia's distinctions portend both greater difficulties in re-attaining previous health conditions and a more limited scope for exacting gains in health progress after that status quo ante is finally reached. Paradoxically, even if Russia's health recovery were to begin immediately--or were discovered to be already underway--the particulars of the country's health crisis suggest that Russia's international health ranking might nevertheless continue to decline for another several decades.

The crucial difference between the earlier mortality crises in Spain, Western Germany, Japan and South Korea and the ongoing health crisis in Russia, of course, is that the former were direct consequences of wars or civil wars, while the latter has erupted in a country in a formal state of

peace.[24] In the four war-riven states, health recovery commenced spontaneously, with the cessation of fighting. No similar option exists for ending excess mortality in Russia today.

Devastating as the Spanish Civil War, World War II, and the Korean War all were, moreover, the demographic toll each of those catastrophes imposed appears to have been discrete in the sense of having had surprisingly limited impact on the health of the crises' survivors. Recent estimates by demographers, for example, suggest that World War II and its repercussions cost Western German women born in 1920--who were exposed directly to the destruction and privation of that terrible defeat--an average of only about six months of life expectancy.[25]

No similar presumption can obtain for Russia. To the contrary: given the prolonged period of health stagnation and decay before the recent Russian health crisis, and the indications that Russia's pattern of excess deaths may be partly or even largely related to accumulated lifestyle-related risks, there is every reason to expect the burden of this crisis to continue to weigh heavily upon the Russian people even after its most acute phase has passed.

Two specific features of Russia's present patterns of death and disease argue especially strongly against the likelihood of a speedy health turnaround.

The first has to do with the country's current cause-of-death structure--the particular types of fatal illnesses, in other words, that are killing people in modern Russia. For Russia's deadly ailments, by and large, are afflictions that tend inherently to be more resistant than others to immediate medical interventions, and less amenable than other to significant short-run control.

The point can be illuminated by contrasting cause-of-death patterns in contemporary Russia and post-war Japan. [SEE FIGURE 1] In 1995, Russia's overall age-standardized death rate was just about the same as Japan's had been in the early 1950s. The composition of the two countries death rates, however, was dramatically different.

In postwar Japan, infectious and communicable disease was a vastly greater threat to public health than it is in Russia today. Death rates from respiratory illnesses (among them, pneumonia and influenza) were over two thirds higher than in contemporary Russia, and mortality from tuberculosis--a major killer in Japan during those years--was fully seven times higher. Fortunately for the Japanese, those were diseases that could be rapidly and inexpensively suppressed by newly invented medicines and fairly basic public hygiene measures. In the face of these sustained

---

[24] The Chechnyan rebellion does not alter this assessment. If Chechnyan combat cost 50,000 deaths, as is commonly suggested, those losses would amount to less than 2 percent of Russia's "excess mortality" for 1992-98.

[25] Charlotte Hoehn, "Kohortensterblichkeit unter besonderer Beruecksichtigung der Weltkriege", in Reiner Hans Dinkel, Charlotte Hoehn, and Rembrandt D. Scholz, eds., Sterblichkeitsentwicklung--under besonderer Beruecksichtigung des Kohortsansatzes, (Munich: Harald Boldt Verlag, 1996).

interventions, declines in death rates were immediate and dramatic. In just the ten years between the early 1950s and the early 1960s, for example, Japan's TB death rate fell by 63 percent.[26]

In Russia today, the principal causes of death are CVD and injury/poisoning, which together account for two-thirds of the nation's mortality. Death rates from CVD are nearly twice as high for modern Russians as they were for postwar Japanese; deaths rates for injury and poisoning, nearly three times higher. And unfortunately for Russia, these are not the sorts of deaths that can be easily prevented through inexpensive prophylactic health policies.

Since fatal injuries stem from immediate episodes of violence, an effective injury prevention strategy could in theory bring correspondingly immediate benefits. In practice, such a strategy would be daunting to enact in Russia today. For an injury prevention campaign worthy of the name would presuppose tremendous behavioral changes on the part of the Russian people--most importantly, a radical drop in the prevalence of heavy drinking. Given Russia's seemingly unique passion for vodka, eliciting sustained declines in alcohol consumption would not be easy. Nor would it be inexpensive. In addition to the direct costs of an anti-alcohol campaign, there would likely be major revenue losses for the state, for traditionally the Russian budget has been almost as dependent upon liquor as the Russian people.

