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Center for Army Analysis

THE MODELING OF ESSENTIAL SERVICES, SECURITY, ECONOMICS, AND EMPLOYMENT (U)

NOVEMBER 2013

CENTER FOR ARMY ANALYSIS
6001 GOETHALS ROAD
FORT BELVOIR, VA 22060-5230

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REPORT DOCUMENTATION PAGE	*Form Approved OMB No. 074-0188*

1. AGENCY USE ONLY	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	November 2013	Final Report, Mar 20 2009 – Oct 20 2009

4. TITLE AND SUBTITLE
The Modeling of Essential Services, Security, Economics, and Employment (U)
MESSEE

5. FUNDING NUMBER

6. AUTHOR(S)
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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
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8. PERFORMING ORGANIZATION REPORT NUMBER
CAA-2009157

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Director
Center for Army Analysis
6001 Goethals Road
Fort Belvoir, VA 22060-5230

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES
N/A

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release: distribution unlimited.

12b. DISTRIBUTION CODE
A

13. ABSTRACT
Outcomes of irregular warfare (IW) are dependent upon the support of the people for their government. Effective representations of IW environments should model people's support for their government, yet models of support, backed by quantifiable data are rare. Modeling Essential Services, Security, Economics, and Employment (MESSEE) uses survey data from Iraq and Afghanistan to estimate the relationships between people's perceptions of the government and their decisions to support their government, which can help prioritize non-lethal counterinsurgency efforts and expenditures. Moreover, the estimated support equation, in turn, permits accurate estimation of a social rate of support for the government, that can be used as an input to other modeling efforts, and which is a critical measure of effectiveness (MOE) itself.

14. SUBJECT TERMS
Survey, Support Rate, Approval Rate, Logistic Regression

15. NUMBER OF PAGES
90

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UU

NSN 7540-01-280-5500
Standard Form 298

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THE MODELING OF ESSENTIAL SERVICES, SECURITY, ECONOMICS, AND EMPLOYMENT (U)

SUMMARY (U)

(U) THE PROJECT PURPOSE is to develop an empirical methodology to estimate the effects of political and economic events and activities on the conflict environment as part of an irregular warfare simulation.

(U) THE PROJECT SPONSOR:

Director
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6001 Goethals Road
Fort Belvoir, VA 22060-5230

(U) THE PROJECT OBJECTIVES:

(1) (U) Use survey data to estimate the relationships between the government's provision of services and the individual's decisions to support the government.

(2) (U) Aggregate these individual decisions into an estimate of a population support rate that can be projected into the future during irregular warfare modeling.

(U) THE SCOPE OF THE PROJECT: Use survey data from Iraq and Afghanistan and a binary modeling technique to estimate the influence of the government's provision of services on the individuals' decisions to support the government. The Iraqi model uses monthly Multi-National Force – Iraq (MNF-I) polling data and the Afghan model uses the International Security Assistance Force's (ISAF) Afghan National Quarterly Assessment Research, Wave 3 (ANQAR 3).

(U) THE MAIN ASSUMPTIONS:

(1) (U) Survey respondents, as a group, are reasonably representative of the population.

(2) (U) The relative influence of factors influencing the support decision changes slowly over time.

(U) THE PRINCIPAL FINDINGS:

(1) (U) The Modeling of Essential Services, Security, Economics, and Employment (MESSEE) study provides an empirical method for projecting support for the government in a simulated future. It provides a feedback loop relating changes in security to changes in support; it provides estimates for the effects of non-lethal activities on support; it provides a feedback loop relating changes in support to changes in the security situation.

(2) (U) It is useful for analysis and perhaps for training simulations as well.

(3) (U) It provides a crucial measure of effectiveness (MOE) for simulations of these environments.

(U) CHALLENGES:

(1) (**U**) Method cannot be used for simulating conflicts without large-scale public opinion surveys, e.g., Sudan and Yemen.

(2) (**U**) A more recent Combined Security Transition Command – Afghanistan (CSTC-A) survey was available for Afghanistan, but respondents were not asked if they supported the government, depriving MESSEE of the dependent variable.

(U) THE PROJECT EFFORT was conducted by Dr. Adam Shilling and Robert Appel, Operations Analysis Division.

(U) COMMENTS AND QUESTIONS may be sent to the Director, Center for Army Analysis, ATTN: CSCA-OA, 6001 Goethals Road, Suite 102, Fort Belvoir, VA 22060-5230.

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1 INTRODUCTION (U)

1.1 (U) Background

- **The outcome of IW is determined by the support of the people (FM 3 -24, 2006; Shilling, 2008).**
- **People's decisions to support the government are contingent upon their perceptions of the government's functioning – its ability to provide security, essential services, and economic well-being to its citizens– and citizens' demographic characteristics.**
- **An effective representation of an IW environment should model people's support for their government. Yet models of support, backed by quantifiable data, are rare.**

Figure 1. (U) Background

(U) Doctrine and a great deal of research say that the outcome of irregular warfare (IW) is determined by the support of the population.

(U) People's decisions to support the government are contingent upon their perceptions of the government's functioning– its ability to provide security, essential services, and economic well-being to its citizens– and their demographic characteristics.

(U) Modeling irregular warfare environments should include representations of popular support, but few of these exist that have adequate backing in empirical data.

(U) Notes: Shilling, Adam P. (2008). Toward an Effective and Humane Counterinsurgency. Louisiana State University Electronic Theses and Dissertations Database; FM 3-24 Counterinsurgency (2006).

1.2 (U) Problem Statement

- **CAA lacked empirical methods and models for representing the effects of political and economic events and activities that are a part of the complex conflict environment in which military operations currently take place.**

Figure 2. (U) Problem Statement

(U) The Center for Army Analysis (CAA) has a simulation of counterinsurgency (COIN) warfare that is used to conduct analysis and answer questions from the combat theaters, but this wargame is heavily dependent upon security-related factors. CAA leadership wanted to enhance the ability of the game to account for economic and political events and activities that impact the environment.

(U) The problem was to enhance the depiction of "soft" factors– those political, economic, and other non-lethal effects– that affect the COIN battlefield, and to do so in a way that relied upon empirical data.

1.3 (U) Sponsor, Purpose, and Objectives

- **Sponsor**
  - **Internal.**
- **Purpose**
  - **Develop an empirical methodology to estimate the effects of political and economic events and activities on the conflict environment as part of an irregular warfare simulation.**
- **Objectives:**
  - **1. Use survey data to estimate the relationships between the government's provision of services and individuals' decisions to support the government.**
  - **2. Aggregate these individual decisions into an estimate of a population support rate that can be projected into the future during IW modeling.**

Figure 3. (U) Sponsor, Purpose, and Objectives

(U) The Modeling of Essential Services, Security, Economics, and Employment (MESSEE) study evolved out of the Iraqi Security Force Assistance (ISFA) III study. It emerged as a separate study at the direction of COL Richard Shelton, then chief of the Operational Capability Assessments division.

(U) Its purpose was to address the gap identified in the problem statement with political and economic modeling. This report details a method that may be useful for future simulation efforts within the Department of Defense (DoD). It is not about a specific study, *per se*, but about a method that can be applied to future studies with updated datasets.

(U) The study had two objectives:

(U) 1. Use survey data to estimate the relationships between the government's functioning and people's individual support decisions.

(U) 2. Aggregate individuals' support decisions into an estimate of the rate of social support for the government that can be projected into the future. This support rate is both a critical measure of effectiveness (MOE) and an input into the security module of CAA's wargame or any other irregular warfare simulation.

1.4 (U) Literature Review/References

- **Consensus of theoretical literature says that COIN is population-centric:**
  - **Galula, D. (2006).** ***Counterinsurgency Warfare: Theory and Practice*****.**
  - **Kitson, F. (1974).** ***Low Intensity Operations: Subversion, Insurgency, and Peacekeeping.***
  - **Lawrence, T. E., (1989).** ***The Evolution of a Revolt*****.**
  - **Mao Tse-Tung (1961).** ***On Guerrilla Warfare.***
  - **Nagl, J. A. (2002).** ***Counterinsurgency Lessons from Malaya and Vietnam: Learning to Eat Soup with a Knife.***
  - **Petraeus, D. H. (2006).** ***Learning Counterinsurgency: Observations from Soldiering in Iraq.***
  - **Shilling, A. (2008).** ***Toward an Effective and Humane Counterinsurgency*****.**
- **Doctrine agrees:**
  - **FM 3-24** ***Counterinsurgency.***
  - **JP 3-24** ***Counterinsurgency Operations.***
- **Methodology and Data:**
  - **Shilling, A. (1996).** ***Ethical Bases of Environmental Behavior.***
  - **Franklin, F. (1996).** ***Quality of Life Measurement and Analysis (QUAILMAN)***
  - **Blaho, J. & Kaiser, L. (2009).** ***Irregular Warfare Quantitative Analysis of Historical Database (IWQAHD)***
  - ***Multi-National Force- Iraq (MNFI) Public Opinion Poll, Iraq.***
  - ***Afghan National Quarterly Assessment Research (ANQAR) 3 Public Opinion Poll, Afghanistan.***

Figure 4. (U) Literature Review/References

(U) The literature cited in Figure 4 is a sample of the works that conclude that counterinsurgency is "population-centric"—fought among and over the population of the contested area—and that the outcome of counterinsurgency is determined by the support of the population.

