State Failure Task Force Report: Phase II Findings

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Abstract: In response to a request from Vice President Al Gore in 1994, the CIA established "The State Failure Task Force," a group of independent researchers to examine comprehensively the factors and forces that have affected the stability of the post-Cold War world. The Task Force's goal was to identify the factors or combinations of factors that distinguish states that failed from those, which averted crises over the last 40 years. The study represents the first empirical effort to identify factors associated with state failure by examining a broad range of demographic, societal, economic, environmental, and political indicators influencing state stability. The Task Force found that three clusters of variables had significant correlation with subsequent state failures: (1) quality of life; (2) openness to international trade; and (3) the level of democracy. However, it is the interaction among these variables that provided the most important insights. Following are excepts from Phase II of the State Failure Task Force findings.

Introduction

The initial report of the State Failure Task Force[1] developed a global model of the factors that contributed to serious political crises over the last four decades. In this report, we describe the progress of the Task Force on four additional research issues:

- Confirmation and refinement of the global model. This work included testing the model on an updated problem set, varying the set of control cases, and testing new or refined variables. In particular, we refined the level-of-democracy variable to examine partial democracies—countries that combine democratic and autocratic features—and their risks of state failure.

- Fitting a model for Sub-Saharan Africa. We also examined how the global model might best be modified to apply to the countries of Sub-Saharan Africa. To improve the accuracy of prediction, the Task Force undertook a pilot study of event sequences in a limited number of Sub-Saharan African cases of state failure and state stability to identify factors that could be precipitators or "accelerators" of crises.

- Transitions to democracy and autocracy. The initial study only examined cases of adverse or disruptive regime transitions. Because of the great interest in transitions to democracy, and the conditions that provide for stable or unstable democracy, the Task Force applied its methodology for analyzing risks of state failure to transitions toward and away from democracy. This report explores the preliminary findings of these analyses of the emergence and decay of democratic regimes.

- The role of environmental factors in state failure. It appeared from the Phase I results that environmental factors did not directly contribute to the risks of state failure. The Task Force believes that this finding was due, in part, to the paucity, poor quality, and lack of comparability of the national-level environmental data and, in part, to the impact of environmental factors on political conflicts being mediated by other economic, social, and political conditions. We, therefore, undertook special initiatives to assess the state of global environmental data and to develop a mediated, two-stage model of the role of environmental factors on the risks of state failure. In this model, it appears that environmental hazards—in states with underlying vulnerabilities and limited governmental or social capacity to respond to environmental deterioration—is associated with increased risk of state failure.

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I. Confirmation and Refinement of the Global Model

Updating the Problem Set and Revising the Control Cases

One problem frequently encountered in statistical analyses such as the one performed in the initial phase of the State Failure project is that specific results may be highly sensitive to a particular data set.[2] If the results reflect statistical accidents, rather than underlying social and political forces, then slight changes in the data set may greatly shift the results. Adding or subtracting cases, or changing the particular control cases, could make some variables newly significant or remove some variables from the list of significant factors. Our first task in re-examining our results was to update the problem set to include state failure cases from 1994-96, and to select new control sets for testing this new data, to make certain that our initial results proved robust.

It was reassuring to find that despite significant revisions and updating of the problem set and analyses using two different sets of control cases and three distinct analytical techniques, the *same* three variables—infant mortality, trade openness, and level of democracy—emerged as the critical discriminators between stable states and state failures. Moreover, these analyses resulted in about the same two-thirds range of accuracy in discriminating failures and stable cases.

State Failure Cases[3]

The set of "state failure cases" in the initial State Failure Task Force Report was updated and revised by reexamining all of the cases and consulting area experts to identify recent events (1994-96) for inclusion.[4] A number of cases in the initial problem set were dropped as being of insufficient magnitude or not meeting the precise definitions for failure events. A considerable number of new cases from recent years were added. However, none of these changes affected the global model results.

Control Cases[5]

The two new sets of control cases were obtained, as before, by randomly selecting to match every country-year that preceded a state failure by two years, three countries that were stable (experienced no crises for the succeeding five years). Changing the control sets made no difference to any of the global model results.

The three analytical techniques used were logistic regression, neural network analysis, and genetic algorithm modeling.[6] Logistic regression and neural network analysis were used to estimate the "predictive" accuracy of our models. Genetic algorithm modeling was used to help identify candidate sets of variables, as a check on the univariate regression methodology, and to validate the suggestions of Task Force social science and area experts. Although each method relies on different assumptions and methods of estimation, all techniques converged on identifying the same three-factor model as the most efficient discriminator between stable and failure cases and yielded models with accuracy of predicting case outcomes of about two-thirds.

Figure 1: Phase I Analytic Process

Identified State Failure and Control Cases

113 failure cases, including:
- Revolutionary wars
- Ethnic wars
- Genocides or politicides
- Adverse or disruptive regime changes

339 control cases, randomly selected

Selected Variables To Test for Association with State Failure

Some 600 variables evaluated:
- Demographic and societal
- Economic
- Political and leadership
- Environmental

Total of 75 high-priority variables selected:
- Most likely to correlate with state failure
- Based on reasonably complete and reliable data

Applied Analytical Methods

Single variable tests identified…
31 variables best at distinguishing failures from nonfailures

Analysis of combinations of up to 14 of these using:
- Statistical logistic regression analysis
- Neural networks analysis

Formulated Models

Single-best model relied on three variables:
- Infant mortality-indirect measure of quality of life
- Openness to international trade-value of imports and exports divided by GDP
- Level of democracy-from information on political institutions

Table 1: Historical State Crises, by Type

Type of Crisis	Initial Phase	Phase II
Revolutionary war	41	50
Ethnic war	60	59
Regime transition	80	88
Genocide and politicide	46	36
Total Number of Consolidated Crises	113	127

Summary of Phase I Findings

The global model developed in the initial phase of the State Failure project and detailed in the task force report[a] had the following features:

- *It considered as "failures" four different kinds of political crisis—revolutionary wars, ethnic wars, adverse or disruptive regime transitions, and genocides or politicides—of varying magnitudes.*
- *The model examined all such crises that occurred during the years 1957-94 in countries whose population in 1994 was greater than 500,000 according to US Census Bureau data.[b]*
- *The model compared conditions in countries that experienced crises at a time two years before the onset of a crisis with conditions in a matched set of stable—or "control"—countries that did not experience a crisis any time in the succeeding five years.*

The global model was developed after examining hundreds of candidate factors suggested as theoretically relevant to state crises and rigorously analyzing 75 variables that had been deemed highly relevant by experts and had global data available for most of the 1955-94 period. The Task Force found that the most efficient discrimination between "failure cases" and stable states was obtained from a global model with only three factors: the level of infant mortality, the level of trade openness, and the level of democracy.

For this global model, a country's infant mortality was measured relative to the world average level of infant mortality in a given year (to correct for a long-term global decline in infant mortality rates). Trade openness was measured as the total value of imports plus exports as a percentage of a country's GDP. Countries were classified as either "More Democratic" or "Less Democratic" (autocracies) on the basis of their level of institutional democracy.

Using these three variables, roughly two-thirds of historical failure and nonfailure cases could be accurately classified. In addition, several interesting relationships among these factors were found:

- *Although high infant mortality consistently appeared to be linked to state failures, we are certain that there is NO direct causal connection between infant deaths and ensuing political crises. Instead, infant mortality appears to be acting primarily as an indicator for the overall quality of material life. Like the canary in a coal mine, whose death indicates serious health risks to miners, high infant mortality serves as a powerful indicator of more broadly deleterious living conditions. This was clear since in some models, income level (real GDP per capita) worked almost as well as infant mortality in predicting state failure. In addition, both infant mortality and GDP per capita could be replaced by a bundle of health and welfare indicators, such as levels of nutrition, health care, and education with almost the same results. Infant mortality plays a key role in the global model not because infant deaths per se are a causal factor, but because infant mortality is the single-most-efficient variable for reflecting a country's overall quality of material life.*
- *The effects of trade openness and infant mortality on risks of state failure were separate, not overlapping. Levels of trade openness and infant mortality showed almost no relationship. They varied independently and operated independently to affect state failure risks.*
- *Infant mortality had a much stronger impact on the risk of state failure in democracies, and had a relatively weak effect on the risk of failure in less democratic countries. Trade openness showed the reverse pattern; that is, trade openness had a stronger impact on the risk of state failure in less democratic countries and had a weaker, though still significant, impact on failure risks in more democratic countries.*
- *Three additional variables were found to be important indicators for specific kinds of political crises, although they did not emerge as important in the overall model. For adverse or disruptive regime changes, regime duration was a significant factor. New regimes were found to have substantially higher risks of further adverse or disruptive changes in their earlier years. For ethnic conflicts, both the ethnic character of the ruling elite and a youth bulge were found to be important factors. Ethnic wars were most likely when a single ethnic group dominated the ruling elite; this was true whether the dominant group came from a minority or majority ethnic group. In addition, the risks of ethnic war were greatly increased by the presence of a "youth bulge"; that is, a large percentage of 15 to 29-year-olds relative to the population age 30-54.*

[a] *See Esty, Daniel C., Jack A. Goldstone, Ted Robert Gurr, Pamela Surko, and Alan Unger. Working Papers: State Failure Task Force Report. McLean, VA: Science Applications International Corporation, 30 November 1995.*

[b] *Despite being over our population size cutoff, two countries were omitted: Eritrea (because data were not available) and Qatar. Two countries with populations below 500,000 using US Census Bureau data—Comoros and Luxembourg—were inadvertently included. These deviations from the rule did not contribute significant error, however, because the number of countries in the study was large.*

Retesting With a Refined Level of Democracy Variable

The original global model, using infant mortality, trade openness, and level of democracy, measured democracy as a dichotomous variable, classifying countries as "more democratic" or "less democratic." However, it became apparent that not all democracies were "equal" in their vulnerability to state failure. The rich and well-established democracies were extremely stable. In contrast, the more recently established and poorer democracies were at very high risk of failure. Given this result, and the interests of policymakers in democratic transitions, it was clearly important to better differentiate the democracy variable to examine the risks associated with "partial democracies."

Using both the democracy and autocracy scales of the Polity III Global Data Set[7], each country was classified as a full democracy, a partial democracy, or an autocracy, on the basis of its political institutions:[8]

- Full democracies have all the characteristics of liberal democracy—such as elections, competitive parties, rule of law, limits on the power of government officials, an independent judiciary—and few or none of the characteristics of autocracy.
- Partial democracies have some democratic characteristics—such as elections—but also have some autocratic characteristics, such as a chief executive with almost no constraints on his/her power, sharp limits on political competition, a state-restrained press, or a cowed or dependent judiciary. Most are countries that have recently transitioned toward democracy but have not yet fully replaced autocratic practices and institutions; some resemble what Fareed Zakaria has referred to in a recent *Foreign Affairs* essay as "illiberal democracies."[9] They are countries that have adopted some democratic practices but have not yet fully extinguished autocratic practices in their government.
- Autocracies have various characteristics of autocracy and few or none of the characteristics of democracies.