Unlike sudden injuries, CVD typically is the culmination of a lifetime of insults on the cardiovascular system. With heart disease, in a real sense, today's "bills" cover "debts" accumulated over long periods in the past. For this reason, trends in deaths from heart disease in any country can never turn on a dime. Even with sensible, well-funded medical policies and wholesale popular embrace of more a "heart healthy" lifestyle, the control and reduction of CVD death rates tends to be a relatively gradual affair; without them, prospects for improvements are--at the very best--much more modest.

A second, related, reason we should not expect speedy improvement in Russian health conditions is that Russia's health trends today embody a large measure of what might be termed "negative momentum". In Spain, Western Germany, Japan, and South Korea, local health conditions had been progressively improving for decades before their respective cataclysmic upheavals; when the conflicts that triggered their mortality crises came to a close, the survivors and their descendants continued upon already-established paths of national health advance. In Russia, by contrast, health conditions have been stagnating--indeed worsening--for over three decades. As a practical matter, this long-term deterioration stands to make even re-attaining the hardly enviable survival prospects enjoyed by their parents and grandparents a surprisingly difficult challenge for today's Russian population.

To appreciate just how much "negative momentum" lies within contemporary Russian health trends, one might compare death rates for Russia proper in 1994 and, say, 1964. For men 15 years of age and older, death rates were higher in 1994 than they had been 30 years earlier--for most age groups,

[26] For sources, see Figure 1.

in fact, far higher. For men in their early 30s, mortality levels were twice as high for 1994 as for 1964; for men in their early 50s, they were almost two and a half times as high. The situation was only somewhat better for women. For them, death rates were worse than they had been three decades earlier for all groups 25 and older; for women in their 30s, 40s, and 50s, death rates typically had jumped by about half between 1964 and 1994.

These health setbacks mean that, at any given age, Russian adults in the mid-1990s were dying at a tempo that had been observed only among persons distinctly older than themselves back in the 1960s. In 1994, for example, the absolute death rate for Russian men in their late 20s was nearly as high as the rate for men their early 40s had been back in 1964; for men in their early 40s, mortality levels were more like the 55-59 year olds of that earlier generation. Among women, the retrogression was not as drastic: nevertheless, death rates for women of any given age in 1994 were similar to, or even higher than, those for women five years their senior a generation earlier.

If death rates provide an accurate reflection of general health conditions for a country like Russia, it would seem that the Russian population as a whole has been growing progressively frailer in recent times--that irrespective of given chronological age, men and women alike are today in a real sense more "elderly" than were their counterparts in their parents' generation. While mortality rates have improved somewhat since the annus horribilus of 1994, Russian men, according to the latest data available, are nevertheless today dying at a pace reported by counterparts fully ten years their elder back in the 1960s; for a number of female age groups, the differential remains at five years or more.

Under such circumstances, simply re-attaining within the next twenty years the health levels Russia "enjoyed" in the 1960s will be no mean feat. For the fifty-year olds in Russia twenty years hence are the thirty-year-olds of Russia today--and by many indications, these particular thirty year olds are strikingly less healthy than their predecessors a few decades earlier. The same may be said of most of the current Russian cohorts--male and female alike--that will compose the majority of the Russian population, and the great majority of the Russian labor force, twenty years from now.

Given their survival trajectories to date, in fact, re-establishing within Russia the mortality and health profiles reported in the early 1960s for the population alive today would be a major task, requiring far-reaching changes in both lifestyle and environment for the country as a whole. Modest as the goal may sound, getting back to status quo ante is an ambitious health goal for Russia today--one that, quite possibly, may not be accomplished for decades.

In its latest round of world demographic projections, the United Nations Population Division proposes an overall life expectancy of just over 70 for Russia for the years 2010/15--just over 65 for men; just over 75 for women.[27] These life expectancy projections are a bit more optimistic than those of the Russian State Statistical Committee (Goskomstat)[28]--whose estimates, in turn, may

[27] United Nations, World Population Projects: The 1998 Revision, (New York: United Nations Population Division, forthcoming).

[28] "INTERFAX Statistical Report", Volume VII,

prove to be overly optimistic for reasons already mentioned. But even taken at face value, their implications are arresting, as Figure 2 demonstrates. [SEE FIGURE 2]

If the UN projections prove correct, male life expectancy in Russia in 2010/15 will only be barely higher than it had been back in the early 1960s--that is to say, half a century earlier. (Russia's overall life expectancy at birth would be higher in 2010/15 than in the early 1960s--by just about a year.) But during Russia's prolonged bout of stagnation, health conditions in most of the rest of the world have been gradually improving--and are projected to continue to improve in the future. Thus Russia's international health standing is envisioned as declining for decades to come--even after the country's health recovery has commenced.