(U) Doctrine agrees with the consensus of theory.

(U) The empirical methodology of MESSEE is an outgrowth of Shilling (1996) *Ethical Bases of Environmental Behavior*, which used a binary modeling technique to explore the factors related to a landowner's decision to participate in a public conservation program.

(U) MESSEE will model citizens' decisions to support their government using a logistic regression modeling technique.

1.5 (U) Scope

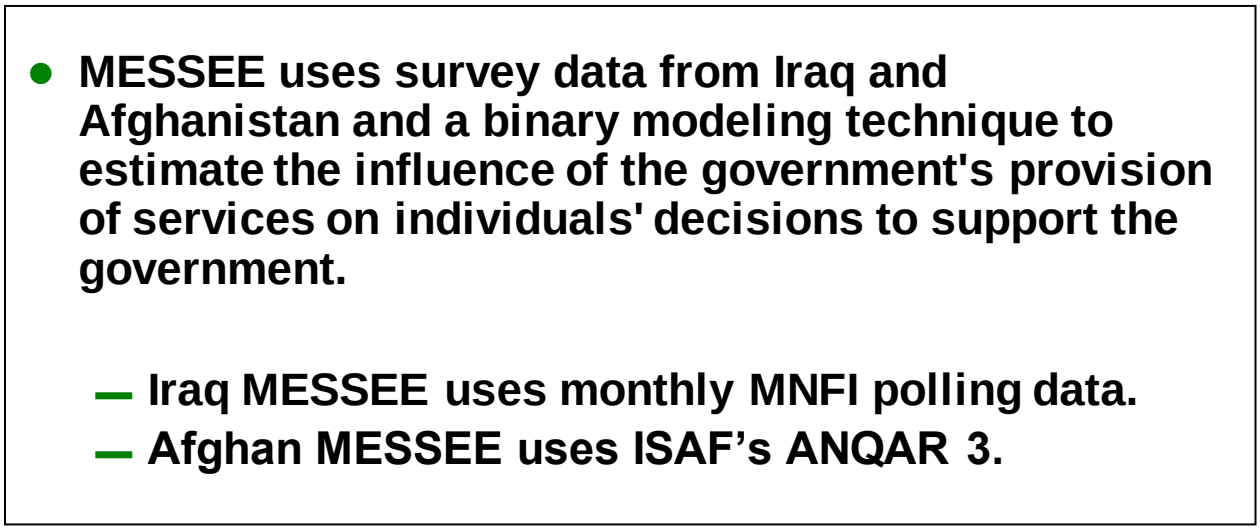

Figure 5. (U) Scope

(U) Figure 5 Acronyms: Multinational Force-Iraq (MNFI); International Security Assistance Force (ISAF); Afghan National Quarterly Assessment Research (ANQAR)

(U) MESSEE will estimate the relationships that affect people's support decisions, and then aggregate individuals' decisions into an estimate of popular support.

(U) MESSEE uses the latest data available from the Multinational Force-Iraq (MNF-I) and from the International Security Assistance Force (ISAF). When MESSEE is performed in the future, the method will need to be updated with the latest data.

(U) The relevant polls for the examples of MESSEE contained in this report were:

- MNF-I Poll, conducted monthly, from December 2008 to February 2009.
- Afghan National Quarterly Assessment Research (ANQAR) 3 conducted in February 2009.

1.6 (U) Assumptions and Limitations

- **Assumptions**
  - **Survey respondents are reasonably representative of the population.**
  - **The relative influence of factors influencing the support decision changes slowly over time.**
- **Limitations**
  - **Method cannot be used for simulating conflicts without large-scale public opinion surveys, e.g. Sudan or Yemen.**
  - **A more recent CSTC-A survey was available for Afghanistan, but did not ask respondents if they supported the government, depriving MESSEE of the dependent variable.**

Figure 6. (U) Assumptions and Limitations

(U) MESSEE requires only two broad assumptions.

(U) 1. The survey sample is representative.

(U) 2. The relative influence of factors affecting the support decision change slowly over time.

(U) The fact that MESSEE is data-backed limits its application to places and times for which polling data exist. The usefulness of MESSEE is limited to the place and time for which parameters are estimated.

(U) However, the methodology can be applied anywhere for which data are available.

1.7 (U) Essential Elements of Analysis / Measures of Effectiveness

- **EEA 1. What popular perceptions of services and government functioning most influence an individual's decision to support the government?**
  - **MOE 1.1 Closeness of nominal independent variables to dependent variable in factor tree.**
  - **MOE 1.2 Magnitude of Spearman's Correlation Coefficient of ordinal and continuous independent variables with dependent variable.**
- **EEA 2. What measureable effects do these perceptions have on an individual's support decision?**
  - **MOE 2.1 Statistical significance of parameter associated with each variable.**
  - **MOE 2.2 Magnitude of parameter estimate associated with each variable.**
- **EEA 3. What measureable effect does ethno-sectarian identity, employment status and province of residence have on an individual's support decision?**
  - **MOE 3.1 Statistical significance of parameter associated with each variable.**
  - **MOE 3.2 Magnitude of parameter estimate associated with each variable.**
- **EEA 4. Can a model predict individual support decisions well enough to inform IW modeling?**
  - **MOE 4.1 Correct prediction rate of full model and cross-validation set.**
- **EEA 5. Can a useful aggregation of individuals' decisions be made to support IW modeling?**
  - **MOE 5.1 Closeness of estimated support rate to that observed in the sample.**

Figure 7. (U) Essential Elements of Analysis / Measure of Effectiveness

(U) Figure 7 contains the Essential Elements of Analysis (EEAs) and the Measures of Effectiveness (MOEs) that are used to determine the method's success in achieving its purpose.

1.8 (U) Methodology: Improving Irregular Warfare Representations

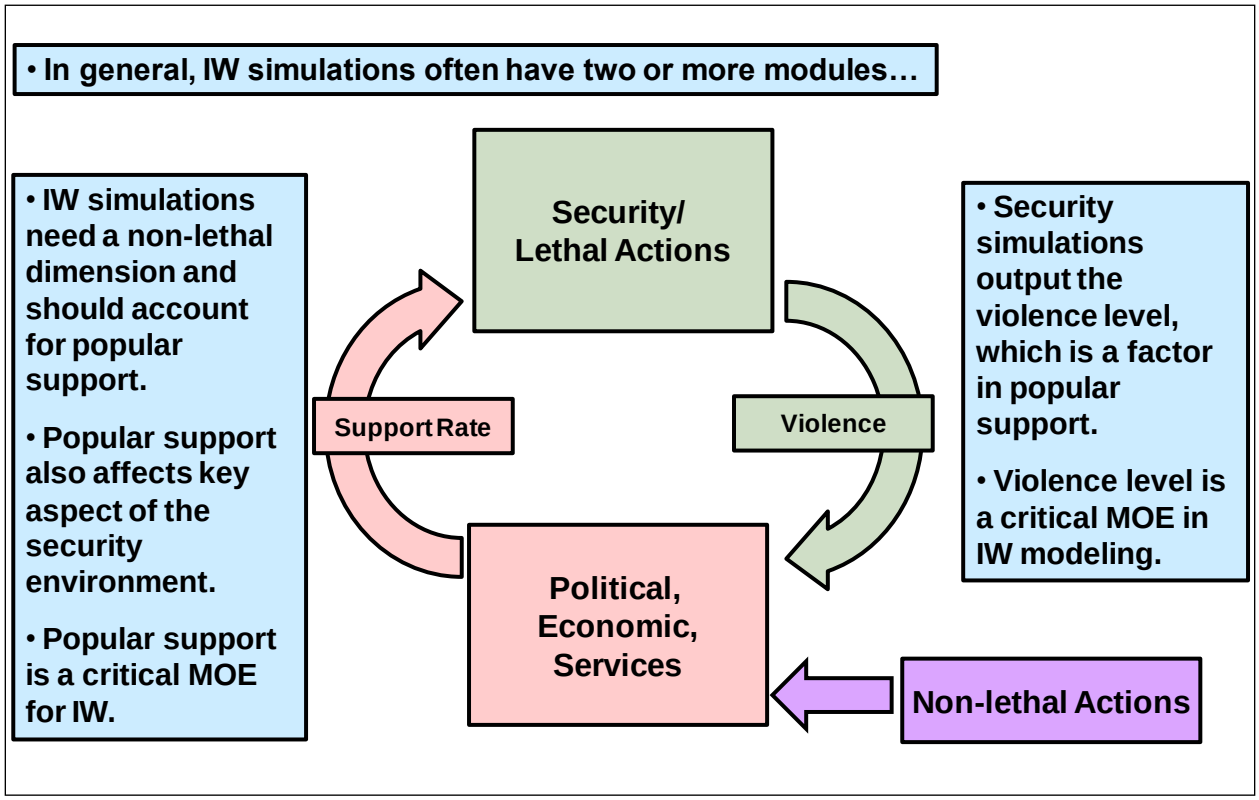

Figure 8. (U) Methodology: Improving Irregular Warfare Representations

(U) In general, IW simulations often have two or more modules. One deals with the "security" aspects of the conflict, and other(s) deal with the "soft" aspects.

