Table 13: Calculations of Excess (Attributable) Mortality among Under Five-Year-Olds (Most Likely Model)

Year	Baseline Death Rate per Thousand Under Five-Year-Olds	Period Death Rate per Thousand Under Five-Year-Olds	Excess Deaths per Thousand Under Five-Year-Olds	Percent Rate Increase (excess deaths divided by baseline rate)	Under Five-Year-Olds (in Thousands)	Est. Excess Deaths †
1990*	40	40	0	0	2,756	0
1990**	40	46	6	15	2,756	1,102
1991	40	100	60	150	2,921	35,052
1992	39	70	31	79	3,096	19,195
1993	38	65.5	27.5	72	3,282	18,051
1994	37	73	36	97	3,479	25,049
1995	36	80.5	44.5	124	3,688	32,823
1996	35	87	52	149	3,909	40,654
1997	34	87	53	156	4,144	43,926
1998***	33	87	54	164	4,393	11,861
TOTAL						227,713

* First eight months

** Last four months

*** First quarter only

† Excess deaths per thousand times under five-year-old population per thousand, divided by 5 (children under five stay in the population five years)

Comparisons with Iraqi Reports of Excess Deaths

Many of the claims of million-plus deaths due to economic sanctions are based on Iraqi Ministry of Health information provided since 1993 on the number of 'excess deaths' recorded in hospitals due to selected causes. Among children under five years of age, all deaths due to respiratory infections, diarrhea, gastroenteritis, and malnutrition are counted as deaths caused by sanctions. Among those over five years of age, all deaths due to cardiac diseases, hypertension, diabetes mellitus, renal diseases, liver diseases, and cancers are counted as caused by sanctions. These data are presented in table 14.

There are serious methodologic problems with these data. First, not all the deaths from these causes are related to sanctions. Indeed, cancer and heart diseases were the most common causes

of death among adults prior to the Gulf war. Second, 'diagnostic drift' among physicians in all countries is notoriously common, especially in politically or social charged situations. Diarrhea and respiratory infections were the most common underlying causes of death among young children in Iraq prior to the Gulf war. Some of the increase in the numbers of deaths recorded as being due to these causes may be affected by subtle as well as not so subtle pressures to consider these the immediate cause of death in the current period.

Finally, many deaths occur outside of hospitals and would not be included in the data systems from which these data come. In 1989, for example, only about a third of all estimated deaths among under five-year-olds were registered in hospitals. Since the embargo, many people now no longer go to hospitals, or go to hospitals for only a brief period. Finding no treatments, they likely take their family members home to die in far greater numbers than before sanctions were imposed. Moreover, many hospital-based deaths are listed as 'causes unknown' due to the lack of adequate diagnostic and laboratory equipment. Most hospital data systems are in disarray, with clinical notes written on odd scraps of paper or old charts of other patients (8). Most hospital statistical offices no longer generate routine reports and few of their computers still work. Many hospital-based deaths must go unrecorded or misdiagnosed in such an environment.

The so-called sanctions-related deaths in Iraq could well be interpreted as an accounting of all hospital-based deaths. A more precise estimate of excess deaths in Iraqi hospitals would be made if the 'baseline' level of 7100 (derived from multiplying the 592 average deaths per month among under fives in 1989 shown in table 1, by 12, for an annual average) is used. Compounded for population growth and subtracted from the total deaths reported for subsequent years, the direction of excess deaths in this exercise is similar to those reported by Iraq for under five-year-olds.

Even gross estimates of deaths among those *above* age five are much more problematic to generate. Adult pathologies are less dependent on environmental and social conditions for which we have good estimates and depend more on clinical variables. No attempt will be made to estimate above five year old excess deaths here.