Guarantees of political rights are essential to institutionalized democracies, and most such

Figure 2: Global State Failures, 1955-96

Figure 3: Number of Global State Failures by Type, 1955-96

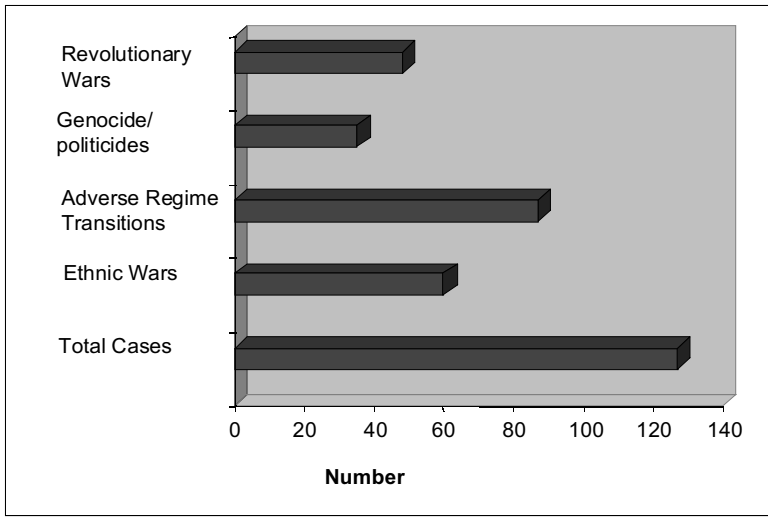


Figure 4: Global State Failures: Revolutionary Wars, 1955-96

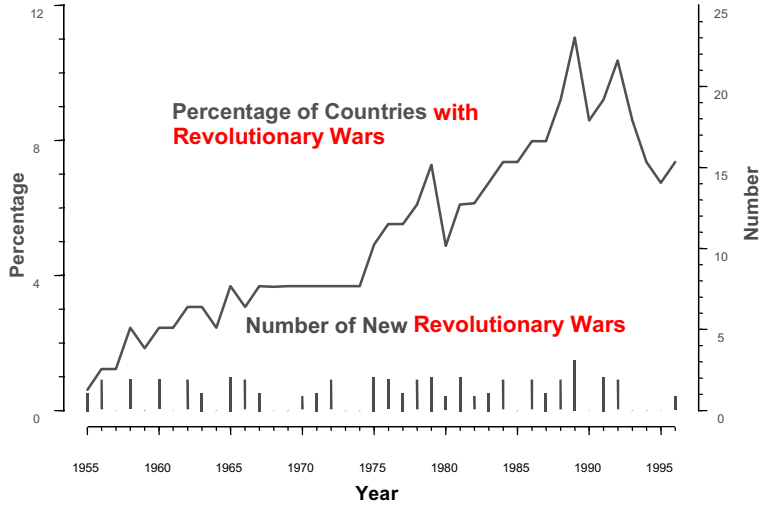


Figure 5: Global State Failures: Ethnic Wars, 1955-96

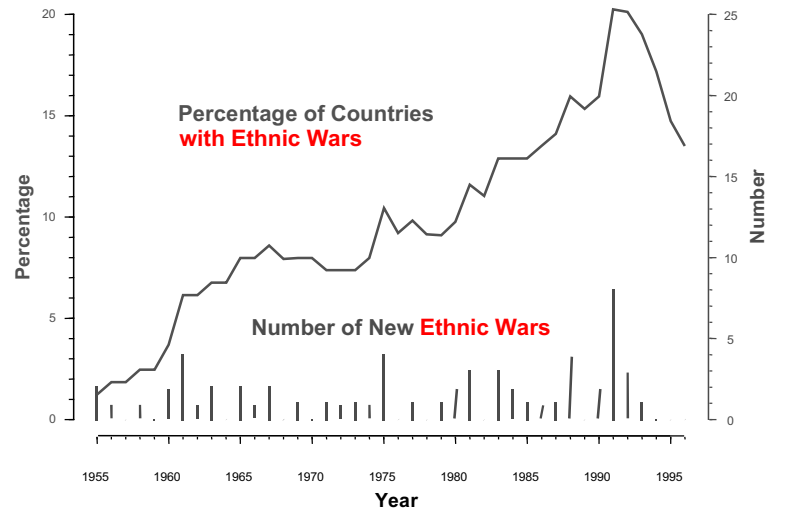


Figure 6: Global State Failures: Genocides and Politicides, 1955-96

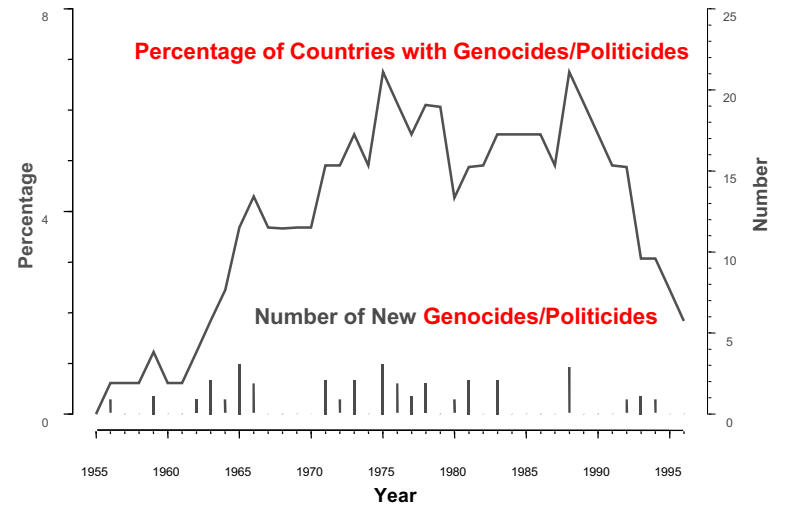
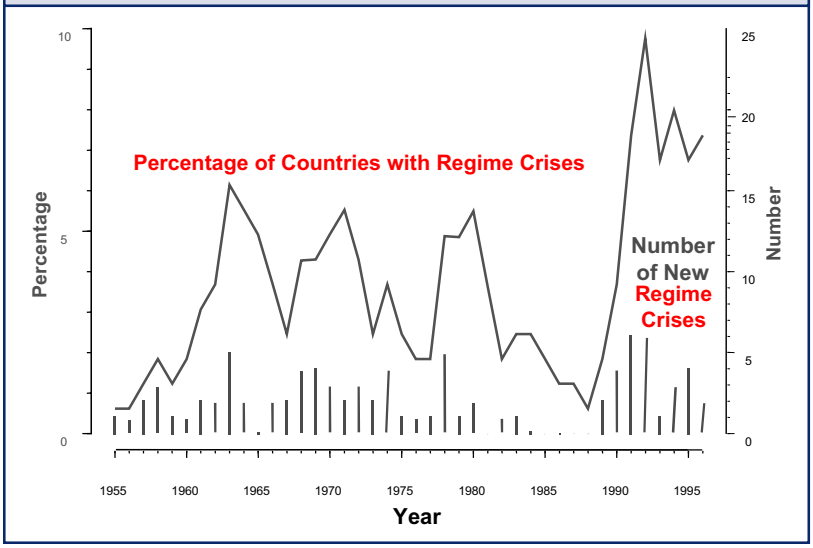


Figure 7: Global State Failures: Adverse or Disruptive Regime Changes, 1955-96



polities guarantee civil rights to all citizens. Therefore, while the democracy index is based on an analysis of political institutions, it correlates very closely (+.90) with Freedom House indices of political rights and civil liberties.

Results

Using the trichotomized measure of democracy, we discovered that *partial democracies are indeed far more vulnerable to state failure–type crises than are either full democracies or autocracies.* To be precise, when using this measure of democracy in the global state failure model—along with infant mortality and trade openness—to discriminate between stable and crisis cases, we find that partial democracies, other things being equal, are on average *three times* more likely to fail.

This refined version of the global model also confirms and makes more precise our estimates of the impact of trade openness and infant mortality (or overall quality of material life) on failure risks. Using the updated problem set, revised data, and new control cases, we find that states with above-average trade openness, other things being equal, have one-half the failure risk of countries with below-average trade openness. In addition, countries with above-world median levels of infant mortality have, other things being equal, three times the risk of state failure as compared with countries with below-median levels of infant mortality.

II. Fitting a Model for Sub-Saharan Africa

In the initial work of the Task Force, there was some concern that grouping advanced democratic nations and poor autocracies in one global analysis was like comparing apples and oranges. We have, therefore, applied our analytic techniques to testing the model on those crisis events and a matched set of control cases, drawn solely from the countries of Sub-Saharan Africa.[10] In addition to testing all of the factors that emerged as significant in the initial report, we also examined a variety of additional factors that area experts suggested as specifically relevant to Africa, including a country's colonial heritage, conditions of ethnic discrimination, and level of urbanization.

The model that most effectively discriminated between crisis cases and control

Changes to the List of Historical State Crises

The set of crises used in the analyses reported here consists of 127 "consolidated" cases of state failures, of a single type, and complex events involving several different kinds of failure in sequence. This is 14 more than in the initial study. The differences, as compared with the list in the initial report, can be summarized as follows:

- *Revolutionary wars. Examples of cases added are Islamist revolutionary movements in Egypt (1986 to present) and in Algeria (1991 to present) and the revolutionary war that overthrew Mobutu's regime in Zaire (now Congo-Kinshasa) in 1996-97.*
- *Ethnic wars. Some ethnic rebellions from the original list were dropped because they were of very low magnitude; others were consolidated into other events. An example of a consolidated case is India, where multiple autonomy rebellions from 1952 to the present are treated as one event. Some internal wars meet the criteria of both revolutionary and ethnic wars, such as the civil war for control of the Afghan Government (1992-97) fought by political movements based on the Pashtuns, Tajiks, Uzbeks, and Hazaris.*
- *Adverse or disruptive regime transitions. A number of cases were dropped and others added. Examples of recent failures of democratic regimes now included in the data set are Albania 1996, Armenia 1994-96, Belarus 1995-96, and The Gambia 1994. Dates and descriptions of a number of historical cases also were changed on the basis of new and more detailed information.*
- *Genocides and politicides. No new cases since 1994 were identified, although indiscriminate attacks on civilians in Chechnya during 1994-96 approached the threshold for politicide. The cases dropped were ones in which killings of civilians did not, on closer examination, appear to be part of a systematic and sustained policy. For example, killings of Kurdish civilians by Kurdish militants and the Turkish military since 1984 are not numerous or widespread enough to meet the definitional criteria.*

In addition, the three lowest magnitude ethnic wars—Papua New Guinea (Bougainville, 1988-97), Thailand (Malay Muslims, 1993-present), and the United Kingdom (Catholics in Northern Ireland, 1969-94)—were excluded from the global analysis of state failures because they were considered too small to count as major events. They were, however, retained in the data set for future study of ethnic conflicts.

[a] Other conflicts categorized and counted as both revolutionary and ethnic wars are Angola 1975-97, Ethiopia 1975-91, and Somalia 1988 to the present.

Trends and Patterns in State Failures

Some types of state failure are particularly likely to lead to other failures, with several patterns emerging from the analysis of discrete and complex cases:

- *There is a substantial risk that internal wars—revolutions and ethnic conflicts—will precede other state failures. Of 50 revolutionary wars, 19 (38 percent) are the first event in a complex case that subsequently included one or more adverse regime transitions, ethnic wars, or genocides. The percentage is higher for ethnic wars—44 percent (26 of 59) of these are the first event in a complex case.*
- *Adverse and disruptive regime transitions are less likely than revolutionary or ethnic wars to lead to other kinds of state failures. Nearly half (41 of 88) are discrete events; less than one-fifth (15 of 88) proved to be the first stage in a complex event.*
- *Genocides and politicides almost always are a consequence of other kinds of state failure. Usually the connection is clear-cut, for example, when an authoritarian regime seizes power and sets out to eliminate political opponents (as in Chile 1973-76) or when revolutionary or ethnic challenges prompt a regime to use extreme measures to reestablish security (as in Indonesia against suspected Communists in 1965-66 and against East Timor nationalists after 1975). In 1996, the only ongoing episode was in Sudan.*

There also are distinctive trends in the onset and frequency of each type of state failure. In the aggregate, the number of states in failure increased up to the end of the Cold War, but in the mid-1990s began to decline. Revolutionary wars have declined in frequency; whereas, ethnic wars have tended to increase, most sharply so in the immediate aftermath of the Cold War. Adverse and disruptive regime transformations, on the other hand, have no distinct long-term trend but show a sharp upward spike in the 1990s, mainly due to failures of new and partially democratic regimes in Africa and some of the post-Communist states.