(U) The purpose of MESSEE was to be the political-economic module in an iterative wargame.

(U) MESSEE takes the violence level output in the security module of the game, uses that to set perceptions of security, accounts for the effects of non-lethal government actions and changes in the environment, and outputs an estimate of future popular support for the government at the national, regional, or provincial levels. MESSEE could also estimate the support rate for a particular demographic– ethnic group, gender, age, or other.

(U) This support rate is in an important MOE, and is used to determine adjustments to insurgent regeneration rates and to combat adjudication tables in the security module.

1.9 (U) Methodology: Binary Choice

- **An individual's "Support" decision can be framed as a binary choice: one either supports the government or does not.**
- **The conceptual model is:**

Support = f(Demographic variables and Perceptions of Security, Essential Services, Economic Well-being)

Figure 9. (U) Methodology: Binary Choice

(U) MESSEE represents an individual's decision to support the government as a binary choice– the individual does or does not support the government.

(U) Conceptually, this decision is a function of his or her perceptions of the government and his or her demographic characteristics.

1.10 (U) Methodology: Logistic Regression

- **Binary logistic regression is one tool to model binary decisions.**
- **In logistic regression models:**
  - **The model outputs a probability for each individual in the dataset based on that person's perceptions and characteristics.**

$$P(\text{Support}) = 1/(1+e^{-z}), \text{ where } z = \alpha + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k$$

  - **The probability calculation is used to predict the decisions of individuals that are not included in the dataset.**
- **The set of individual probabilities can be aggregated to a "support rate" for the government.**

Figure 10. (U) Methodology: Logistic Regression

(U) Binary logistic regression is a method for modeling binary decisions and estimating parameters.

(U) It works by considering a parameter, z, to be a linear combination of a set of variables.

(U) The parameter, z, is then inserted into the probability function, and a probability is computed for each respondent.

(U) It is important to stress this point: the model outputs a probability, a number between zero and one, for each respondent– his or her likelihood of supporting the government based on survey responses. So, the model generates an Nx1 vector of probabilities.

(U) The estimated logistic regression equation is useful because it can be used to predict the likelihood of support for individuals who are not in the sample, if their perceptions and characteristics can be determined.

(U) Finally, the set of individual probabilities can be aggregated into an estimate of a popular support.

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2 IRAQI MESSEE (U)

(U) Original specifications of MESSEE were based upon Iraqi data.

2.1 (U) The Dataset

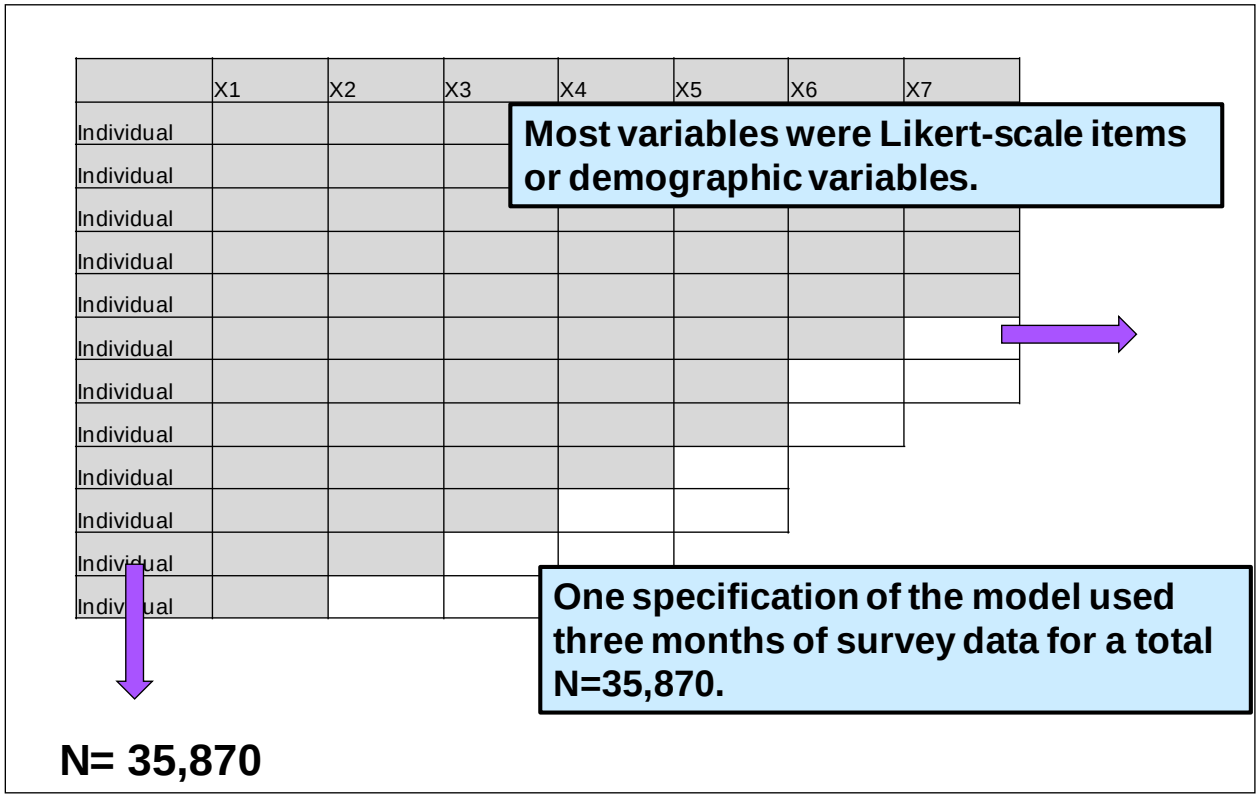


Figure 11. (U) The Dataset

(U) The data were drawn from a survey done in Iraq for the Multi-National Forces – Iraq (MNF-I). The survey gathers about 12,000 responses per month, and data are available from October 2007 to February 2008.

(U) The specification of the model that was selected for this report uses 3 months of data for a total sample size of 35,870. During this interval, time was not a statistically significant factor.

(U) Most questions were Likert-scale items that sought information about people's demographic characteristics and perceptions of the government.

2.2 (U) Dependent Variable

- **An individual's support for the government was measured directly by survey. Each respondent was asked his or her agreement with the following:**

  "I support the current Iraqi central government"

- **Responses could range from Strongly Agree to Strongly Disagree.**
- **Responses were placed in binary form:**
  - **Strongly agree, Somewhat agree = 1**
  - **Strongly disagree, Somewhat disagree, Neither agree nor disagree, Don't Know, Not Applicable = 0**

Figure 12. (U) Dependent Variable

(U) An individual's support for the government was measured directly by survey.

(U) Respondents agreed, disagreed, or remained uncertain with the statement: "I support the current Iraqi central government"

(U) Agreement was considered support and coded as a "1". Disagreement, uncertainty or a non-response was considered non-support.