The figure of 106,106 excess deaths (See table 12) from 1990 through the first quarter of 1998 is intended to be a best conservative estimate of excess mortality among under five-year-olds. Excess deaths are not the only important impact on health and welfare of the population. Prior to 1990 death came to about one in every twenty Iraqis under age five. During the 1990s about one additional Iraqi out of twenty born died before reaching age five. Even a small number of documentable excess deaths is an expression of a humanitarian disaster, and this number is not small. But damages also are likely to occur among many of the other eighteen out of twenty Iraqis who do not die prior to age five. Many of these damages may be serious or irreparable. In Iraq these likely include reduced mental capacity due to malnutrition, reduced educational achievement because of school dropouts, social deterioration from family breakdown and poverty growth, and reduced governability through increases in crime and lawlessness. Excess mortality is important as a severe denial of all rights to affected individuals and because it is a measurable state. It may well be that these other impacts, less clearly countable or attributable to sanctions, may be more important for quality of life among Iraqis overall. Excess deaths should thus be seen as the tip of the iceberg among damages to occur among under five-year-olds in Iraq in the 1990s.

Table 14: Estimated Excess Deaths, Ministry of Health and This Analysis Compared

Year	Baseline Deaths Reported by Iraqi Ministry of Health in 1990 and Projected for Population Growth	Death among Under Five-Year-Olds Reported by Iraqi Ministry of Health	Excess Deaths Among Under Five-Year-Olds Reported by Iraqi Ministry of Health	Estimated Excess Deaths in the Conservative Analysis	Estimated Excess Deaths in the Likely Analysis
1990	7,537	8,903	1,366	0	1,102
1991	7,989	27,473	19,484	4,134	35,052
1992	8,468	46,933	38,465	7,717	19,195
1993	8,976	49,762	40,786	11,300	18,051
1994	9,515	52,905	43,390	14,882	25,049
1995	10,086	55,823	45,737	18,465	32,823
1996	10,690	56,997	46,307	22,048	40,654
1997	11,332	57,656	46,324	22,048	43,926
1998*	3,003	17,820	14,817	5,512	11,861
TOTAL			**296,676**	**106,106**	**227,713**

***First quarter only**

The Significance of Mortality Changes

The total number of war-related Iraqi civilian and military deaths may have been as high as 66,663.[7] The minimum estimates of under five-year-old mortality detailed above represent close to four civilian deaths during the postwar embargo, 1991 through 1997, for each war-related death. By contrast, the Al Furdos bomb shelter, bombed on 13 February 1991 during the Gulf war, resulted in the death of 209 civilians. Targeting of that site resulted in an international outcry, an apology from the U.S., and a modification in the criteria for choosing subsequent bombing targets. Yet current excess death levels among under five-year-olds, conservatively estimated earlier in this analysis from 1996 through 1997 as 60 per day, comes close to that level *every day*. Similarly, the bombing raids by the UK and the U.S. in December 1998 resulted in an estimated 60 civilian deaths. It went unreported that during those three days, 180 Iraqi civilians likely lost their lives due to worsened living conditions related to the sanctions.

How sure can we be that under five-year-old mortality rose in Iraq? The 'gold' standards of evidence for this assertion do not yet exist. Strong and consistent survey data collection, in some cases by independent international researchers, show deteriorating nutrition, water quantity and quality, sanitation, literacy, and immunization levels. Hyperinflation, stagnant salaries, and shortages or high prices for medical goods and food throughout the 1990s are consistent with these disastrous trends. Flawed reporting from the Iraqi Ministry of Health, mistakes in carrying out or interpreting some nutritional surveys, and a lack of access to some of the original survey data sets limit our ability to determine with confidence the levels to which mortality has risen. To overcome these problems, this paper developed a variety of means to independently estimate mortality levels among under five-year-olds. Those analyses showed a considerable rise in mortality. The final estimate used is the most conservative of the estimates made.