Table 2: Global Model Results

Key Variables	**Countries at Greater Risk**	**Countries**
Material Living Standards	Infant mortality above median	Infant morta
Trade Openness (imports+exports)/ GDP	Below median	Above medi
Level of Democracy	Partial democracies	Autocracies;

Figure 8: Countries by Level of Democracy, 1996

Full Democracies		Partial Democracies	Autocracies	
Argentina	Lesotho	Bosnia and Herzegovina	Afghanistan	Nigeria
Australia	Lithuania	Cambodia	Albania	North Korea
Austria	Madagascar	Comoros	Algeria	Oman
Bangladesh	Malawi	Congo, Republic of the [a]	Angola	Rwanda
Belgium	Mali	Ethiopia	Armenia	Saudi Arabia
Benin	Mauritius	Fiji	Azerbaijan	Serbia and Montenegro
Bolivia	Mongolia	Georgia	Bahrain	Singapore
Botswana	Namibia	Ghana	Belarus	Somalia
Brazil	Nepal	Guinea-Bissau	Bhutan	Sudan
Bulgaria	Netherlands	Guyana	Burkina Faso	Swaziland
Canada	New Zealand	Honduras	Burma	Syria
Central African Republic	Nicaragua	Jordan	Burundi	Tajikistan
Chile	Norway	Kyrgyzstan	Cameroon	Togo
Columbia	Panama	Malaysia	Chad	Tunisia
Costa Rica	Papua New Guinea	Mexica	China	Turkmenistan
Cyprus	Philippines	Moldova	Congo, Democratic Republic of the [b]	Uganda
Czech Republic	Poland	Mozambique	Cote d'Ivoire	United Arab Emirates
Denmark	Portugal	Pakistan	Croatia	Uzbekistan
Dominican Republic	Romania	Paraguay	Cuba	Vietnam
Ecuador	Slovenia	Peru	Egypt	Zimbabwe
El Salcador	South Africa	Russia	Gabon	
Estonia	South Korea	Senegal	The Gambia	
Finland	Spain	Sierra Leone	Guinea	
France	Sweden	Slovakia	Indonesia	
Germany	Switzerland	Sri Lanka	Iran	
Greece	Taiwan	Tanzania	Iraq	
Guatemala	Thailand	Yemen	Kazakhstan	
Haiti	The Former Yugoslav Republic of Macedonia	Zambia	Kenya	
Hungary			Kuwait	
India	Trinidad and Tobago		Laos	
Ireland	Turkey		Lebanon	
Israel	Ukraine		Liberia	
Italy	United Kingdon		Libya	
Jamaica	Uruguay		Mauritania	
Japan	Venezuela		Morocco	
Latvia			Niger	

[a] Congo (Brazzaville) [b] Congo (Kinshasa)

cases in the Sub-Saharan Africa model had six significant elements.[11]

Level of Democracy

As with the general model, partial democracies were most vulnerable to state failure. This result again showed a high degree of statistical significance. However, while in the global model full democracies and autocracies were about equally stable, in Sub-Saharan Africa autocracies were slightly more stable than even full democracies—presumably because in Africa full democracies have greater problems managing ethnic conflicts and fluctuations in material living standards than do the full democracies of Europe and North America. In addition—and this is one of our most striking results—we found that the vulnerability of partial democracies to state failure was especially great in Sub-Saharan Africa and much higher than in the world at large. The precise results of this model were that in Sub-Saharan Africa, other things being equal, partial democracies were on average 11 times more likely to fail than autocracies. Full democracies were far less vulnerable; other things being equal, they were on average more than twice as likely to fail than autocracies.

Trade Openness

Trade openness is also confirmed as a highly statistically significant correlate of state failure. The greater a country's trade openness, the *less* likely that country is to experience a major state crisis. As in the global model, other things being equal, countries in Sub-Saharan Africa that were above the median in trade openness were on average only about one-half as likely to fail as countries below the median.

Change in Material Living Standards

In the global model, which compared countries with a huge

Key Variables

Key variables measure the following items:

- *Infant mortality. Although this variable directly captures reported deaths to infants under one year old per thousand live births, it also serves as an indirect measure of a host of broad-based material standard of living and quality-of-life indicators. Infant mortality is strongly correlated with a variety of other variables encompassing economic performance, education, social welfare, environmental quality, and democratic institutions.*
- *Trade openness. This variable is a ratio that measures the value of imports plus exports divided by GDP. Of the other variables analyzed in the first phase of this project, it correlated only with the density of roads—generally accepted as an indicator of economic development—and population size.*
- *Level of democracy. This variable is constructed from information on political institutions. Democratic regimes have competitive political participation, elected chief executives, and significant checks on executives' exercise of powers. The variable correlates closely with indicators of civil and political liberties and also with measures of economic well-being.*
- *Regime durability. This variable is a count of the number of years since the last major, abrupt change in regime. Abrupt shifts toward or away from democracy count as regime changes and reset the duration count to zero. Regime changes that follow state breakdown and civil war also reset the count. Nonviolent transitions from one authoritarian regime to another, or one democratic regime to another, do not register on this variable. Regime duration is correlated with several indicators of economic development, including per capita GDP.*
- *Youth bulge. This variable is a ratio of the population in the 15- to 29-year age bracket relative to that in the 30 to 54-year age group. It correlates with six other variables related to economic development and education.*
- *Ethnicity of the ruling elite. This is a variable that compares the ethnic composition of the ruling elite to that of the population at large in an ethnically divided society. It indicates whether the elite demographically represents a minority group, a majority group, or the population as a whole. It is uncorrelated with other variables in this study.*
- *Annual change in GDP per capita. This variable indicates the direction of recent changes in material welfare. It is measured by taking the change in real GDP per capita from the previous year. Positive change indicates growth; negative change indicates economic decline.*
- *Level of Urbanization. This variable measures the proportion of total population that is living in cities of 100,000 inhabitants or larger. It captures the degree to which a country's overall population is urban.*
- *Colonial heritage. This variable compares the impact of French colonial heritage to the average impact of all other former colonial powers in Sub-Saharan Africa. It has often been opined that different colonial powers left (or are still active in creating) different degrees of political stability in their former colonies. While there are not enough cases to support statistical tests for every past power—Britain, France, Germany, Italy, Belgium, and Portugal—on the recommendation of area experts, we chose France as a country with many former colonies and a still active role in most of the period covered.*
- *Ethnic discrimination. This variable is derived from information on ethnic and religious groups that are economically or politically disadvantaged because of present or past practices of discrimination by dominant groups. The indicator signifies the existence of at least one politically significant communal group subject to significant discrimination or that sought greater political autonomy from the state in which it was situated.*
- *Land burden. This variable is the number of farmers per unit of cropland multiplied by the ratio of farmers to the total number of workers. It is highest in countries where a large proportion of the population is dependent on agriculture, but arable land is limited.*
- *Deforestation rate. This variable measures the annualized rate of change in forest area from 1980 to 1990, using data provided by the UN Food and Agriculture Organization.*
- *Telephones per capita. This variable measures the number of telephone lines in a country divided by the total population. It is used as a rough indicator of a country's capacity to respond to "shocks" or changes. A country's ability to install and operate a major physical infrastructure reflects, we believe, its general ability to "get things done." In addition, there are reasons to think that communication capacity is especially important for effective responses to environmental problems. Telephones per capita correlates highly with per capita GDP level, although the annual changes in the two variables are not correlated.*
- *Soil degradation. This variable combines information about the severity and extent of soil degradation within a country, based on an assessment completed in 1990. The assessment utilized regional experts to estimate degradation over the previous five to ten years.*
- *Population in subsistence agriculture. This variable is used to measure the degree to which a country's population is vulnerable to either deforestation or soil degradation. Subsistence agriculture is an activity that indicates high poverty and high dependence on the health of terrestrial ecosystems. The percent of population dependent on subsistence agriculture is inversely correlated with the level of GDP per capita, although the annual changes in the two variables are not correlated.*

Figure 9: Sub-Saharan Africa State Failures, 1955-96

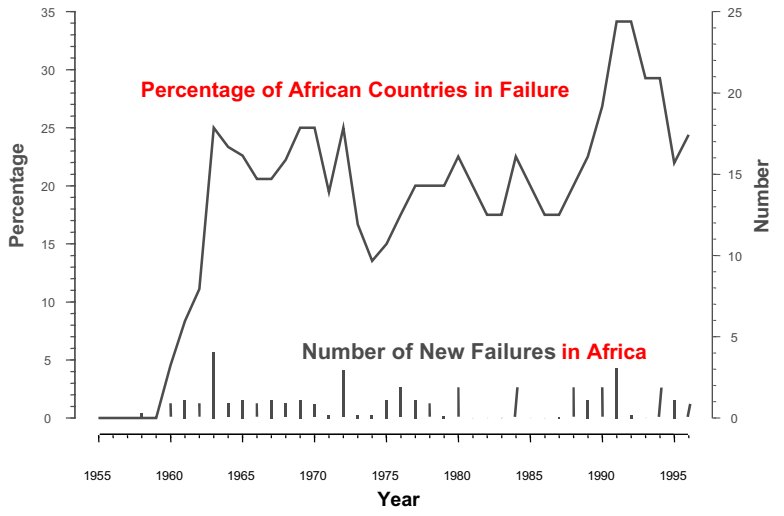
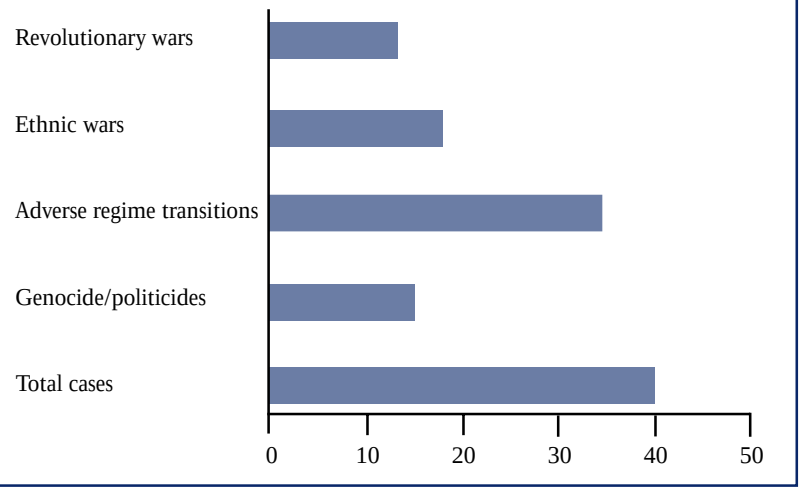


Figure 10: Number of Sub-Saharan African State Failures by Type, 1955-96



Variables Tested for the Sub-Saharan Africa Model

Economic
Trade openness
GDP per capita
Change in GDP per capita
Land burden
Urban population
Population density
Change in reserves

Political/leadership
Separatist activity
Democracy
Change in democracy level
Economic discrimination
Political discrimination
Ethnic discrimination
Party fractionalization
Parliamentary responsibility
Party legitimacy

Demographic/societal
Youth bulge
Colonial heritage
Labor force
Annual change in employment
Secondary school enrollment ratio
Ethno-linguistic fractionalization
Amnesty International political terror scale
US State Department political terror index
Government repudiation of contracts
Risk of expropriation

Agricultural
Cropland area
Irrigated land
Population in agriculture
Population in subsistence agriculture

Energy
Commercial energy use
Commercial energy production

range of living standards, the level of material living standards—as measured by infant mortality (or by GDP per capita or a basket of health and welfare measures)—was found to be a powerful discriminator of risks of state failure. In the Sub-Saharan African cases, where most countries are clustered at the low end of the scale of material living standards, recent changes in living standards emerged as a stronger indicator of failure risks than did absolute levels. In particular, other things being equal, countries that had experienced a negative annual change in GDP per capita were on average twice as likely to experience a serious political crisis two years later than countries that had had a positive change in GDP per capita.[12]

Colonial Heritage

The Task Force—along with Sub-Saharan Africa regional experts—discussed the possibility that differences in colonial heritage affect vulnerability to state failure. Although states of all varieties of colonial background did experience problems, the data showed that, holding other factors equal, former French colonies on average had only one-third the risk of failure of other African countries. This was a firmly statistically significant result. However, we note that until recently France has also maintained a higher level of engagement—political, financial, and military—with its former colonies than most other powers. As these levels of engagement decline, it may well be that French colonial heritage will become less significant as a moderating factor in regard to state crises.