2.3 (U) Independent Variable Selection

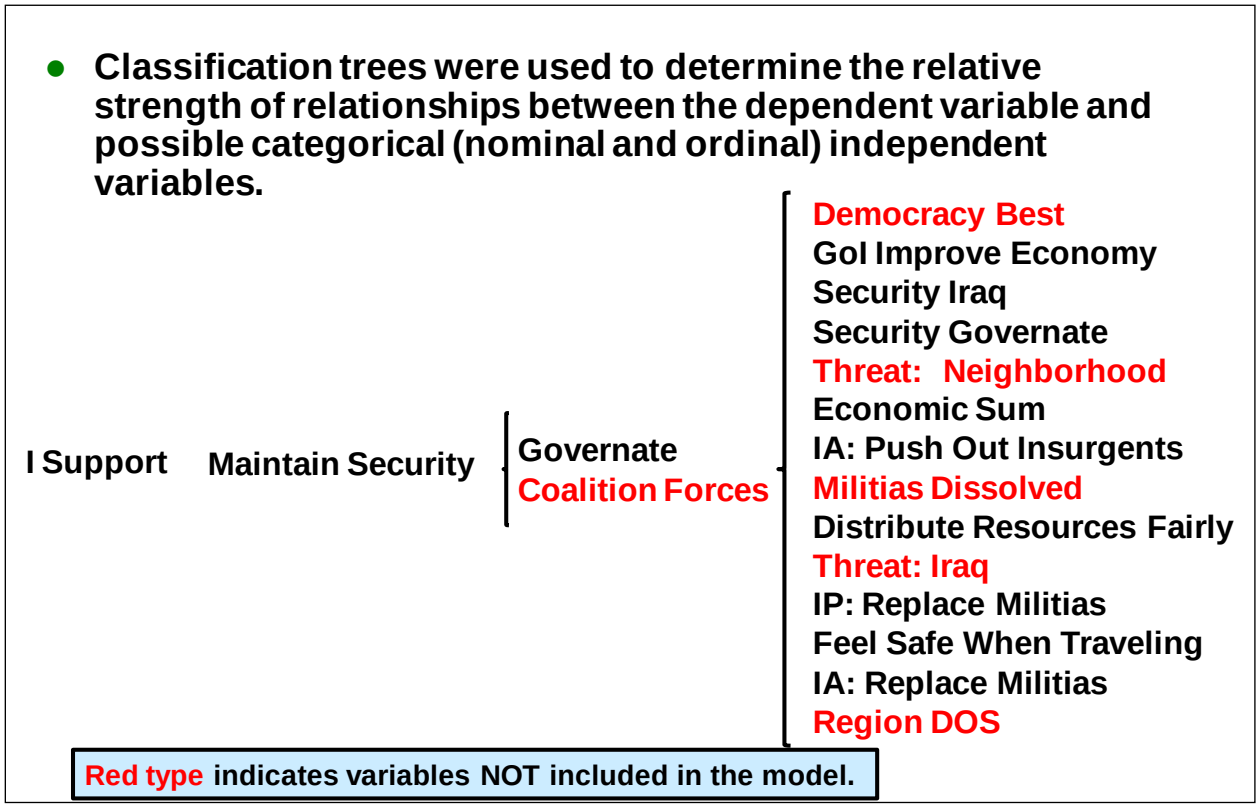


Figure 13. (U) Independent Variable Selection (1 of 2)

(U) Researchers examined a number of possible survey responses as independent variables. Knowledge of counterinsurgency theory was combined with statistical techniques to identify potential variables.

(U) Classification trees were used to determine the relative strength of relationships between the dependent variable and possible categorical independent variables.

(U) The slide depicts the top three levels of the classification tree– those responses that are most highly related to the support decision.

(U) The variables depicted in black type were included in the model.

Variable	Rho		Variable	Rho
Maintain Security	0.41		Security Better Neighborhood	0.13
Security Sum	0.3		Economy Improving	0.12
GOI Improve Economy	0.29		Security Better Iraq	0.12
Corrupt National Council	0.29		Feel Safe When Traveling	0.11
Distribute Resources Fairly	0.28		Trash	0.09
Economy Sum	0.27		Health	0.08
IA: Prevent Sectarian Violence	0.22		Essential Services Sum	0.08
IA: Push out Insurgents	0.22		Electricity	0.08
Democracy Best	0.21		Militia Activities	0.07
IP: Protect my neighborhood	0.19		Sewer	0.05
Security Neighborhood	0.18		Economic Satisfaction	0.05
Security Province	0.17		Violence Justified	0.05
IP: Prevent Sectarian Violence	0.17		Must "Give Gift"	0.05
Security Iraq	0.16		Militias dissolved	0.04
Coaltion Forces	0.15		Food	0.04
IP: Push out Insurgents	0.15		Must Move from Home	0.03
IA: Replace Militias	0.14		Gas	0.02
IP: Replace Militias	0.13		Water	0.01

- **Correlated by Spearman's Rho***
- **Indices were constructed (in darker shades) to include more variables (in lighter shade of same color) and to take advantage of the properties of continuous variables.**
- **Continuous variables greatly increase tractability during aggregation.**
- **Time was not significant for three month period prior to study.**
- **Three months' data equaled 35,870 observations.**

**** Values of Rhos are absolute***

Indices for perceptions of Security, Essential Services, and Economic Well-being are primary predictors.

- **IP= Iraqi Police**
- **IA= Iraqi Army**

Figure 14. (U) Independent Variable Selection (2 of 2)

(U) Additionally, researchers correlated prospective independent variables with the dependent variable using Spearman's rank order correlation coefficient. Spearman's "rho" is the most appropriate method to calculate the correlation between ordinal variables. For this calculation, the complete ordinal range of the dependent variable from "strongly disagree" (0) to "strongly agree" (4), not its binary form (0 or 1), was used.

(U) The correlations are depicted in the table above by the absolute magnitude of the Spearman's rho.

(U) Some interesting results emerge:

- The government's ability to maintain security is most highly correlated with support.
- The government's perceived ability to improve the economy in the future and its ability to distribute resources fairly were both more important to support than an individual's current level of economic satisfaction.
- Satisfaction with essential services was less correlated with support than U.S. expenditures would suggest.

(U) Researchers constructed a series of indices from the responses of Likert-scale items relating to security, economics, and essential services. They took a series of questions relating to each of these categories, ensured the items were coded so that "more was better," and summed the responses for each individual.

(U) These indices highlighted in the darker colors and containing the word "sum," are composed of the items in lighter shades of the same color. Each index was more closely related to support than most of its component items. This permits use of a greater quantity of data relating to security, economics, and essential services, rather than the selection of only one or two survey questions for each one.

(U) These indices were treated as continuous variables, which greatly facilitates aggregation.

(U) Details on the creation of these indices are contained in Appendix A.

2.4 (U) Independent Variable Summary

- **Continuous Variables**
  - **Continuous variables were constructed by summing questions with Likert scale responses.**
  - **Indices were constructed for Security, Economic and Essential Services perceptions.**
- **Categorical Variables**
  - **Province: The province in which a respondent resides.**
    - **18 possible responses**
  - **Employment Status: 12 categories were consolidated into four.**
    - **Unemployed, Not in work force, Part-time, Full-time**
  - **Identity: Constructed from questions on ethnicity and religion.**
    - **Shia, Sunni, Kurd, Other**

$$z = \alpha + \beta_1(\text{Security}) + \beta_2(\text{ES}) + \beta_3(\text{Econ}) + \beta_4(\text{Province}) + \beta_5(\text{Identity}) + \beta_6(\text{Employment})$$

Figure 15. (U) Independent Variable Summary

(U) Indices for security perception, economic well-being, and satisfaction with essential services were included in the model as continuous variables.

(U) Nominal variables included the province where a respondent lives, his employment status, and ethno-sectarian identity.

(U) Province had 18 possible responses, employment status had 4 levels, and identity had 4 categories.

(U) Detailed information on variable coding is contained in Appendix A.

(U) This selection of independent variables yielded the model specification highlighted.

2.5 (U) Descriptive Statistics

Frequency Distributions: I Support (Binary)

	Frequency	Percent
Non-Support	19578	54.6%
Support	16292	45.4%

Frequency Distributions: I Support (3 cats)

	Frequency	Percent
Non-Support	11205	31.2%
Support	16292	45.4%
Uncertain	8373	23.3%

- **Frequency distribution of the binary dependent variable indicated 45.4% support for the government.**
- **Using survey data, which permitted a respondent to be "Uncertain," we find that Supporters are the plurality of the Iraqi population.**