What made mortality among under five-year-olds rise? A short-term rise in deaths occurred during the initial embargo in 1990. Diarrhea and war-related mortality rose steeply during and following the Gulf war and postwar insurrection in 1991. Starting in 1991, decreased access to food and increased risk of respiratory and diarrheal infections led to a marked increase in malnutrition among those reaching twelve months of age, when the protections offered by breast feeding have waned and risks from poor weaning practices rise. Those unprotected by breast feeding were at far greater risk. Although the prevalence of breast feeding was high, supplementary bottle feeding was also high and rising. Few infants were exclusively breast fed during the first six months, and the introduction of complementary semisolid foods failed to reach a third of children aged six to nine months. Malnutrition among women giving birth led to a high rate of low weight births and high perinatal mortality. Without significant improvements in sanitation, food sources, or medical care, many of the children with acute malnutrition after weaning became chronically malnourished as toddlers. They were at increased risk of serious disease and death, especially from measles, diarrhea, and respiratory infections. Throughout Iraq, grain and meat production fell, purchasing power and educational achievement declined, and the energy, water, medical, and transportation infrastructure declined. These changes left all Iraqis at greater risk for poor health outcomes. This risk was greatest among those with more limited access to goods, services, and infrastructure. This included those in rural areas, those with lower income and educational levels, girls, and those where the public health infrastructure was repaired the least (especially southern governorates).

Why didn't the Iraqi government respond more rapidly and effectively to the decline in heath and deterioration of the health system? Iraq's health and social systems, designed on a capital-intensive model of importation of goods to raise the standard of living, were poorly suited to Iraq's suddenly transformed epidemiologic situation in the 1990s. The health system in the 1980s was heavily oriented toward sophisticated curative care. Many physicians received specialty education in advanced clinical specialties but few public health or community health specialists were trained. Thus, there were few people with the skills to facilitate efficient reorganization or rationing decisions in the health system. The Iraqi government resisted reorganizing to confront the economic crisis caused by sanctions, in apparent hopes that sanctions would not last long. The Iraqi national consciousness of 'sitting on a sea of oil' also mitigated against a culture of adaption to what became a severe and sustained capital shortage. Finally, with a highly centralized, one-party political system, popular pressure from the Iraqi

people did not exist to demand a more effective response by the government. While waiting in vain for the return of oil-based affluence in the early 1990s, Iraq was heavily isolated from potential international assistance in remodeling the health system. Major changes in the focus of the health system were needed to encourage breast feeding, promote measles immunization, introduce appropriate weaning foods, screen children and provide supplementary rations for those in need, and focus on providing simple and early interventions for diarrhea and respiratory infections. These changes began only in 1995 and have grown slowly since then.

Why did levels of malnutrition level off around 1996? The eventual development of the primary care strategy outlined above probably contributed to the plateauing of rising levels of malnutrition. Since 1997 the promise, and then the reality, of oil for food relief, eased the economic crisis and made more medicines and foods available.

What further research is needed now? We need to learn much more about the impact of social deterioration on those who do not die in Iraq. Among children, this includes research on changes in mental capacity, educational achievement, and access to learning materials among those in school; employment and survival strategies among those not in school. Changes in learning and employment opportunities in higher education and in-service training should similarly be explored. Changing types and levels of delinquency and familial and governmental responses should be studied. Changing patterns and levels of family formation, family functioning, and family-related social pathologies should be identified. The changing knowledge and practice base of professionals, cut off from routine international exchange, should also be identified. We should learn more about the nutritional status of older children and adults and identify the pathways by which those changes occurred. Changing patterns of resource generation and utilization, including both formal (money) and informal (unpaid labor) resources, in Iraqi households should be identified. This will assist in identifying the coping strategies used throughout the decade.

Now in its third year, an extensive review of the oil for food program is needed. Where, and in what ways, has this program been successful? In what ways has it been ineffective in improving humanitarian conditions in Iraq, and why? What further areas should be included in the oil for food program if any? Addressing these issues will facilitate dealing with the most important question of all—when moving from the humanitarian assistance oil for food program to postcrisis reconstruction and development, what strategies and issues should be given priority? How can reconstruction be implemented in the most efficient and effective manner to speed Iraq's recovery?

What level of humanitarian suffering is acceptable? According to the Charter of the UN and the international human rights conventions, governments and international organizations are responsible for protecting and improving social and economic conditions. No dogma exists to establish an acceptable level of violations of these conditions or to measure the trade-offs between one class of rights and another. In practice, human rights covenants specifying rights to safety, security, health care, and education of citizens in embargoed countries have been frequently and repeatedly violated. It may be argued that embargo-related violations are a 'lessor of evils' compared to the ills the embargo against Iraq is designed to prevent (nuclear weapons) or limit (biological and chemical weapons, violations of borders). Yet even if there may be