A Pilot Event-Data Analysis

The general models of state failure identify risk factors associated with serious political crises, but they are less useful in forecasting outcomes for individual countries. To better understand the factors that might precipitate a failure in a high-risk country during the two-year period before a crisis, the Task Force conducted a pilot analysis[a] of events in twelve Sub-Saharan African cases—four ethnic wars, four regime crises, and four control cases—since the mid-1980s.[b] We used the Global Events Data System at the University of Maryland—which relies on Reuters' international wire service—to track daily events over a period of two years before the onset of state failure (or, for the control cases, during a two-year period in which no state failure occurred) and to identify:

- *"Accelerators." Feedback events that affect the general conditions underlying conflict development, which also have a cumulative interaction effect that may increase escalation.*
- *"De-accelerators." Events such as negotiations and policy reforms that are likely to de-escalate a crisis.*
- *"Triggers." Events that are likely to propel a high-risk situation to the next phase of crisis escalation.*

Based on previous analyses using this approach, we would expect to observe an increase in the number and severity of accelerator events shortly before the onset of state failure.

The method analyzes political events over time, with separate models for ethnic warfare and regime crisis. Examples of accelerators of ethnic warfare are "attacks on or threats to core symbols of ethnic group identity" and "external support for communal group objectives from international actors." For example, whereas external support for communal groups is typically thought to be a factor that facilitates conflict escalation, tracking accelerators allows us to trace the ebb and flow of the types, quality, and quantity of support over time.

On the basis of the pilot study, the Task Force concluded that the results of the analysis are sufficiently interesting to merit further study. Although the sample size was too small for rigorous statistical analysis, the time clusterings of events for countries in crisis were more similar to those of other countries in crisis—either regime crisis or ethnic war—than to countries not in crisis,[c] suggesting that further analysis by methodologists and area experts may be fruitful. A side benefit of the analysis was that it allowed the start dates of four of the crises to be adjusted, because—based on the sequence of daily events—some of the crises apparently began either earlier or later than the Task Force had previously specified in the list of historical crises. In general, the pilot study results demonstrate that monitoring accelerators is a potentially powerful analytic tool that allows analysts to observe the development of crises in high-risk countries in fine-grained steps, rather than being constrained by the limitations of yearly data.

The graphic illustrates the pattern of accelerators in former Zaire, a case of ethnic war beginning in April 1992.[d] It shows a gradual buildup of events from April 1990 to a peak in October 1991, but deaccelerators seem to check complete breakdown up to that point. Accelerators of ethnic warfare (disunity with the elite and elite responses to threats) reach a high level from January to March 1992.

[a] *The accelerators approach used here is derived from a study of the accelerators of genocide and politicide reported by Barbara Harff, "Early Warning of Genocide: The Cases of Rwanda, Burundi, and Abkhazia." In Ted Robert Gurr and Barbara Harff,* Early Warning of Communal Conflicts and Genocide: Linking Empirical Research to International Responses. *Tokyo: United Nations University Press, Monograph Series on Governance and Conflict Resolution No. 05, 1996.*

[b] *For a description of the cases, see appendix B.*

[c] *See appendix B for details on the method.*

[d] *For details on the Liberia case, see appendix B, figure B-1: Liberia: Regime Crisis Case.*

Level of Urbanization

Although the absolute level of GDP per capita was not a significant predictor of state failure, when combined with the level of urbanization—as measured by the proportion of population living in urban areas—the impact was statistically significant. Having a high proportion of urban population increased the risk of political crisis only in countries whose GDP per capita was below the average for Sub-Saharan Africa. Among such low GDP per capita nations, the risk of failure was twice as high as for countries with higher levels of urban population.

Interestingly, the effect of the share of population in urban areas on failure risks becomes favorable in countries with higher levels of GDP per capita. Other things being equal, for countries that had—by Sub-Saharan African standards—above average GDP per capita, those that also were above average in their proportions of urban population were only one-fifth as likely to fail as those that had lower levels of urbanization. In sum, countries with either high GDP per capita and higher levels of urbanization—relative to other Sub-Saharan African countries—or low GDP per capita and low urbanization were more stable; it was only when relative levels

of urbanization were "out of balance" with relative levels of economic development that political risks increased.

This confirms the bimodal effect of urbanization on political risks described by Jack Goldstone in his work on early modern European states;[13] namely, that if the economy is doing well, and urbanization takes place in the context of good employment opportunities, then migrants to cities are socialized into an urban context that they view as rewarding hard work and promising a better future. This is politically stabilizing. In contrast, if the economy is doing poorly and urban migrants find poor opportunities for employment, then migrants are socialized into an urban context that is frustrating and that they view as hostile and unresponsive. This situation greatly aggravates the risks of political crisis.

Table 3: Sub-Saharan Africa Model Results

Key Variables	Countries at Greater Risk	Countries at Lesser Risk	Relative Risk of Failure
Material Living Standards Change	Negative annual GDP per capita change	Positive annual GDP per capita change	2.0
Trade Openness (imports+exports)/ GDP	Below median	Above median	1.9
Level of Democracy	Partial democracies	Autocracies	11.0
	Full democracies	Autocracies	2.6
Level of Urbanization	High urbanization and low GDP per capita	Low urbanization and low GDP per capita	2.0
	Low urbanization and high GDP per capita	High urbanization and high GDP per capita	4.9
Colonial Heritage	Not French	French	2.6
Ethnic Discrimination	Higher	Lower	1.9

Ethnic Discrimination

The presence of communal groups that are subject to significant economic or political constraints appears to increase the risks of political failure, all other things equal, by almost a factor of two. However, this result was only weakly statistically significant and should be viewed as suggestive rather than conclusively demonstrated.

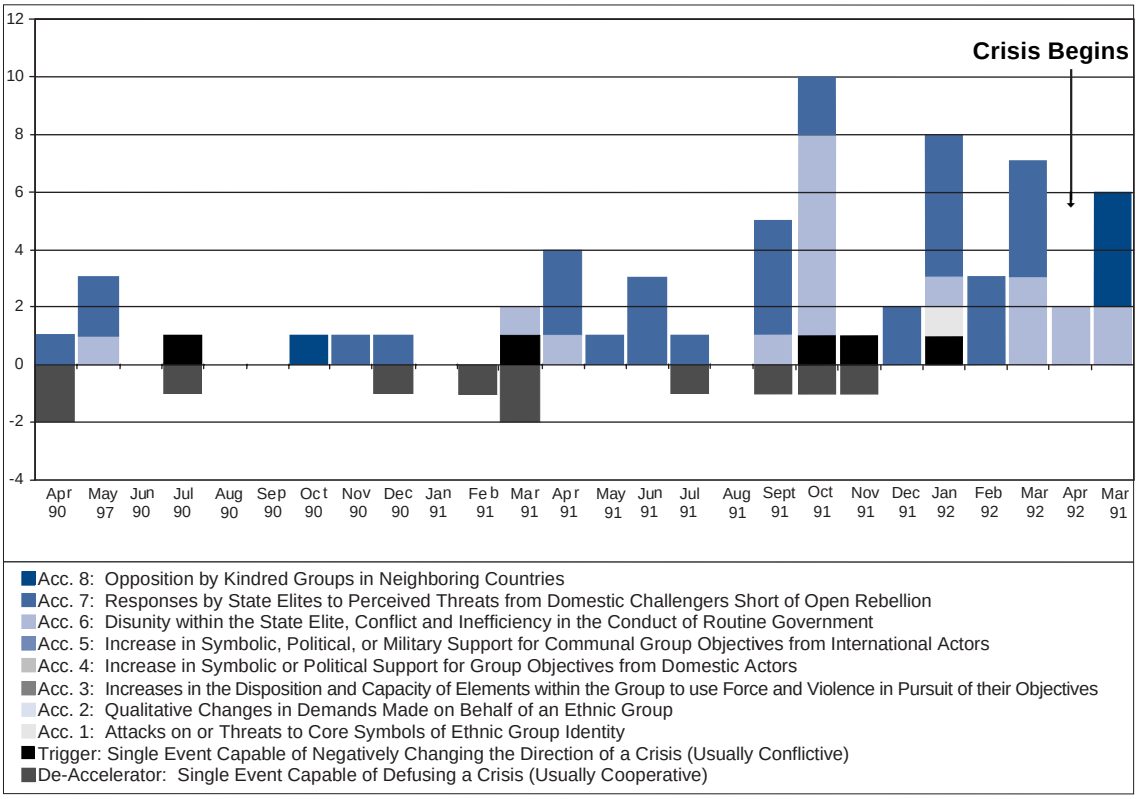
The Sub-Saharan Africa model had roughly the same accuracy as the global model—about two-thirds—in discriminating between state failure and stable cases[14] but resulted in substantially reduced "false positives" for Sub-Saharan African countries.[15]

III. Transitions to Democracy and Autocracy

Trends

Institutionalized democracies have increased significantly in number since the late 1980s. At the end of the Cold War, the number of full democracies in the world system exceeded the number of autocracies for the first time since World War II. As of 1991, full democracies numbered 57, compared with 55 autocracies. By 1996 the number of full democracies

Figure 11: Former Zaire Ethnic Conflict (Accelerators, De-accelerators, and Triggers)



had increased to 71, whereas autocracies had declined to 49. The post–Cold War transition—which Samuel Huntington calls "the third wave of democratization"[16]—also has seen the establishment of a large number of partial democracies. In 1996 there were 27 such polities, double their numbers in the 1980s.

The long-run trend by which democracies have come to outnumber autocracies has two sources. One is the significant number of new democracies established in the post-Communist states. The other, and more important factor, is that many countries that tried and failed to establish democratic polities tried again. South Korea, for example, shifted from autocracy to full democracy in 1960, but a year later lapsed back to autocracy. In 1963 it shifted again to partial democracy but returned to autocratic rule in 1980. South Korea's most recent transition began in the mid-1980s and was completed in 1988 when it became, and has thus far remained, a full democracy. In short, South Korea accounts for three transitions toward democracy and two cases of backsliding to autocracy. Pakistan, Turkey, Thailand, and Bangladesh—all full or partial democracies by 1997—also made three or more democratic transitions between 1955 and 1996.