Continuous Variable Information

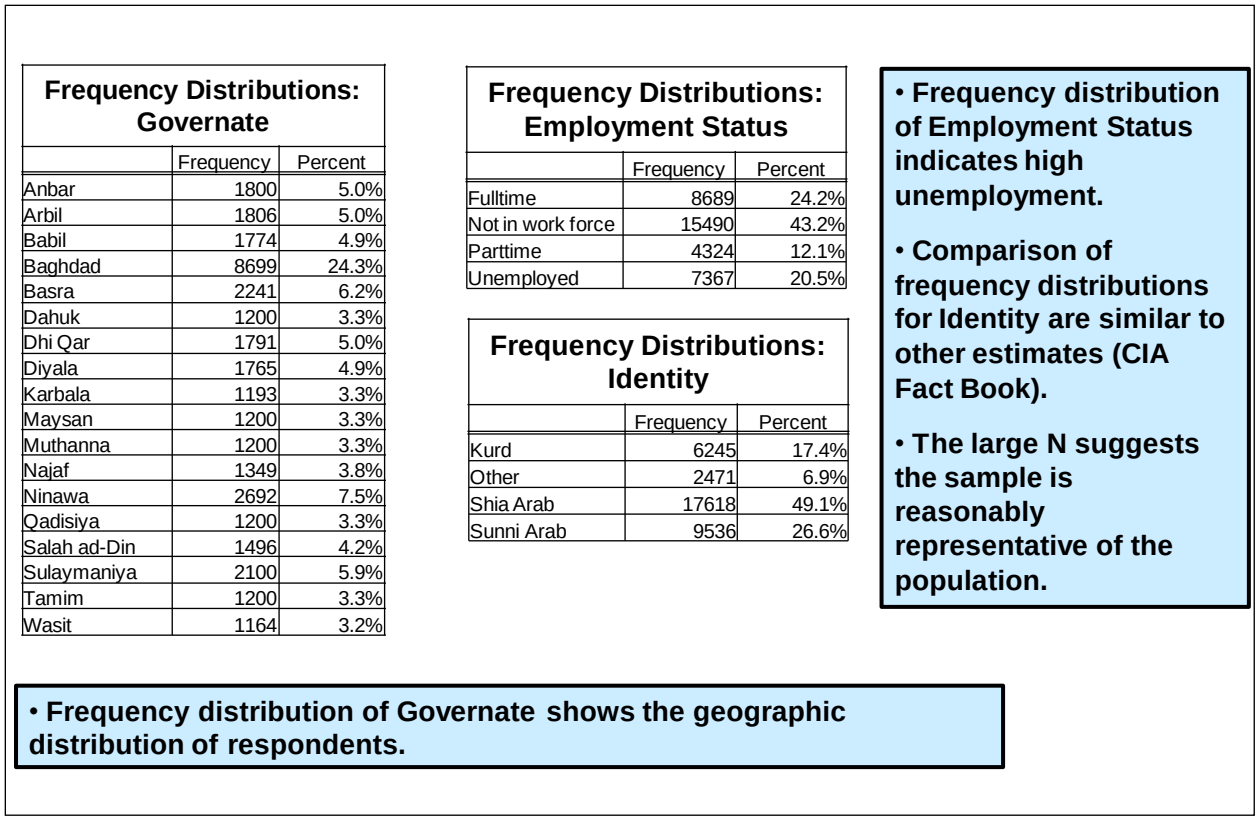
	N	Minimum	Maximum	Mean	Std. Deviation
Covariate ES_Sum	35870	.00	24.00	10.41057	4.40167
Eco_Sum	35870	2.99	17.00	8.24307	2.47391
Sec_Sum	35870	3.00	54.00	35.55983	8.17166

- **Means and standard deviations were computed for the constructed indices that were continuous.**

Figure 16. (U) Descriptive Statistics (1 of 2)

(U) Descriptive statistics were performed on the dependent and continuous independent variables. The rate of support was 45.4 percent.

(U) Survey respondents were permitted to be "uncertain" of their support for the government. Comparing those who were uncertain (23 percent) and those who were not supportive (31 percent) to those who were supportive, the plurality of the populace is supportive of the government in Iraq during the sample period.



Frequency Distributions: Governate

	Frequency	Percent
Anbar	1800	5.0%
Arbil	1806	5.0%
Babil	1774	4.9%
Baghdad	8699	24.3%
Basra	2241	6.2%
Dahuk	1200	3.3%
Dhi Qar	1791	5.0%
Diyala	1765	4.9%
Karbala	1193	3.3%
Maysan	1200	3.3%
Muthanna	1200	3.3%
Najaf	1349	3.8%
Ninawa	2692	7.5%
Qadisiya	1200	3.3%
Salah ad-Din	1496	4.2%
Sulaymaniya	2100	5.9%
Tamim	1200	3.3%
Wasit	1164	3.2%

Frequency Distributions: Employment Status

	Frequency	Percent
Fulltime	8689	24.2%
Not in work force	15490	43.2%
Parttime	4324	12.1%
Unemployed	7367	20.5%

Frequency Distributions: Identity

	Frequency	Percent
Kurd	6245	17.4%
Other	2471	6.9%
Shia Arab	17618	49.1%
Sunni Arab	9536	26.6%

• Frequency distribution of Employment Status indicates high unemployment.

• Comparison of frequency distributions for Identity are similar to other estimates (CIA Fact Book).

• The large N suggests the sample is reasonably representative of the population.

• Frequency distribution of Governate shows the geographic distribution of respondents.

Figure 17. (U) Descriptive Statistics (2 of 2)

(U) Frequency distributions of the categorical variables were performed.

(U) The large sample size (N=35,870) suggests the sample is reasonably representative of the population.

2.6 (U) Parameter Estimates and P-Values

Parameter Estimates

Parameter	B	Std. Error	Sig.
(Intercept)	-4.369	0.1118	0.000
Governate=Anbar	-0.293	0.0913	0.001
Governate=Arbil	-0.598	0.1054	0.000
Governate=Babil	0.9	0.0879	0.000
Governate=Baghdad	-0.493	0.0721	0.000
Governate=Basra	0.246	0.0801	0.002
Governate=Dahuk	-1.103	0.1089	0.000
Governate=Dhi Qar	-0.773	0.0835	0.000
Governate=Diyala	-0.594	0.0902	0.000
Governate=Karbala	-0.206	0.0903	0.023
Governate=Maysan	-1.056	0.0895	0.000
Governate=Muthanna	0.42	0.0932	0.000
Governate=Najaf	-0.138	0.0894	0.122
Governate=Ninawa	-0.639	0.0882	0.000
Governate=Qadisiya	-0.112	0.0921	0.226

Parameter Estimates

Parameter	B	Std. Error	Sig.
Governate=Salah ad-Din	-2.378	0.1295	0.000
Governate=Sulaymaniya	-0.675	0.1019	0.000
Governate=Tamim	-0.406	0.0978	0.000
Governate=Wasit	0[a]	.	.
Identity=Kurd	0.638	0.0655	0.000
Identity=Other	0.62	0.0527	0.000
Identity=Shia	0.708	0.0416	0.000
Identity=Sunni	0[a]	.	.
Emp_Stat_4=Fulltime	-0.056	0.0356	0.118
Emp_Stat_4=Not in work force	-0.113	0.0317	0.000
Emp_Stat_4=Parttime	-0.108	0.0431	0.012
Emp_Stat_4=Unemployed	0[a]	.	.
ES_Sum	0.029	0.0031	0.000
Eco_Sum	0.208	0.0057	0.000
Sec_Sum	0.06	0.0018	0.000

Dependent Variable:
I_Sppt_Binary
Model: (Intercept), Governate, Identity, Emp_Stat_4, ES_Sum, Eco_Sum, Sec_Sum
a. Set to zero because this parameter is redundant.

- **Small p-values show significance of included independent variables.**

Figure 18. (U) Parameter Estimates and P-Values

(U) Figure 18 contains the parameter estimates for each continuous variable and each level of the nominal variables. Small p-values ($\alpha/2 < 0.025$) indicate statistical significance. Positive parameter estimates indicate that increasing the value of a variable will increase the probability of support.

(U) Modeling was conducted using the Statistical Package for the Social Sciences (SPSS) 17.0 "Generalized Linear Models" module, and "binary logistic" regression was selected from among the models available.

(U) Binary logistic regression estimates parameters for nominal variables, such as Province, Identity, and Employment, by considering one level the base, and calculating the change in z for all other levels. Unless otherwise specified, SPSS treats the last category in alphabetical order as the base.

(U) Several levels of "Province" (or Governate)—Najaf and Qadisiyah—were not different than Wasit, all located in southern Iraq and demographically similar. Furthermore, "full-time" employment was not different than "unemployed." This counterintuitive result may be an artifact of this dataset or it may represent the disappearance of the negative effect of a respondent being employed only "part-time" or being "not in the workforce."