In the early 1990s--in the onset of Russia's current, acute mortality crisis--life expectancy for the country as a whole is estimated to have been almost five years higher than in the collectivity the UN terms the "less developed regions" (low-income Asia, Africa, and Latin America). Twenty years from now, by these projections, overall life expectancy in Russia would be only about two years higher. Life expectancy for Russian men would be ever so slightly lower than the overall male average for those regions. For Russian women, lifespans would be a little over six years longer than in the "Third World"--but they are almost nine years longer today.

More concretely: these projections imply that Russia's overall life expectancy twenty years from now would be lower than the regional averages for either Latin America or Asia. In the Western hemisphere, to go by these projections, only Bolivia, Guatemala, and Haiti would have a lower male life expectancy than Russia's own. And Russia's overall life expectancy would be lower than those of such Asian countries as China, Indonesia, Iran, the Philippines, Thailand, and Vietnam. (It would also be lower than Iraq's.) Although Russia's overall life expectancy would, in this envisioning, still be higher than for South Asia, male life expectancy would be lower in Russia than in India or Pakistan--and would be just about the same as in Russia and Bangladesh.

The only continent with lower levels of life expectancy than Russia twenty years hence, by these latest UN projections, would be Africa. Yet even there, a number of countries are anticipated to be healthier than Russia in terms of overall life expectancy: Algeria, Egypt, Morocco, and Cape Verde among them. With respect to male life expectancy, Russia's level in 2015/20 is envisioned as being less than two years higher than those of such countries as Comoros, Ghana, or Swaziland.

Projections of this sort, of course, must be treated with the caution they deserve. Projections are just that--merely projections. In the event, the ones just cited may overestimate Third World health progress: a terrible epidemic, war, or other disaster may depress life expectancy far below the future levels anticipated. But that caveat holds equally for projections of health progress within the Russian Federation. Though they can hardly be presumed to foretell the future, these projections

---

Issue 33 (308), August 14 1998; reprinted as "Russia: Interfax Statistical Report 8-14 Aug 98", FBIS-SOV-98-226, August 14, 1998
(electronic version).

emphasize just how easy it will be in the years ahead for Russian health conditions to slip further down into the ranks of the "Third World"--and how extraordinarily hard it will be to forestall such an eventuality.

Poor Health And Russian Economic Power

If Russia's health prognosis is indeed as gloomy as we have just suggested, mortality and disease will pose major obstacles to economic development in Russia for decades to come.

In our era, the wealth of nations lies in their human resources. Land, commodities like oil, and even physical property have all been making a steadily diminishing contribution to economic output over the entire course of the modern age. A debilitated, unhealthy Russia is utterly unlikely to be capable of maintaining a highly productive economic system. Rather, Russia's continuing relative decline in international health rankings is likely to be accompanied by a continuing relative decline in her international economic standing. Given Russia's prospective health problems, its economy twenty years hence may look even smaller by comparison with others than it does today.

Internationally, the correspondence between health and productivity is a strong one, as may be seen in Figure 3. [SEE FIGURE 3] No matter whose statistics one chooses or what time period one examines, countries with higher levels of life expectancy tend to have higher level of per capita output--and the ones with lower output tend also to have poorer levels of health.

While the relationship between health and economic productivity is of course vastly more complicated than can be depicted in the simplified graphic in Figure 3, the fact remains that, at any given time, a country's level of life expectancy turns out to be quite a good predictor of its level of income. There are, of course, certain countries for whom such predictions consistently veer off the mark--but even in those cases, the deviations are readily explicable from a human resources perspective.

The United States, for example, "overperforms" economically--its income level is always higher than would be predicted solely on the basis of its health attainment. That differential may be understood in terms of the added productivity boost that such things as our technological pre-eminence, our corporate/managerial advantages, and our cadre of highly trained specialists imbue to a country with our overall level of life expectancy. Conversely, China is an "underperformer" economically--there, per capita output is always lower than life expectancy per se would predict. But given China's technological backwardness and the still problematic nature of its "institutional infrastructure" (markets, laws and the like), it is hardly surprising that human resources should be less productive in China than they might be elsewhere.

For the Russian Federation today, life expectancy happens to be a rather good predictor of productivity. Russia's per capita GNP, in other words, is just about what one would guess from its level of life expectancy; by some comparisons, in fact, Russia's output levels look slightly better than

one would predict on the basis of health alone. That should be sobering news for Moscow, for it suggests that the country's current economic weakness is not so much an aberration attendant to its ongoing "transition process" as a fact connected closely with the country's extraordinarily high levels of mortality and illness. Unless, moreover, Russia can hope to emerge as a USA-style "overperformer", its future economic and health progress will be closely linked.