Transitions are defined in terms of shifts among the three categories of regime type—full democracy, partial democracy, and autocracy. For the analysis of trends, the Task Force defined transitions to democracy as shifts from autocracy to either partial or full democracy as well as shifts from partial to full democracy.[17] These transitions are said to be *stable* if the regime does not regress toward autocracy in the first five years after the initial transition.[18] A regime is *unstable* if it regresses toward autocracy within five years. Thus, a country that changes from autocracy to partial democracy, then two years later transitions from partial to full democracy, is counted as having made one stable transition. A country changing from partial democracy to autocracy and remaining an autocracy for five years is counted as a stable downward transition; whereas a country that shifts from democracy to autocracy, then within five years returns to partial democracy, would be counted as an unstable downward transition.

Table 4: Democratic Transition Success Rates, by Region

Region	Total Transitions, 1957-1991	Percent That Survive for Five Years or More
Europe	14	93
Latin America	24	83
Newly Independent States	12[1]	67
Asia	14	64
Africa	10	40
TOTAL	74	73

[1] Uzbekistan, Turkmenistan, and Tajikistan did not make initial transitions to democracy.

Four major observations can be made about the evidence:

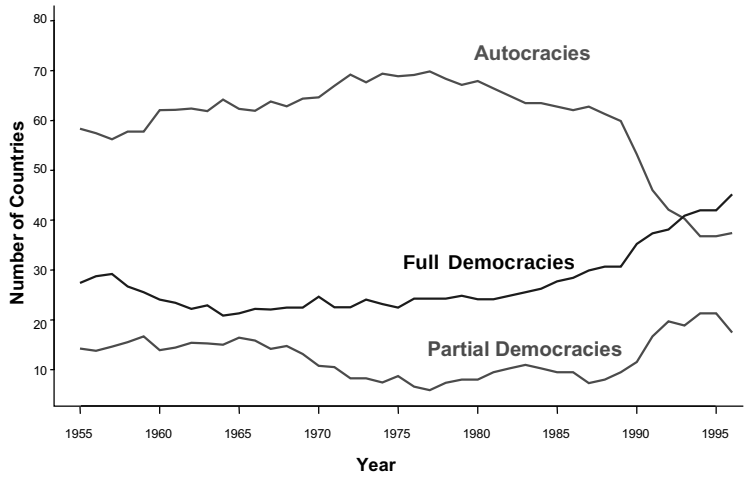
- **Many democratic transitions do not endure.** Between 1957 and 1991 there were 54 durable transitions— that persisted for at least five years—toward full or partial democracy in independent countries, including 16 democracies established during the period 1989-91 in the Soviet and Yugoslav successor states. Another 20 democratic transitions were attempted between 1957 and 1991 but reverted to autocracy during their first five years. An additional 33 democratic failures—durable democracies that shifted toward autocracy for at least five years—occurred.

- **Post–Cold War democratic transitions may be more durable than earlier ones.** Before 1986, 24 regimes made durable transitions toward democracy, more than offset by 44 failures—reversion to autocracy—of full or partial democracies.[19] The 38 durable transitions toward democracy between 1986 and 1991, however, were offset by only nine failures. A more precise comparison looks only at the outcome of democratic transitions that were attempted between 1957 and 1991. Of the 36 transitions that occurred before 1986, 12 countries (33 percent) reverted to autocracy within five years; whereas, for the 38 transitions in 1986 or later, only eight (21 percent) failed to survive. The short-term survival of democratic transitions thus appears to have increased slightly in the post–Cold War period, although the difference is not quite statistically significant.

- **World regions differ substantially in the success of democratic transitions.** Before 1986, Africa south of the Sahara had only one durable democratic transition and the record in Asia was only slightly better. In Latin America and the Caribbean, half of the pre-1986 transitions endured to early 1997. The success rates of recent democratic transitions are highest in Asia—where Cambodia is the only recent democratizing regime to backslide (in 1997)—and in Latin America. Despite a great deal of concern about the durability of the post-Communist states, 14 of the 19 that became partial or full democracies during 1989-91 have maintained democratic regimes. The exceptions are Azerbaijan and Armenia—where democratic governance was undermined by civil war—and Belarus, Kazakhstan, and Albania where it was subverted by chief executives who dissolved or emasculated legislatures that constrained their power.

- **Partial democracies are less durable than either autocracies or full democracies.** There are inherent political contradictions in most partial democracies—a tension between demands for greater and more effective participation on the one hand, and the desire of political elites to maintain or enhance their control. Most partial democracies transition within a decade or so either to full democracies or revert to autocracy.

Figure 12: Democracy Trends, 1955-96



Variables Tested for the Democratic Transition Models

Demographic
Infant mortality, normalized
Secondary school enrollment ratio
Youth bulge, normalized
Annual change in infant mortality

Political/leadership
Ethnic character of ruling elite
Years national leader was in office
Regime durability
Democracy minus autocracy index
Autocracy index
Regime duration
Political rights
Civil liberties

Economic
Real investment share of GDP, normalized
Trade openness
Land burden
Real GDP per capita, normalized

Models

In developing statistical models of transitions, the Task Force used a narrower definition of transition than it did for the analysis of trends.[20] Because crossing the autocracy-democracy divide was thought to be the more critical transition, and because the number of shifts between partial and full democracy was relatively small, the Task Force decided to limit its statistical analysis to transitions from autocracy to partial or full democracy and those from partial or full democracy to autocracy. In this analysis, models were developed that attempted to answer two research questions:

- What social, economic, and political conditions differentiate countries that make durable democratic transitions from others?
- What conditions characterize countries in which democratic regimes fail to succeed?

These questions are different from the issue of the conditions of "state failure" because the democratic transitions are defined and measured differently from state failures. Moreover, few transitions from autocracy to democracy, and only about half of the transitions from democracy to autocracy, meet the criteria of adverse regime transitions.

Transitions from Autocracy to Democracy.[21]

A total of 39 transitions to democracy were available for analysis and were matched with 68 control cases—autocracies in the same region that did not shift to democracy during the matching years.[22] Experts examined the state failure database to identify variables that they thought should contribute to democratic transitions, and statistical tests were used to determine which of them differentiated significantly between the transitions and the controls.

Then various combinations of these variables were analyzed to determine the most efficient set. From more than 60 models analyzed, the one with the highest accuracy included two variables: relatively low land burden—an index that is highest for

Table 5: Democratic Transition Model Results

Autocracy to Partial or Full Democra		
Key variables	Countries More Likely To Transition	Countrie To T
Regime durability	Below median	Abov
Land burden	Below median	Abov
Partial or Full Democracy to Autocra		
Key variables	Countries More Likely To Transition	Countrie To T
Infant mortality, normalized	Above median	Belov
Regime durability	Below median	Abov

Investigating Links Between Conflict and the Environment

The efforts reported here build on a thriving set of research programs at a variety of institutions investigating the environment's role in violent conflict. Early hypotheses centered on environmental degradation and resource depletion directly precipitating violent conflict. Two major sets of case studies in the 1990s suggested that environmental causal pathways to conflict were more complicated. Environmental variables—which alone were neither necessary nor sufficient to cause conflict—were found to play multiple roles along a complex causal chain involving intervening social, political and economic variables.

- *Dr. Thomas F. Homer-Dixon of the University of Toronto found that when "environmental scarcity" of renewable resources did play a causal role, it was most likely to be through impacts that were "sub-national, persistent, and diffuse." These impacts indirectly contributed to acute conflict by exacerbating more familiar sources of conflict—for example, ethnic divisions or relative deprivation.*

- *Drs. Guenther Bachler and Kurt Spillman, codirectors of the Swiss Environmental Conflicts Project (ENCOP), identified seven types of "environ-mentally-induced conflict" in a typology that distinguished levels of conflict and parties to conflict. ENCOP case studies also highlighted "environmental conflicts" as traditional conflicts "induced by environmental degradation."*

As the number of case studies accumulated through these projects and other efforts such as those at the International Peace Research Institute, Oslo, and Columbia University, it became clear that intervening "institutional capacities," or coping mechanisms, to address environmental challenges were critical in determining whether conflict would occur.

Until very recently, a gap in the research program has been the use of statistical analysis examining a large number of countries over time. The need for this kind of study is made clear by the highly qualified conclusions that the case studies produced. The work of the State Failure Task Force is one of only two such studies undertaken to date, the other being the work of Hauge and Ellingsen. In addition, ours is the only study to explore systematically the interactions between environmental change, vulnerability, and capacity in this context, and the only study to use quantitative measures to attempt to uncover these relationships.[a]

[a] *See appendix D for selected bibliography.*

countries with largely agricultural populations and scarce cropland—and low durability of the regime before the transition. This model correctly classified two-thirds of the cases in a set of 39 transitions and 68 controls. The best three-variable model correctly classified two-thirds of the cases and showed that durable democratic transitions were most likely when infant mortality was relatively stable, autocracy was already restricted, and land burden was low.

These models suggest some interesting substantive findings. The regimes most likely to undergo stable democratic transitions during the last 40 years:

- Already had shifted away from purely autocratic forms of government.
- Tended to have had less durable regimes; that is, they had attempted previous political experiments.

Transitions were also more likely to occur in societies with greater economic capabilities (measured by low land burden) and less short-term variability in quality of life (measured by changes in infant mortality).

Once a country has transitioned to democracy, the Task Force found that the likelihood that the transition will be stable depends on several factors:

- Countries whose democratic transitions are most likely to succeed have greater annual improvement in infant mortality, a lower level of infant mortality, greater trade openness, a higher proportion of the population in urban areas, and more years of experience as a democracy.

Transitions from Democracy to Autocracy.[23]

A total of 35 democratic failures—transitions from full or partial democracy toward autocracy—were available for analysis and were matched with 98 control cases;[24] that is, democratic countries in the same region that did not fail during the matching years. The two-variable model with the highest accuracy—nearly three-quarters of cases correctly classified—included infant mortality normalized by world average and regime durability. High infant mortality and low regime durability characterized transitions to autocracy.

It is not surprising that newer democracies—those of low durability—are more likely to fail than long-lived ones, based on the evidence that many democracies fail during their first five years. The role of infant mortality—and by extension, other aspects of quality of life—in raising the prospects for democratic survival is consistent with the results of the general models of state failure.

IV. The Role of the Environment in State Failure

Goals and Hypotheses

We set out to determine whether the proposition that there is a measurable connection between environmental degradation

and state failure was true. Our goals were to:

- Test the argument with data drawn from all countries, over an appropriate time period. Although a number of scholars in recent years have claimed that there is a connection between environmental degradation and political violence, these claims have been largely based on individual case studies.[25] These individual studies, albeit largely of high quality, fail to rigorously test the correlative claim.

- Determine whether it was possible to offer analytical guidance to decisionmakers as they face new security challenges. US policymakers—in the State Department, National Security Council, Defense Department, and other agencies—have increasingly framed environmental issues in security terms.[26] No clear consensus exists, however, as to what kinds of environmental changes are most important, what factors make a given level of environmental change more or less dangerous, or what types of policy interventions are most promising.

- Construct a specific model, and test it with empirical data, to provide the foundation for monitoring and forecasting potential trouble spots, where environmental deterioration could potentially enhance the likelihood of state failure.

Two primary expectations guided our analysis:

- We did not expect to find any direct, measurable correlation between environmental change and state failure. Although this expectation is at odds with some of the literature,[27] we were guided by the following logic: models of environmentally induced political violence all include numerous intervening variables that are held to interact in a complex fashion.[28] The large number of intervening variables makes it hard to find strong direct relationships between the environment and state failure. The complex interaction means that whatever relationships do exist are likely to be different from case to case. As a result, the linkages between environmental change and state failure are unlikely to be discovered by simply adding environmental variables to a state failure model.[29]

- We did expect that environmental change might have a significant, negative impact on one of the factors associated with state failure in the general model. In particular, we sought to explore whether environmental degradation would have an impact on quality of life measures such as infant mortality. If so, then this would demonstrate an important, though indirect, connection between environmental degradation and state failure.