2.7 (U) Logistic Regression Model

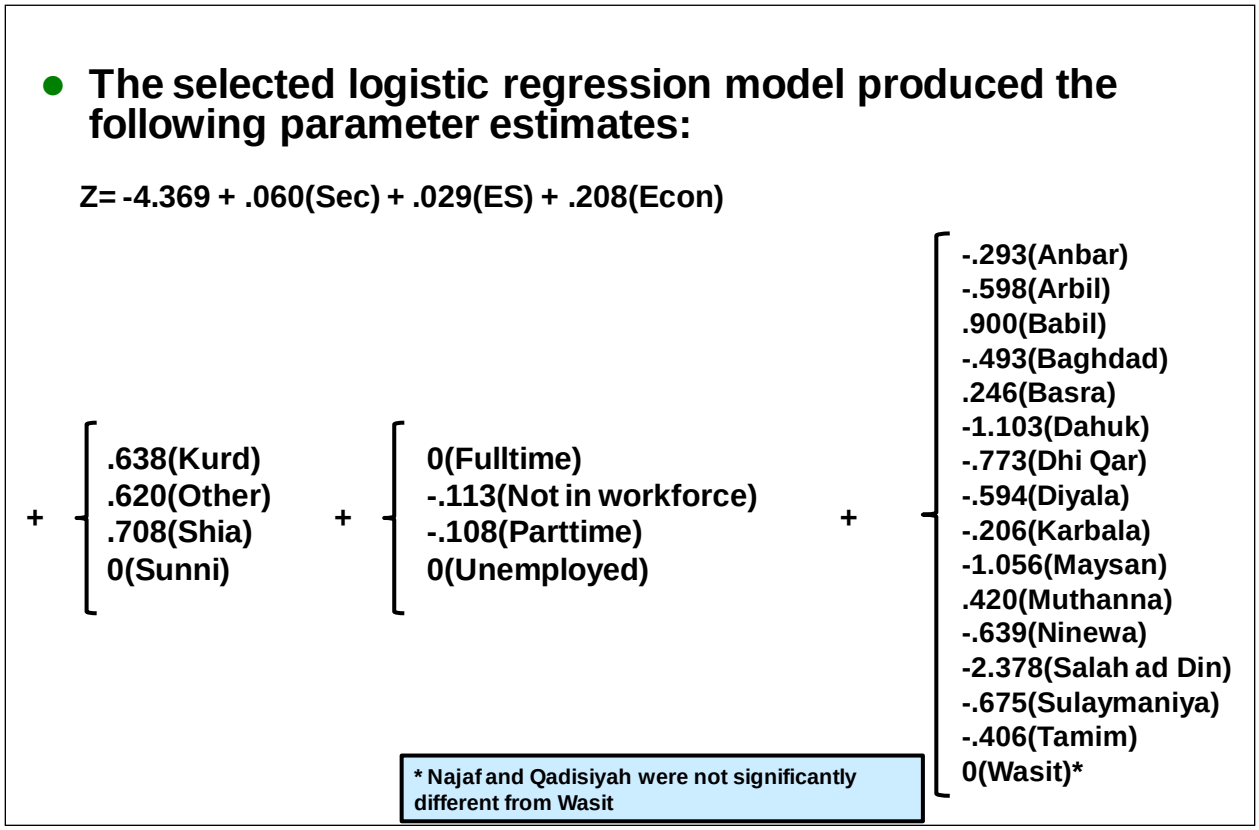


Figure 19. (U) Logistic Regression Model

(U) Inserting the parameter estimates into the support function yields the equation above.

(U) Placing an individual's scores on the indices into the function allows us to calculate a probability that he or she will support the government.

(U) Note: The value of Province, Employment, and Identity must be either 1 or 0. For example, a Kurdish respondent would have a 1 for "Kurd" and a 0 for other levels of identity.

2.8 (U) Goodness of Fit

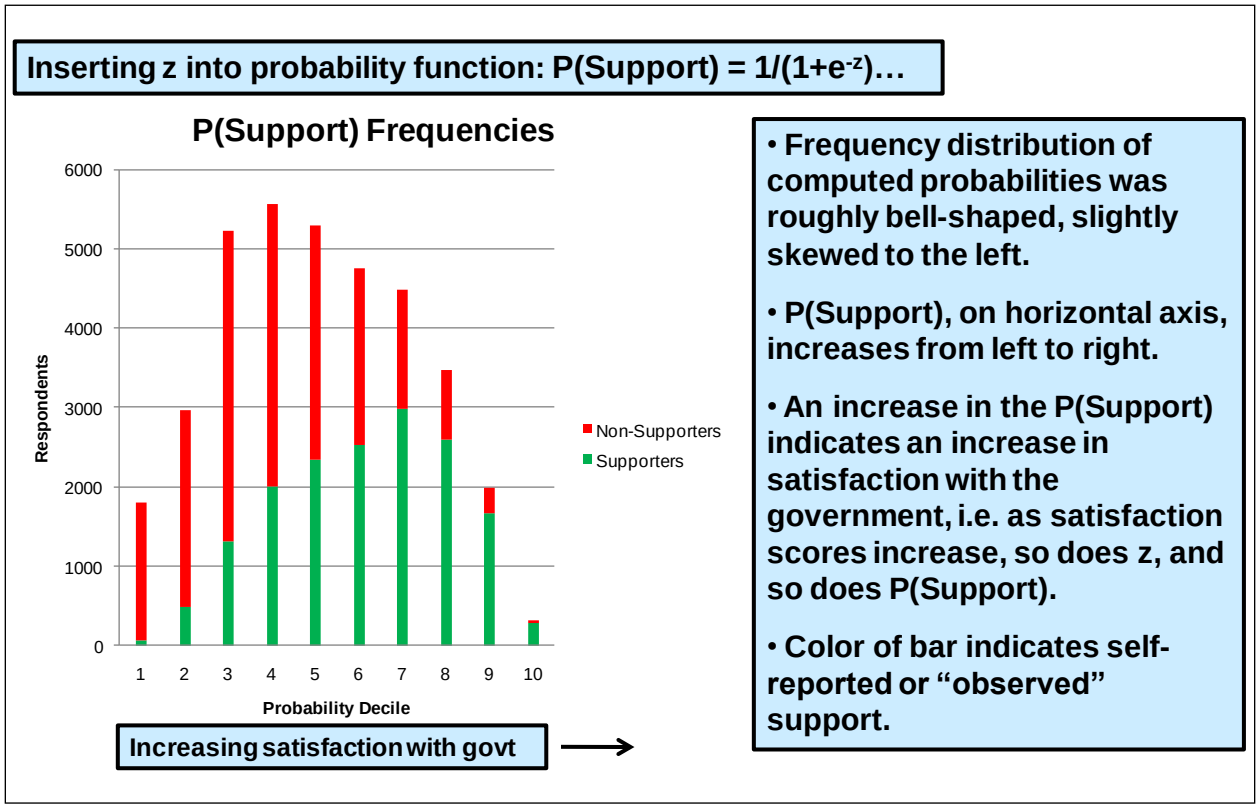


Figure 20. (U) Goodness of Fit (1 of 3)

(U) Figure 20 contains a graphical representation of the data. Inserting z for each respondent into the probability function, researchers computed a probability of support for each.

(U) Researchers sorted the probability of support computed for each respondent into deciles, and the graph shows the distribution of respondents' probabilities of support by decile. Therefore, the first column counts respondents with probabilities of support between 0 and 0.1, the second those between 0.1 and 0.2, etc.

(U) The coloring distinguishes those who stated they supported the government (in green) from those that did not (in red). Respondents' stated support decision was the dependent variable.

(U) A person's probability of support is hypothetically a measure of that person's satisfaction with the government's provision of services– as the satisfaction indices increase, so do probabilities of support.

(U) Going from left to right in the graph, the probability of support increases, which indicates generally increasing satisfaction with the government. Therefore, "self-reported" or "observed" support, indicated by color, should also increase.

(U) However, some people expressed a great deal of satisfaction with the provision of services yet did not choose to support the government, indicated by red on the right half of the graph. Others expressed dissatisfaction with services, yet chose to support the government anyway, indicated by green on the left half of the graph.

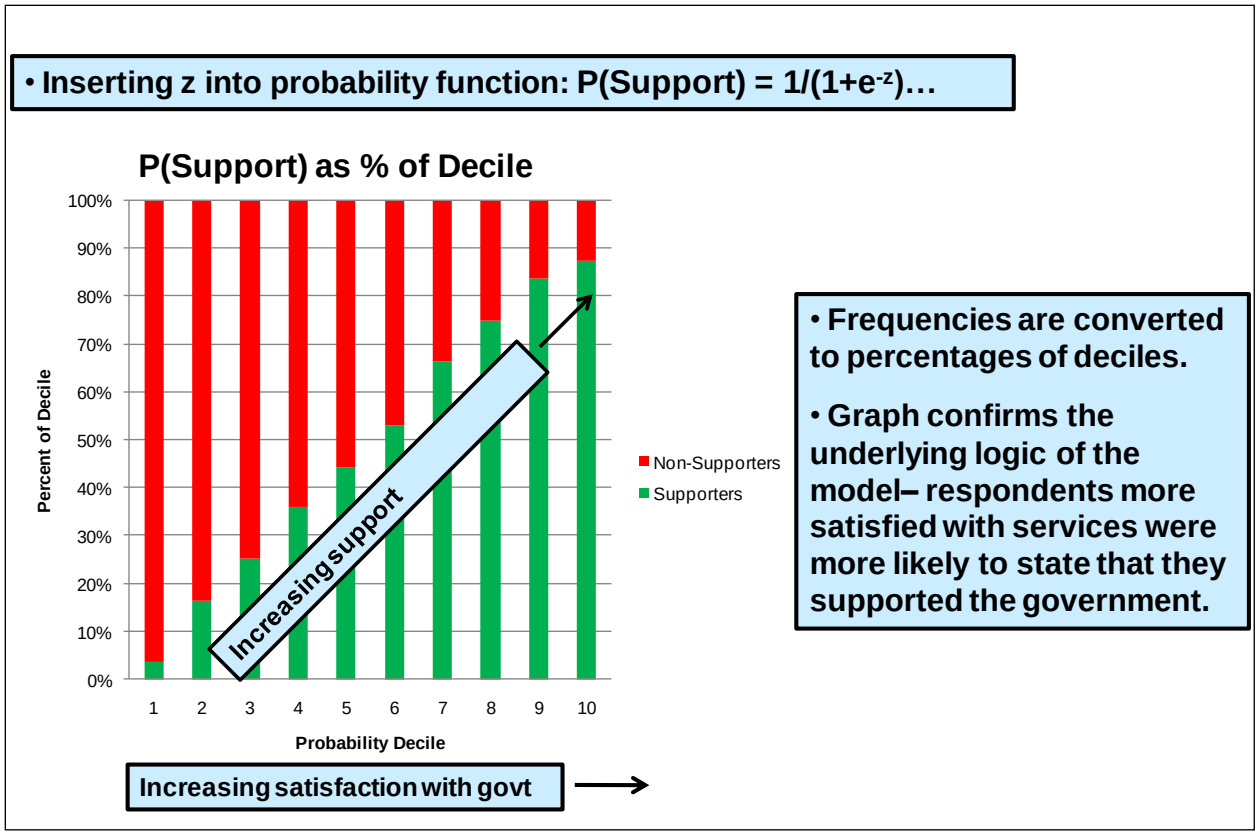
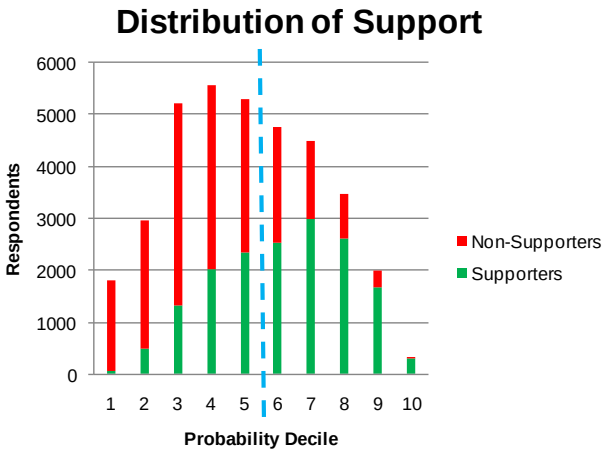