Yet for all the reasons we have already seen, health progress in Russia over the next several decades may well be painfully slow. Just what would this portend for the Russian economy?

One way of thinking about the question would be to compute illustrative GNPs for Russia and other countries on the basis of today's international relationships between health and productivity, but using the numbers for life expectancy and population size that are projected for, say, two decades from now. Obviously, this will be a highly imperfect approach--but it may nevertheless prove useful in at least providing an impression of the sorts of global and Russian changes that we may contemplate in the years immediately ahead.

Although current UN demographic projections envision Russia's total population as being smaller twenty years from now than it is today, they also anticipate life expectancy to be somewhat better. Using our crude, health-based "predictors", such a future Russia would be assigned a real GNP of a little over a trillion present US dollars. Taken at face value, that total would imply consequential economic progress for Russia in the years ahead--a respectable pace of GNP growth averaging, say, 2.5 percent per year.

But the world is a moving target--and much of the world may be moving more rapidly than Russia in the decades ahead. Certainly health-based "predictors" of economic performance would suggest as much. The same methods that depict a future Russia with a trillion-dollar economy twenty years from now, for example, can be used to conjure up a contemporary Turkish economy of almost 1.5 trillion dollars. Similar calculations portray a Russia virtually encircled in Asia by larger economies: not just Korea, Japan, China, and India, as today, but in addition Pakistan, Iran, and (as just mentioned) Turkey, would all have economies at least as large as Russia's own.

This illustrative method, indeed, suggests that Russia's international economic ranking could drop steadily over the coming twenty years, notwithstanding an envisioned measure of national health recovery and economic progress. At the moment, Russia's economy is probably the world's thirteenth or fourteenth in terms of overall size. Crude, health-based calculations imply that it might be as low as number 20 two decades from now.

What would it mean to be the world's twentieth largest economy twenty years from now? We might get some sense of the geopolitical ramifications by considering what is the world's twentieth largest economy today. The World Bank provides "PPP adjusted" estimates of national output for 1997; though these should not be taken as precise, they offer at the very least sense of scale.

Think of Thailand or Australia. Neither of them would have been the world's twentieth largest

economy in 1997--they were both almost certainly larger than that. To think of the world's twentieth largest economy in 1997, visualize instead something in the vicinity of Argentina or South Africa: perhaps Holland.

With the power of the Dutch, or the South African, or the Argentine economy at its disposal, a radical or revisionist state could today cause tremendous difficulties for its neighbors, its region, and arguably even the entire international community. It could be a nuisance, a headache, or (if left unchecked) a predatory menace. But no matter what its international disposition, no matter how shrewd and ruthless its statesmen, a country with an economy the size of South Africa's today could not hope to lay claim to Great Power status. The gap between that ambition and the resources necessary to realize it would simply be too great.

What holds for South Africa and Argentina today my obtain for the Russian Federation tomorrow. A less peaceable, more militant Russian state than the one we know today could easily be a source of tensions and a cause of troubles that the international community presently does not have to contend with, and naturally would prefer not to. But if the Russian Federation's relative economic standing continues to slip in the decades ahead, genuine Great Power status will drift ever further from the grasp of Moscow, irrespective of the priorities, ideology, or skill of its leadership. Russia's potential for mobilizing national power is severely impaired today by the sickness of its people--and disease and death look to be an even more crippling constraint on Russian power over the generation to come.

Can Russia Soon Recover Great Power Status Despite Its Current Health Problems?

It is, of course, possible to argue that Russia's current trends in sickness and death will not necessarily impede the country's comeback on the world stage. At least two such objections deserve our consideration.

The first would hold that the economic costs of Russia's health crisis are not nearly as grave as we have just suggested. Some recent econometric research on the repercussions of the international AIDS epidemic, for example, has concluded that this pestilence, gruesome as its human consequences may be, has had only a negligible impact on economic growth and output--even in AIDS-ravaged areas of sub-Saharan Africa.[29] Using analogous reasoning and a similar econometric framework, one new study estimates that the total costs of Russia's mortality crisis are surprisingly low: only 0.3 percentage points a year knocked off the country's economic growth rate.[30] That would be drag on economic growth, to be sure, but only a relatively minor one: by implication,

---

[29] Cf. David E. Bloom and Ajay S. Mahal, "Does the Aids epidemic threaten economic growth?", Journal of Econometrics, vol. 77, no. 1 (1997).

[30] David E. Bloom and Pia Malaney, "Macroeconomic consequences of the Russian mortality crisis", World Development (forthcoming).