Analytically, we conceived of the factors interacting in the following manner: a given change in environmental conditions generates an impact on a society that varies according to the underlying environmental conditions—a society's vulnerability—and which is mediated by a nation's capacity to respond effectively. Where capacity is high, harm will be avoided.

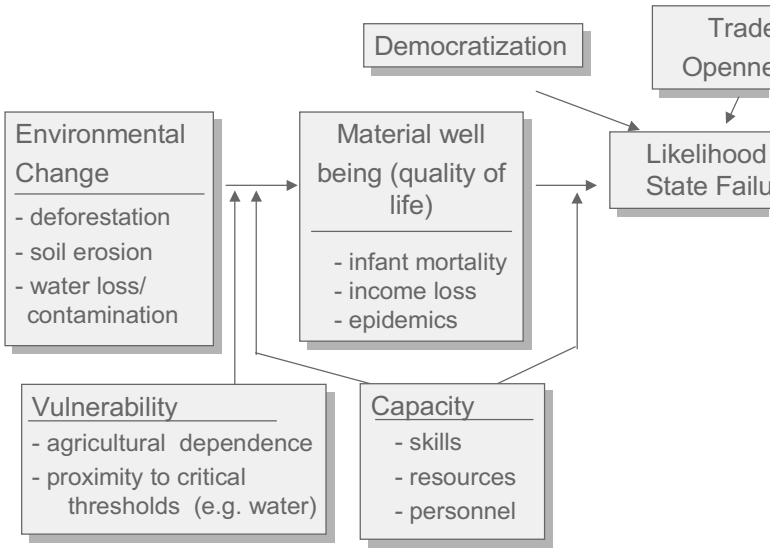
To illustrate, consider crop yields as the impact and drought as the environmental change. Vulnerability is the degree to which crop yields might be expected to fall in the absence of effective intervention. It might be measured through extent of irrigation or sensitivity of crops to rainfall. Capacity is the degree to which the government and social actors are able to lower the actual impact, and might be measured as the size of the government budget, number of scientifically trained experts, or extent of communications infrastructure.

To be even more concrete, for the 1991-1992 growing

Figure 13: Mediated Environmental Model

The relationship can be expressed as *Impact = a function of (environmental change, vulnerability, and capacity), where*

- Environmental change is a change in environmental resources.
- Vulnerability is the magnitude of the potential impact per unit of change in environmental conditions.
- Capacity is the ratio of actual impact to potential impact.



This formula provides an analytic framework for understanding the key relationships among environmental change, vulnerability, and capacity for response. Given data limitations and the lack of appropriately denominated indicators, we tested a simple formulation of the model in which environmental impact is a linear function of environmental change, vulnerability, and capacity.

season, El Niño–driven droughts were forecast for northeastern Brazil and for Zimbabwe, with more or less equivalent lead times given to decisionmakers and a comparable projected and actual change in environmental resources—rainfall. The vulnerability—the potential drop in agricultural production divided by loss in rainfall—was also about the same. However, the net social impact, or actual loss in output, was very small in Brazil but quite high in Zimbabwe, where 80 percent of the maize crop was lost. Many analysts attribute this difference to different levels of capacity in the two settings. Officials in Brazil acted on the knowledge early, implementing effective strategies, whereas in Zimbabwe the information was never used, and no responsive strategies were developed.[30]

Findings

Environmental change does not appear to be *directly* linked to state failure. To determine whether it was possible to find a statistical correlation between environmental change and state failure, we tested variables that measured deforestation and freshwater supply, but both failed to generate significant results. This was consistent with our hypothesis that the more direct effects of democratization, trade openness and quality of life—measured by infant mortality—had such a strong impact on state failure that they masked any impact of environmental deterioration.

This result is at odds with recent work by Hauge and Ellingsen,[31] the only other study we are aware of that employs statistical tests to evaluate claims about the direct impact of environmental harm on political violence. Hauge and Ellingsen found a significant impact from deforestation, soil degradation, and freshwater access, results that we believe are due to differences in how the dependent variables are operationalized and how the independent variables are used. Some of these differences are potentially large enough to account for the different results by themselves; taken together they make the two models essentially incomparable. Because the state failure model covers a greater time period and includes trade openness as an explanatory variable, we think its results have more validity. Nevertheless, the Hauge and Ellingsen model shows that there is more than one way to approach these questions, and we welcome the opportunity for scholarly debate.

Environmental change is significantly associated with changes in infant mortality. To investigate the merits of the mediated model, we assembled data on environmental change, vulnerability, and state capacity. Because of data limitations, we limited our scope to the period 1980-90; extending the time frame back further would have seriously reduced the number of countries and variables available for testing.

We chose infant mortality as the dependent variable because of the availability of data, the high significance of infant mortality as a factor associated with state failure, and the high correlation of infant mortality with a number of other measures of material well-being. We would have preferred to use a basket of indicators that captured the level of material well-being or quality of life, but the only well-being indices we located covered too few countries, spanned too few years, or included factors that were not relevant to our analysis.

Table 6: Hague and Ellingsen and the State Failure Study: Differences

	Study
	Hague and Ellingsen
Operationalization of Dependent Variables	
Definition of failure	Used incidence of civil w in one model; armed conflict in another
Overall time period	1980-1992
Unit of observation[1]	Each year of civil war or armed conflict
Use of Independent Variables	
Treatment of deforestation variable	Categorized
Range of variables included	Some overlap with State Failure, but nothing analogous to trade openn

[1]This is a major difference. The State Failure Task Force chose to develop a model tha outbreak of state failure. Hauge and Ellingsen's model, in effect, combines out break asked not only to estimate the likelihood of when a civil war will start, but also when

Once the data were assembled, we screened potential capacity and vulnerability variables by computing their correlation with infant mortality. Those that were significantly correlated—telephones per capita, population in subsistence agriculture, and land burden—were then tested in combination with an environmental stress variable in a multiple linear regression model.[32]

As we expected, deforestation proved to be statistically significant only when tested in a model that included measures of vulnerability and capacity. For given levels of vulnerability, capacity, and baseline infant mortality rates, we found that the greater the loss of forest cover, the higher the increase in infant mortality rate.

The results for the model using soil degradation as the environmental stress were more complex, and no linear relationship could be measured. We obtained significant results, however, by multiplying the rate of degradation by its severity and including it as an interactive term. The results suggest that soil degradation has a negative impact when severe degradation occurs at a rapid rate; otherwise the impact is positive. One possible interpretation of this finding is that the same practices that induce soil degradation—such as agricultural production—might have a positive net impact, for example, by improving nutrition or incomes, if the degradation does not proceed too rapidly.[33]

Insights

One major insight that emerges from the analysis is that available measures of environmental degradation do not currently serve as a direct signal of impending state failure. In part, this is a function of the long, complex chain of association between environmental change and state failure, with a number of factors intervening along the way. Those factors are strong enough to push some societies blessed with benign environmental conditions into failure and to prevent other societies suffering serious environmental damage from slipping into political instability. This finding is also a function of the

Variables Tested for the Environmental Model

Environmental Change
Deforestation
Soil degradation
Change in agricultural land
Access to fresh water (urban, rural, and total population)
Fraction of freshwater reserves withdrawn
Sulfur dioxide emissions
Population density

Vulnerability
Percent of population engaged in subsistence agriculture
Land burden: (farmers per area of cropland) x (farmers per labor force)
Storm damage
Share of national income by lowest 20 percent of population

Capacity
Secondary school enrollment ratio
Adult female literacy
Public expenditures on education
Telephone lines per capita
Bureaucratic quality
Corruption
Number of bribery cases
Law and order tradition
GDP per capita
Debt service
Rail mileage per square mile
Rail-ton miles per capita
Road density

Environmental Data Limitations

Our analysis was seriously constrained by the paucity of available data. Whereas the overall state failure model was able to test some 75 economic, political, and demographic variables, the environment model could test only a handful. This data constraint meant that some important environmental factors could not be examined. For example, water quality—consistently mentioned in the literature as the most serious environmental problem facing developing countries—could not be included because reliable time series data are available for only 38 countries.a Air quality suffers from similar deficiencies.

Useful indicators of vulnerability were also scarce. Because the best environmental change indicators—deforestation and soil degradation—that we had were related to terrestrial ecosystems, we were able to rely on vulnerability measures that tapped the degree of sensitivity to agricultural perturbations. However, measures relevant to other environmental shocks, such as declines in air quality, would have been harder to construct.

The available measures of capacity were especially disappointing. The ideal measure, in our view, would take into account the financial resources, quality and extent of infrastructure, and knowledge and skills of public and government officials available for monitoring, assessing, and responding to major environmental problems. Despite the great attention paid to issues of capacity building in recent years,[b] we were unable to identify any useful indicators that came close to capturing this concept and, instead, had to rely on proxies that imperfectly measured a few aspects of capacity.

[a] Even for these countries, data are taken from single-point monitoring stations.

[b] See, for example, the UN Development Programme's Capacity 21 program.

seriously limited data at our disposal. On balance, we cannot say how large an impact environmental damage has on the risk of state failure.

Nevertheless, the results of our analysis provide evidence for an indirect connection between environmental change and state failure. Deforestation and soil degradation appear to diminish the quality of life, as measured by infant mortality rates, for low-capacity states that are socially vulnerable to disruptions in soil ecosystems; and infant mortality has been shown to have a direct impact on the likelihood of state failure.

Caveats on the Findings

While we believe that the results of the mediated environmental model are useful and significant, the model has several limitations:

- The process of converting analytic concepts into measurable variables has necessarily resulted in variables that are more narrow and arbitrary than the analytic constructs that they represent. This is most true for our core capacity variable—telephones per capita, which we recognize to be a very limited measure of governmental and societal response capability—but to a degree it is true for all the variables.

- The findings represent a general tendency that applies to the set of all countries for which data were available, over the ten-year period studied. That does not mean that this tendency will be true for each individual country at every point in time. Some countries might experience far more direct connections between environmental change and state failure than we observe; other countries might experience less connection between environmental change and infant mortality than our results suggest.

- Environmental data limitations mean that our conclusions are far from the last word. We simply did not have measures for some very important environmental changes—including water quality, with its impact on public health—that might prove more significant as precursors of state failure than those we tested. Data constraints also prevented us from testing whether state failure is associated with aggregate processes of environmental deterioration, encompassing the degradation of soil, air, and water systems.

Implications of Phase II Findings for Forecasting and Policy

The main result from retesting and refining the global model is a solid confirmation of the work undertaken in the first phase of the Task Force's work. Even with an updated and expanded problem set, different control sets, and more refined measures of democracy, the basic global model continued to accurately classify roughly two-thirds of historical cases. Moreover, the same independent variables emerged as statistically significant in a variety of retests.

The major implication for forecasting is that as far as statistical data are concerned—given current limitations in accuracy and coverage for global data—using a large number of variables does not add to the effectiveness of forecasting models. In many cases, we found that the gaps in either the temporal or geographic range of particular variables were so great that any possible gains in prediction were offset by statistical uncertainties or missing data problems associated with measuring those additional variables. Thus, in all models and regional sub-models, a handful of variables emerged as providing significant power in discriminating between state failures and stable cases over the past 40 years. Although many additional variables—including those measuring nutrition, education, droughts, and civil rights—showed significant correlations with risks of state failure, they did not add statistical power to models based on our key variables. Those variables, which consistently emerged in a wide variety of models, are material living standards, trade openness, and democracy, and in more limited circumstances, youth bulge, regime duration, ethnic dominance or discrimination, and the urban proportion of the population.[34] We shall have to wait until the accuracy and coverage of global data series improves before we can gain further accuracy by building more complex models. In the meantime, there is a compelling need to improve global and regional data on these key dimensions, and on many other social, economic, political, and particularly, environmental conditions.