Figure 21. (U) Goodness of Fit (2 of 3)

(U) To confirm the hypothesis that as the probability of support increases and so does observed support, researchers have taken the same information as on the previous page, but have converted the raw counts of supporters and non-supporters into percentages of each decile.

(U) This shows a strong relationship between satisfaction, estimated by the probability of support, increasing moving from left to right, and stated support, depicted by green. This shows the logic underpinning the model is good.



P(Support) > .5 = Support		
Observed	Predicted	Counts
0	0	14614
0	1	4964
1	0	6230
1	1	10062
	Sum=N	35870
Success		24676
Failure		11194
Success Rate		0.688

P(Support) > .545 = Support		
Observed	Predicted	Counts
0	0	15811
0	1	3767
1	0	7484
1	1	8808
	Sum=N	35870
Success		24619
Failure		11251
Success Rate		0.688

• A high proportion of correct predictions indicates goodness.

• Partitioning the sample in half yields a correct prediction rate of 68.8%.

• Dividing the sample at the break observed in the sample very slightly improved rate.

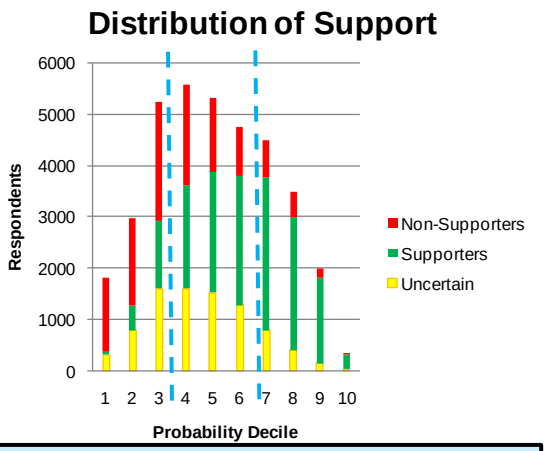
Figure 22. (U) Goodness of Fit (3 of 3)

(U) One measure of goodness of fit in binary models is the proportion of correct predictions: each individual's stated support decision (the dependent variable) is compared to the predicted answer, which is a function of the probability of support (P(Support)) calculated for the same individual.

(U) Defining a rule such that P(Support) > 0.5 = Support, partitioning the sample in half, everyone on the right half of the graph is predicted to be supporters. Those on the left are predicted to be non-supporters. Comparing this predicted support to each respondent's stated support decision (the dependent variable), the model predicts correctly 68.79 percent of the time.

(U) If a P(Support) > 0.545 = Support, the break actually observed in the sample (45 percent were supporters), the prediction rate improves slightly to 68.81 percent.

2.9 (U) Goodness with "Three" Categories



P(Support) Permitting Uncertainty		
Partitions	33/34/33	32/23/45
Predicted 1s=	7007	12575
Predicted 0s=	11715	11181
Predicted Us=	17148	12114
0-0	9276	8930
0-1	1587	3767
0-Uncertain	8715	6881
1,0	2439	2251
1,1	5420	8808
1-Uncertain	8433	5233
Successes=	14696	17738
Failures=	4026	6018
Predictions=	18632	23666
Predictions/N	0.519	0.660
Success/ Predictions	0.789	0.750

• Original survey permitted a respondent to be "Uncertain" but the binary nature of the model binned those respondents into "Non-support" category.

• Uncertain individuals were approximately normally distributed by P(Support).

• Permitting uncertainty, and evaluating successful predictions increases prediction rate.

• But a large number of observations fit into the "Uncertain" interval and no definitive predictions are made for those.

Figure 23. (U) Goodness with "Three" Categories

(U) The original survey permitted a respondent to be "uncertain" about his support for the government. Therefore, researchers wanted to see what partitioning the set into three categories would do to the correct prediction rate.

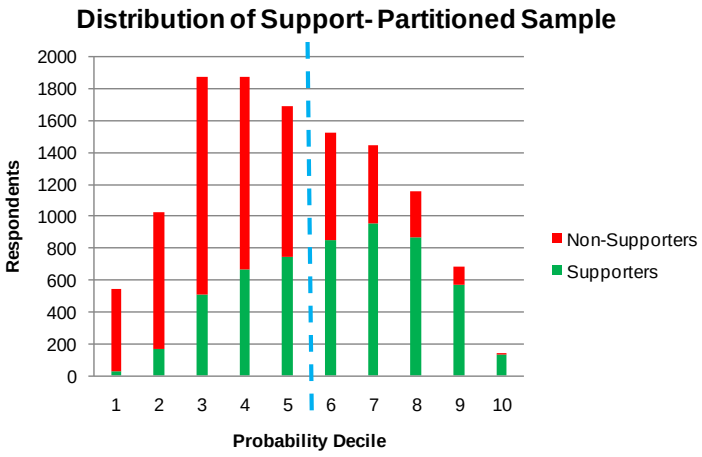
(U) Since assigning partitions is somewhat arbitrary, they tried simply dividing the sample into thirds. Low P(Support) (<.33) were considered non-support and high probabilities (>.67) were considered support, with probabilities in the middle judged as uncertain.

(U) Making definitive partitions predicts only on the tails, the model is successful 79 percent of the time, but due to the rough-bell shape of the data, this permitted definitive predictions in only 52 percent of cases.

(U) Researchers examined other partition rules and determined that assigning partitions is a compromise between a higher correct prediction rate and lower number of definitive predictions made. They decided the best compromise was along the breaks observed in the sample—32 percent non-support, 23 percent uncertainty, and 45 percent support– which allowed definitive predictions in 66 percent of all cases, and yielded a respectable correct prediction rate of 75 percent.

(U) Researchers also observed that uncertain individuals (in yellow) were approximately normally distributed.

2.10 (U) Cross Validation



P(Support) > .5 = Support		
Observed	Predicted	Counts
0	0	4895
0	1	2093
1	0	1583
1	1	3363
	Sum=N	11934
Success		8258
Failure		3676
Success Rate		0.692

- **Cross-validation supported the validity of the model.**
- **2/3 of the original sample was used to estimate parameters and to predict the remaining 1/3.**
- **N=11,934 in the test sample.**
- **Prediction rate = 69.2% was slightly better than the full model.**

Figure 24. (U) Cross Validation

(U) Cross-validation was performed on the model. Two-thirds of the data were used to estimate parameters, and that equation was used to predict the remaining one-third of the data.

(U) The test set had 11,934 observations and a correct prediction rate of 69.2 percent, slightly better than the full model.