Russia's burden of disease might not be nearly so onerous as to prevent the county's ascendance as a major global economic power--and thus, a major political power--in the decades immediately ahead.

Without gainsaying the admirable and sophisticated modeling techniques marshalled for this particular argument, one may make two points about this type of objection. First, it is quite possible that estimates of a negligible economic cost for the sub-Saharan AIDS epidemic--upon which this syllogism rests--are actually quite wrong, drawing as those models did on much more preliminary information about a scourge that at his point is radically depressing life expectancies in countries across the entire sub-Sahara.[31] Second, the debilitating illnesses and afflictions pressing down life expectancy in the Russian Federation today may be distributed much more broadly over the populace than would be an AIDS epidemic of equal lethality; if so, the economic impact of the Russian-style health retrogression could be commensurately greater.

A second kind of objection asserts that even weakened or debilitated, the Russian populace remains a force to be reckoned with in world affairs, due to its formidable potential on the field of battle . Edward N. Luttwak offered a variant of this argument years ago, when he warned readers in 1985 against "Delusions Of Soviet Weakness:

> ...[D]runkeness is no doubt pervasive in the[ir]...armed forces. But the Russians have always been great drinkers. Drunk they defeated Napoleon, and drunk again they defeated Hitler's armies and advanced all the way to Berlin.[32]

That Russian soldiers have distinguished themselves by their ruggedness, bravery, and self-sacrifice in more than one major war is incontestible. But valor is not always the decisive element in battle: if it were, the Polish cavalry in 1939--like countless defeated legions before them--would have savored victory against the Wehrmacht, rather than suffering annihilation at their hands.

Just as the Wehrmacht's motorized columns introduced the world to a new form of fighting in the plains of Poland in 1939, so Operation Desert Storm may have offered us a glimpse of the next face of war: the hi-tech, information-intensive arrangements that currently travel under the banner of "the revolution in military affairs (RMA)". While this nascent "revolution" may not invest the armies that embrace it with invincibility, it looks nonetheless to confer them with tremendous advantages over non-RMA opponents.

A debilitated Russian populace is unlikely to support a "revolution in military affairs" worthy of the name. In a sick country, amassing the requisite corps of soldier/specialists to conduct high-technology warfare may be a challenge in itself. (Brave and regimented drunkards may have succeeded in marching on Paris and Berlin in the past, but they would fare rather less creditably

---

[31] According to the UN Population Division's most recent estimates, for example, life expectancy at birth in Botswana fell by over almost fourteen years between the early and the late 1990s.

[32] Edward N. Luttwak, "Delusions of Soviet Weakness", Commentary, January 1985, pp. 32-33.

today in, say, high-precision aerial combat.) More importantly, though, a debilitated and impoverished Russian populace will be hard pressed to finance the far-reaching expenditures and investments that a meaningful "revolution in military affairs" would demands.

If Russia cannot support a full-fledged "revolution in military affairs" in the next decades, it may still be able to field a large conventional force--a force that would perhaps enjoy overwhelming capabilities by compassion with a number of neighboring states. But such an armed force would have little capacity for projecting military power far beyond its borders or against Great Power adversaries--no matter how courageous, and casualty-tolerant, the Russians happened to be.

Conclusion

A decade ago--at the end of the Soviet era--the Russian Federation contained the world's fifth largest population. By 2020, according to UN projections, Russia's population will be no more than ninth. In the late 1980s, Russia's life expectancy, though lower than Europe's, Japan, or America's, was nonetheless higher than Asia's or Latin America's; twenty years from now, according to UN projections, Russia's life expectancy would be lower than those of 125 of the 188 countries and territories assayed--and as we have seen even this may turn out to be an optimistic assessment.

In the Soviet era, Russia was the sick man of Europe. Today, it is also the sick man of Asia. This illness does not look to be quick in passing. The humanitarian implications of Russia's health crisis are enormous. The strategic implications also appear to be inescapable.

Russia's well-wishers--like the Russian people themselves--should hope for a speedy establishment of civil society, a sturdy rule of law, and sound, steady economic policies for the Russian Federation. They should also pray for enlightened public health measures to attack frontally the country's terrible health situation (a program, incidentally, to which none of Russia's many political parties at this time are yet committed.)

Russia's imagined antagonists, for their part, should not base their fears and apprehensions on the specter of a rapidly reviving "Great Power" Russia. As orderlies at medical institutions around the world can attest, even a weakened patient must be treated with care if he is seized by delirium. But it looks like Russia is going to be in bed for a long, long time.