A secondary implication is that the accuracy of statistical models forecasting state failure risks two years in advance remains at a level that is useful, but insufficient for refined predictions. In order to bridge the gap between the two-thirds accuracy of our statistical model, and the better than 90-percent accuracy required for effective policy responses, the skills of individual country analysts and policymakers in assessing rapidly changing local conditions remain absolutely crucial.

The mathematical data analysis cannot prove causality, but the correlations are consistent with causal interpretations. Our findings also suggest policy implications that are interesting and complex, although the best focus and mix of policy responses will, of course, vary from case to case.

Involvement in international trade, as measured by trade openness, is associated with a lower risk of state failure in virtually all states and all contexts. This finding suggests that policies or measures—including internal factors such as dependable enforcement of contracts, modest or low corruption, and improved infrastructure, as well as bilateral or multilateral efforts to eliminate trade barriers—that help to foster higher levels of international trade could help prevent political crises. Interestingly, it appears that it is the involvement in international trade itself, and not the eventual prosperity that such trade provides, that is the key to this effect. The work of Etel Solingen has shown that free trade, if sustained, helps bring together coalitions of elite actors that support the rule of law and stable property relationships, as a condition for building wealth.[35] Such

coalitions may or may not be democratic, but in either case, they promote political stability.

Partial democracies—particularly in lower-income countries where the quality of life remains poor—are associated with elevated risks of failure. Although full democracies and autocracies are fairly stable, the in-between forms of government are at high risk of undergoing abrupt or violent change. This suggests that while a policy of promoting democracy may eventually lead to a world of stable liberal states, one cannot presume that the inevitable intermediate stages will also be stable. Policymakers need to be particularly attentive to the risks of failure in such states, and should seek and encourage progress toward full democracy. Moreover, if helping to increase the odds of stability in such states is a goal, then policymakers need to focus on developing policies that help foster international trade and on supplementing democratization programs with broad development programs that help improve the overall level of material living standards.

Material living standards have an undeniable effect on the risks of state failure. In some models, it is the overall level of material living standards that emerges as important; in other models, such as that for Sub-Saharan Africa, it is the direction of change that appears crucial. In either case, the policy implication is that efforts to improve material living standards are a significant way to reduce risks of state failure. In Sub-Saharan Africa, it turns out that high levels of urbanization reinforce this effect—for states with high levels of urbanization, states experiencing growth in GDP per capita have only a fraction of the risks of state failure of those states experiencing economic stagnation or decline.

Despite the prevalence of ethnic conflicts—especially in Sub-Saharan Africa—ethnic discrimination or domination is not the sole, or even the most important, correlate of state failure. Because ethnic factors do not emerge as the most powerful—or most statistically significant—factors associated with state failure, they bear monitoring, but other policy levers may be more readily available and more effective.

Environmental stress, vulnerability, and capacity form an interdependent triad that affects quality of life and, indirectly, the risk of state failure. Our findings imply that analysts concerned with the social impact of environmental change need to monitor not simply the environment, but also changes in a country's vulnerability to environmental changes and its capacity to cope effectively with them. The increased appreciation of the need to develop indicators of environmental change and of sustainability should be complemented with equally vigorous efforts to develop useful indicators of vulnerability and capacity, where the recent track record has been less encouraging. At the broadest level, our findings also suggest that when it comes to minimizing declines in quality of life, increases in capacity and reductions in vulnerability are equally appropriate targets for policy intervention as increases in environmental protection.

Newer democracies, especially in countries where quality of life is relatively low, are more likely to fail than long-lived ones. The Task Force's models and data can be used to inform policymaking about the conditions under which democratic transitions are likely to succeed or fail. Most contemporary democracies in Latin America, Asia, and Africa established democratic institutions one or several times, then reverted to autocratic rule before making their most recent transitions to democracy. The problem-ridden history of democratic transitions in these regions raises questions about the future durability of newly established democracies there and in the post-Communist states. Analytic results suggest it is crucial that international support for democratic institutions be reinforced by policies that promote improvement in the quality of life.

Future Directions

Potentially fruitful future analytic directions that are suggested by the Phase II results include:

- Forming a better understanding of the conditions of successful democratic transitions. Initial results suggest that successful democratic transitions tend to be preceded by political experimentation–including previous unsuccessful attempts to establish democratic institutions–and to occur in countries where agricultural stress is low and material living standards are higher. On the other hand, backsliding to democracy tends to occur within a few years after democratic institutions are introduced, and in countries with relatively low quality of life and high agricultural stress. Analyses are needed of the extent to which successful democratic transitions depend on improvements in the quality of life, and economic performance generally, during the early years. Models of these relationships should also take account of factors such as elite ethnicity, urban growth, and youth bulge, which have been shown to correlate with other kinds of state failure, especially revolutionary and ethnic wars.

- Further developing the concept that the impact of environmental degradation on state failure is mediated by vulnerability and capacity, and more thorough testing of the model. Additional steps would include:

  → Constructing additional indicators of environmental change—such as water and air quality—vulnerability, and capacity from currently available sources.

  → Building a set of "watch lists" for specific ongoing environmental threats that would focus attention on environmental deterioration in countries with high vulnerability and low capacity.

  → Developing a core set of environmental indicators—measured consistently across countries and over time—that could be used in future analyses. This effort would include using the next generation of remote-sensing satellites to gather terrestrial and atmospheric data and using intensive on-site monitoring to build an adequate database for other environmental problems such as water quality, air quality, and

chemical hazards.

→ Developing models that capture regional variation—or localized "hot spots"—within a country that are masked by national level analysis. We know that the environmental impact on material quality of life will be stronger if there is a spatial correlation among the variables. For example, if a given unit of land has a high rate of deforestation, a high land burden, and poor institutional capacity, we would expect a larger local impact on infant mortality, an hypothesis that could be tested using currently available high-spatial-resolution data sets.

→ As additional data become available, continuing to test the hypothesis that environmental damage directly contributes to the likelihood of state failure.

- Developing a more detailed concept of "state capacity" to test as a mediating factor in general and regional models. Building on the results of the mediated environmental model, further examine and develop in more depth the concept of state capacity, develop quantitative measures that tap this dimension, and incorporate this concept as a mediating factor. We should also seek or develop data sets that are better able to capture state capacity.

- Investigating the usefulness of pilot studies of event data for bridging the gap between model-based risk assessments and "early warnings." The general models of state failure identify risk factors measured two years before the expected onset of failure. Even the best models identify a substantial number of false positives and fail to predict correctly some failures. The goal is to supplement general models with early warning models that track the immediate precursors of failure and provide more accurate and timely warnings than do risk assessments that are based on background conditions. Specifically, monitoring of events should concentrate on situations judged to be at high risk through expert- and model-based analysis, and statistical techniques should be applied to study the clustering of events before a crisis.

- Investigating the impact of international support on the risk of state failure. Many policymakers and analysts assume that bilateral and multilateral policies can forestall some state failures and minimize the severity of others. Previous Task Force analyses have assessed the impact of some kinds of international economic policies—such as IMF standby agreements—on the likelihood of state failure, but these analyses have not shown strong and consistent results. The impact of other kinds of international engagement, such as diplomatic and military support, development programs, and assistance with institution building remain to be studied. Appropriate data and indicators need to be gathered and tested in new models. Because the objectives and hence the likely outcomes of international policies have changed since the peak of the Cold War, such models should distinguish between pre- and post–Cold War patterns of international policy and their consequences.

Appendix A: Global Model and General Material

Defining State Failures and Control Cases

State Failure

State failure and state collapse are new labels for a type of severe political crisis exemplified by events of the early 1990s in Somalia, Bosnia and Herzegovina, Liberia, and Afghanistan. In these instances, the institutions of the central state were so weakened that they could no longer maintain authority or political order beyond the capital city, and sometimes not even there. Such state failures usually occur in circumstances of widespread and violent civil conflict, and are often accompanied by severe humanitarian crises. In a general sense, they are all part of a syndrome of serious political crisis which, in the extreme case, leads to the collapse of governance.

Only 18 complete collapses of state authority have occurred during the last 40 years, too few for meaningful statistical generalization. Therefore, the Task Force broadened its focus and sought to identify systematically all occurrences of partial as well as complete state failures that began between 1954 and 1996. We began from existing compilations of data on revolutionary and ethnic conflicts, regime crises, and massive human rights violations of the types categorized as genocides and politicides (political mass murders). An initial list—the basis for the Phase I analysis—was critically evaluated, updated, and refined for the present study. The four types of internal wars and failures of governance are:[36]

- Revolutionary wars. Episodes of violent conflict between governments and politically organized challengers that seek to overthrow the central government, to replace its leaders, or to seize power in one region. From the 1950s through the late 1980s, most revolutionary wars were fought by guerrilla armies organized by clandestine political movements. A few, like the Iranian revolution of 1978 and the student revolutionary movement in China in 1989, were mass movements that organized campaigns of demonstrations. These mass movements are included only if one or both parties used substantial violence.

- Ethnic wars. Episodes of violent conflict in which national, ethnic, religious, or other communal minorities challenge governments seeking major changes in their status. Most ethnic wars since 1955 have been guerrilla or civil wars in which the challengers sought independence or regional autonomy. A few, like those in South Africa's black townships in 1976-77, involved large-scale, violent protests aimed at sweeping political reforms. Warfare between rival community groups is not considered ethnic warfare unless

it involves conflict over political power.

- Adverse or disruptive regime transitions. Major, abrupt shifts in patterns of governance, including state collapse, periods of severe elite or regime instability, and shifts away from democratic toward authoritarian rule. Some are preceded by revolutionary or ethnic wars as in Cuba 1959 and Liberia 1990. They also may precipitate internal wars and be followed by massive human rights violations. They are analytically distinct from internal wars, however, and sometimes occur with minimal open violence. Note that abrupt nonviolent transitions from autocracy to democracy are not considered "adverse" and thus are not included as failure cases.

- Genocides and politicides. Sustained policies by states or their agents–or in civil wars, by either of the contending authorities—that result in the deaths of a substantial portion of a communal or political group. In genocides the victimized groups are defined primarily in terms of their communal (ethnolinguistic or religious) characteristics. In politicides victims are defined primarily in terms of their political opposition to the regime and dominant groups.

The 233 internal wars and failures of governance are the basis of the problem set; that is, the study's dependent variable. The list is known to omit low-magnitude cases but is thought to include all serious cases of these types that began between 1955 and the end of 1996 in all states in the international system with 1996 populations greater than 500,000.[37]

One problematic issue is that internal wars, regime crises, and gross human rights violations often co-occur. Moreover, multiple events of the same type sometimes occur sequentially in the same country. Where wars or crises overlapped or came in quick succession, they were combined. The final problem set consists of 127 *consolidated cases* that include 71 *discrete cases* plus 56 *complex cases*, such as linked sequences of events (of any kind) in which four years or less elapsed between the beginning and end of successive cases. The analyses reported here were based on 125 cases, after excluding two low-magnitude ethnic conflicts.

Appendix D: Environment

Mediated Environmental Model Methodology

For the environmental model, the infant mortality rate in 1990 is assumed to be a function of its baseline in 1980, plus the effects of intervening changes—from 1980 to 1990–in environmental stresses, vulnerability, and capacity factors, while controlling for baseline levels in 1980. Symbolically, the model can be expressed as:

$$IM_t = a + b_o IM_{t_o} + \Sigma(b_i E_i + b_{il}\Delta E_i) + \Sigma(c_j C_j + c_{jl}\Delta C_j) + \Sigma(d_k V_k + d_{kl}\Delta V_k) + \varepsilon$$

Where t is the year 1990, t_0 is the year 1980, IM is infant mortality, E_i are environmental stresses, C_j are state capacities, and V_k are vulnerabilities.

Because the number of explanatory variables in a multiple regression model must be limited to avoid "overfitting,"[38] and because only about 100 countries have nonmissing values for all variables needed to estimate the environmental coefficients, we could include a maximum of 10 independent variables in the model. Each stress, capacity, and vulnerability factor contributes two variables—a baseline and a change measure—with an additional variable required to measure baseline infant mortality rate. Thus, only one variable from each of the stress, capacity, and vulnerability categories can be accommodated in the model, plus at most one additional variable.

To select appropriate covariates for the model we initially screened potential capacity and vulnerability variables by computing their correlation with infant mortality. Those that were significantly correlated were then tested together with an environmental stress variable in a multiple linear regression model of the general type shown above. Each combination of one capacity, one vulnerability, and one environmental stress variable defined a separate regression model. In addition, since it was hypothesized that tropical countries respond differently to environmental stresses, a tropics variable was included.

A lack of data further limited our ability to test variables in the model, and we were only able to test deforestation and soil degradation variables as environmental stresses and telephones per capita, population in subsistence agriculture,

Table D-1: Best Environmental Models

Table D-1: Best Environmental Models

Dependent Variable	Independent Variables		
	Environmental Stress	Vulnerability	Capacity
Infant mortality	Deforestation rate	Percent of population in subsistence agriculture	Telephone per capita
Infant mortality	Deforestation rate	Land burden	Telephone per capita
Infant Mortality	Soil Degradation (severity times rate)	Land burden	Telephone per capita

Table D-2: Environmental Model Coefficients

Variable	Label	Coe
LGIM80	UN infant mortality in 1980 (log)	1.1
WOODSX	C	
LWOODS80	W	
BNK63X	A	
L10BNK63	Ti	
LANDBX	Annual change in land burden	0.0
L10LANDB	Land burden in 1980	0.0
INTERCPT	Constant term	-0.7

Dependent variable: Infant mortality in 1990 (log)
Number of observations: 95
R-squared statistic: 0.97

Table D-3: Environmental Model Output

General Linear Models Procedure

Dependent Variable:

Source	LOGIM DF
Model	7
Error	87
Corrected total	
R-Square	

Parameter	
INTERCEPT	-0.791673
LOGIM80 Log of infant mortality	1.131075
WOODSX Change in forest area (percent)	-0.035194
LWOODS80 Log of woodlands	-0.000303
LANDBX Annualized percent change in land burden	0.010068
L10LANDB 1980 Land burden	0.000087
BNK63X Annualized percent change in telephones per capita	-0.014068
L10BNK63 1980 Telephones per capita	0.507711

and land burden as capacity and vulnerability variables:

- Soil degradation data came from a UN Environment Program data set—Global Assessment of Human Induced Soil Degradation (GLASOD)[39]—that contains assessments by regional soil experts about the severity and rate of human-induced soil degradation. The assessments—completed in 1990—reflect processes of degradation over the previous five to 10 years. We converted the data from GIS format to country values. The severity of soil degradation is classified on a 0-4 scale, with 4 being the most severe. The rate is classified from 0-3, with 3 being the fastest. We created a composite severity score by multiplying each classification score by the corresponding percentage of area and taking the sum. We created alternative scores by weighting the higher classes of degradation more heavily and obtained similar results.

- The deforestation rate—defined as the annualized rate of change in forest area from 1980 to 1990—verged on statistical significance (p=0.06) in models with telephones per capita as a measure of state capacity and either land burden or population in subsistence agriculture as a measure of vulnerability.

- The tropics indicator was not significant, nor were any interactions among the capacity, vulnerability, and stress variables.

None of the soil variables were significant when tested individually or in simple sums (such as the age of land in class 3 plus the age of land in class 4). However, when the interaction between severity and rate was tested we achieved significant results, with telephones per capita as the capacity variable and land burden as the vulnerability variable. The interaction can be interpreted as suggesting that the impact of soil degradation on infant mortality is nonlinear; soil degradation increases infant mortality only when the degradation is severe and takes place

rapidly.

The environmental model was obtained by regressing 1990 infant mortality rates on annual deforestation rates, adjusting for differences in states' baseline (1980) infant mortality and differences in their capacity and vulnerability. The adjustment was accomplished by including as covariates the factors listed in Table D-2 (telephones per capita serves as a surrogate for capacity, whereas land burden is a proxy for vulnerability). The R-squared statistic, which ranges from 0 to 1, measures the fraction of variability accounted for by the model and therefore is an indicator of how well the model fits the data. The value of R-squared in this case is deceptively large, because most of the variability in states' 1990 infant mortality is in fact explained by 1980 infant mortality alone. The model suggests, however, that even after taking this dependence into account, there remains an association between deforestation rate and infant mortality, as indicated by the p-value of 0.06 for deforestation, almost meeting the conventional statistical significance level of 0.05.

[Editor's Note: These excerpts of the Phase II Findings of the State Failure Task Force exclude the Executive Summary portions of Appendices A (Global Model and General Material and D (Environment) and all of Appendices B (Sub-Saharan Africa) , C (Democracy), and E (Data Sources).]

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[1] Esty, Daniel C. Jack Goldstone, Ted Robert Gurr, Pamela Surko, and Alan Unger. *Working Papers: State Failure Task Force Report*. McLean, VA: Science Applications International Corporation, 30 November 1995.

[2] For a list of countries included in the study, see appendix A, table A-1 : Country List.

[3] For a list of state failure cases, see appendix A, table A-3: Historical State Conflicts, Crises, and Transitions, 1955-96.

[4] See appendix A for details on the procedure for revising the set of state failures.

[5] For a list of control cases, see appendix A, table A-4 : Control Cases Used for the Global Model.

[6] See appendix A for details on the logistic regression and genetic algorithm techniques; see Esty, Daniel, Jack Goldstone, Ted Robert Gurr, Pamela Surko, and Alan Unger, *Working Papers: State Failure Task Force Report*. McLean, VA: Science Applications International Corporation, 30 November 1995, for details on neural network analysis.

[7] Jaggers, Keith, and Ted Robert Gurr. "Tracking Democracy's Third Wave with the Polity III Data." *Journal of Peace Research* vol. 31(4):469-482, 1995. For details on the scoring and a list of indicators and weightings for each index, see appendix C, table C-1: Indicators of Institutional Democracy and Autocracy, in the full text report.

[8] For a list of country scores, see appendix C, table C-2: Democracy, Autocracy, and Democracy Minus Autocracy Scores by Country, 1996.

[9] Zakaria, Fareed. "The Rise of Illiberal Democracies." *Foreign Affairs*, vol. 76(6):22-44, 1997.

[10] For a list of control cases, see appendix B, table B-1: Control Cases Used for the Sub-Saharan Africa Model. Sub-Saharan Africa crises are included in appendix A, table A-3, Historical State Conflicts, Crises, and Transitions, 1955-96

[11] See appendix B for further details on the model.

[12] It should be noted, however, that this finding did not have quite as much statistical significance (p=.10) as the other findings in this model.

[13] Goldstone, Jack A. *Revolution and Rebellion in the Early Modern World*. Berkely: University of California Press, 1991.

[14] On the basis of data two years in advance of the crises.

[15] The global model had the best accuracy for Western industrialized countries and poorer accuracy for Sub-Saharan Africa, where it tended to misidentify too many countries as failures.

[16] Huntington, Samuel P. *The Third Wave: Democratization in the Late Twentieth Century.* Norman: University of Oklahoma Press, 1991.

[17] For a complete list of transitions, see appendix C, tables C-3, Transitions From Autocracy to Partial or Full Democracy, or from Partial to Full Democracy, 1957-91, and C-4, Transitions from Full or Partial Democracy to Autocracy, or from Full to Partial Democracy, 1957-91.

[18] This is a minimum criteria. The median age at which democracies regressed toward autocracy in the period studied is four years. The analysis could also be done using a more stringent criterion for stability; for instance, 10 or even 20 years.

[19] Note that failures outnumbered durable transitions because some failures occurred in countries whose democracies were established before 1957 and thus were not counted as transitions for this analysis.

[20] For details on the method, see appendix C.

[21] For a list, see appendix C, table C-6: Transitions from Autocracy to Partial or Full Democracy Used in Model Derivation.

[22] Data were missing for other cases.

[23] For a list, see appendix C, table C-5: Transitions From Full or Partial Democracy to Autocracy Used in Model Derivation.

[24] Data were missing for other cases

[25] For a useful review of these claims, see Geoffrey D. Dabelko and P. J. Simmons. "Environment and Security: Core Ideas and US Government Initiatives." *SAIS Review* 17(1):127-146, 1997.

[26] These developments are covered in the issues of the *Environmental Change and Security Project Report*, Woodrow Wilson Center, Washington, DC.

[27] For example, Robert D. Kaplan. "The Coming Anarchy." *Atlantic Monthly* 44-76, February 1994. For a bibliography on environment and conflict, see appendix D.

[28] Homer-Dixon. Thomas F. *Environment, Scarcity, and Violence.* Princeton: Princeton University Press, forthcoming 1999.

[29] Levy, Marc A. "Is the Environment a National Security Issue?" *International Security* 20(2):35-62, Fall 1995.

[30] Glantz, Michael, Michele Betsill, and Kristine Crandall. *Food Security in Southern Africa: Assessing the Use and Value of ENSO Information.* Boulder, CO: National Center for Atmospheric Research, Environmental and Societal Impacts Group, 1997.

[31] Hauge, Wenche and Tanja Ellingsen. "The Causal Pathway to Conflict: Beyond Environmental Scarcity." *Journal of Peace Research* 35:3, 1998.

[32] See appendix D for details of the method; for a list of models and coefficients, see table D-1: Best Environmental Models.

[33] Of course, our measure of soil degradation is too imprecise, and our time frame is too limited for us to determine whether there is an "optimal" rate of soil degradation. It is entirely possible that extending the time frame from one to two decades, for example, would have a negative impact on infant mortality at all levels of soil degradation.

[34] Youth bulge—a large proportion of the adult population concentrated in the young adult years—was a significant factor in a model of ethnic war that was developed during Phase I. For details, see Daniel Esty, Jack Goldstone, Ted Robert Gurr, Pamela Surko, and Alan Unger, *Working Papers: State Failure Task Force Report*. McLean

VA: Science Applications International Corporation, 30 November 1995.

[35] Solingen, Etel. *Regional Orders at Century's Dawn: Global and Domestic Influences on Grand Strategy*. Princeton University Press, 1998.

[36] For sources and more detailed descriptions, see Esty, Daniel C., Jack Goldstone, Ted Robert Gurr, Pamela Surko, and Alan Unger. *Working Papers: State Failure Task Force Report*. McLean, VA: Science Applications International Corporation, 30 November 1995.

[37] Eritrea and Qatar, which have populations over 500,000, were inadvertently omitted; Luxembourg was inadvertently included, despite falling below our population size cutoff, according to the US Census Bureau's International Data Base. These deviations from the rule do not contribute significant error because the number of countries in the study was large.

[38] A widely used rule of thumb constrains the number to about 10 percent of the sample size.

[39] "Global Assessment Of Human Induced Soil Degradation (Glasod): A Users Guide To The Global Digital Database," UNEP/GRID, July 1, 1991.