2.11 (U) Effect of Identity on P(Support)

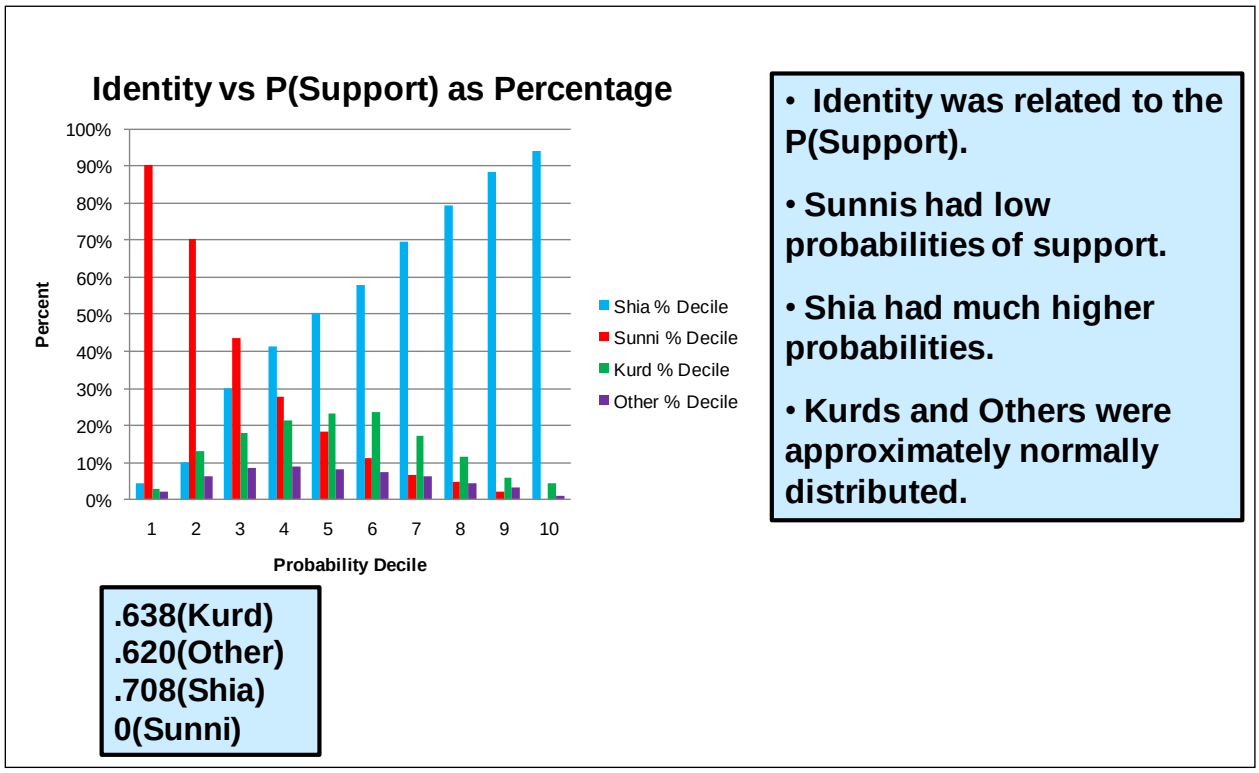


Figure 25. (U) Effect of Identity on P(Support)

(U) While the correct prediction rates observed so far are respectable for social science research, researchers investigated why they were not better.

(U) The answer in Iraq appears largely due to ethno-sectarian identity.

(U) So far, P(Support) has been considered an estimate of a person's satisfaction with the government's provision of services. In reality, P(Support) is partially determined by the respondent's identity. The positive parameter estimates (above) indicated that other groups were more likely to support the government than Sunnis, which means all other things equal, a Sunni's P(Support) would be less than that of Shia neighbor with the same job and the same perceptions of the government.

(U) A graphic depiction of this phenomenon shows that Sunnis' P(Support) (red) is indeed low. Due to the logic of the model, researchers can confirm the general American perception in the field that Sunnis are less supportive of the (Shia-led) government, and Shia (blue) more supportive.

2.12 (U) Effect of Identity on Support

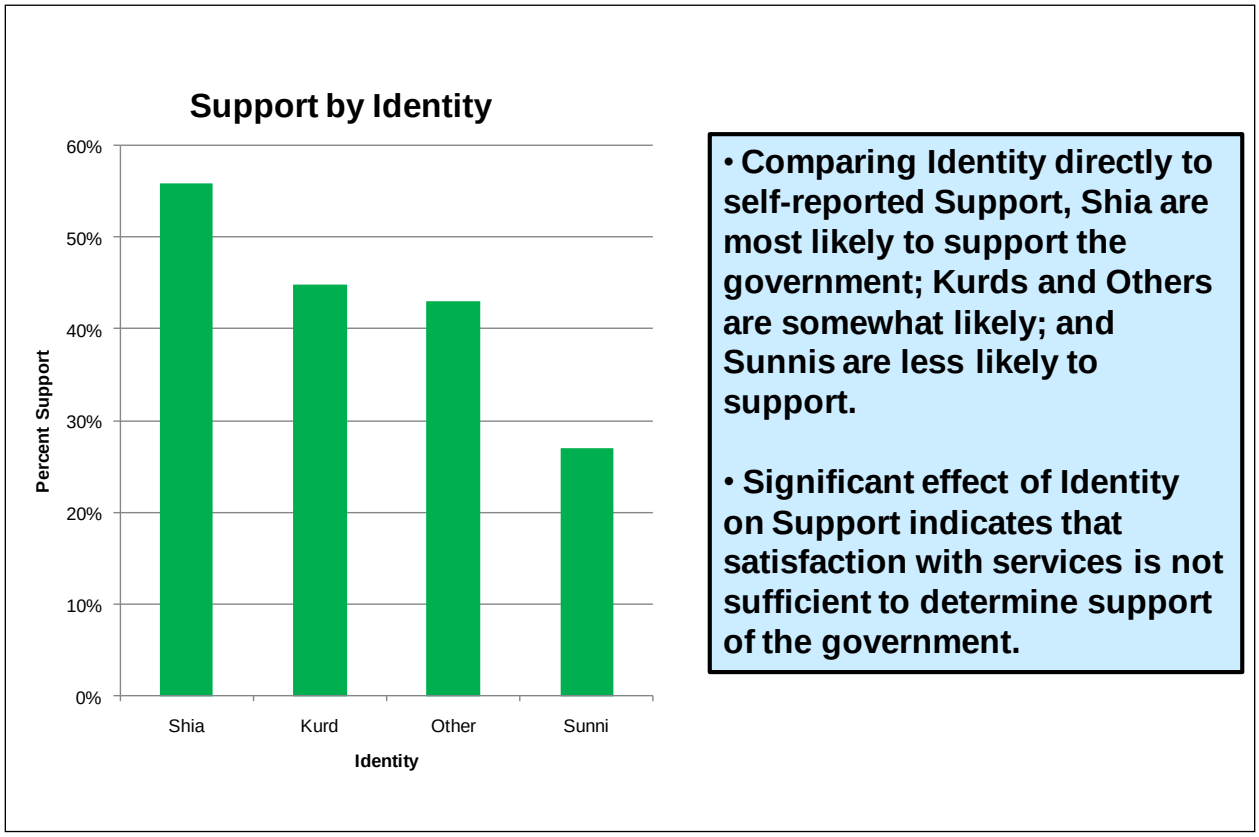


Figure 26. (U) Effect of Identity on Support

(U) Researchers also compared Identity directly to observed support (the dependent variable).

(U) Again, Shia were much more likely to support the government, and Sunnis much less. Kurds and Others were somewhere in between.

(U) This suggests that satisfaction with services is not sufficient to determine support for the government, and that national reconciliation will improve the foundation of democracy in Iraq.

2.13 (U) Aggregation

- **We can use information on any individual's attitudes to calculate the probability that he or she will support the government.**
- **Example: a fully-employed Kurd living in Anbar with satisfaction scores on Security=23, ES=12, Economics=9:**

  Z= -4.369 +.638(Kurd) + -.293(Anbar) + 0(Fulltime) + .060(Security=23) + .029(ES=12) + .208(Economics=9) = -0.424

  $P(Support) = 1/(1+e^{-(-0.424)}) = .3955$
- **The model provides insight into the propensity of all people like him or her (fully-employed Kurds in Anbar) to support the government.**
- **Inserting the parameter values for categorical variables, and inserting the provincial average values of continuous satisfaction indices, into the model provides an estimate of the average probability that people who fit this "profile" will support the government.**

Figure 27. (U) Aggregation (1 of 2)

(U) MESSEE is useful because if researchers know a person's characteristics and preferences, they can estimate his or her propensity to support the government.

(U) See the example in Figure 27 above that calculates the probability that a person of those characteristics and with those attitudes will support the government.

(U) Given that other people who have similar characteristics to the Kurd in the example above will have a similar propensity to support– the same categorical variable parameter values– researchers can approximate a support rate for all fully-employed Kurds living in Anbar.

(U) Inserting both the parameter values for categorical variables and the provincial average values of the satisfaction indices (Security, Economic, and Essential Services) into the model provides an estimate of the average probability that people who fit this "profile" will support the government.

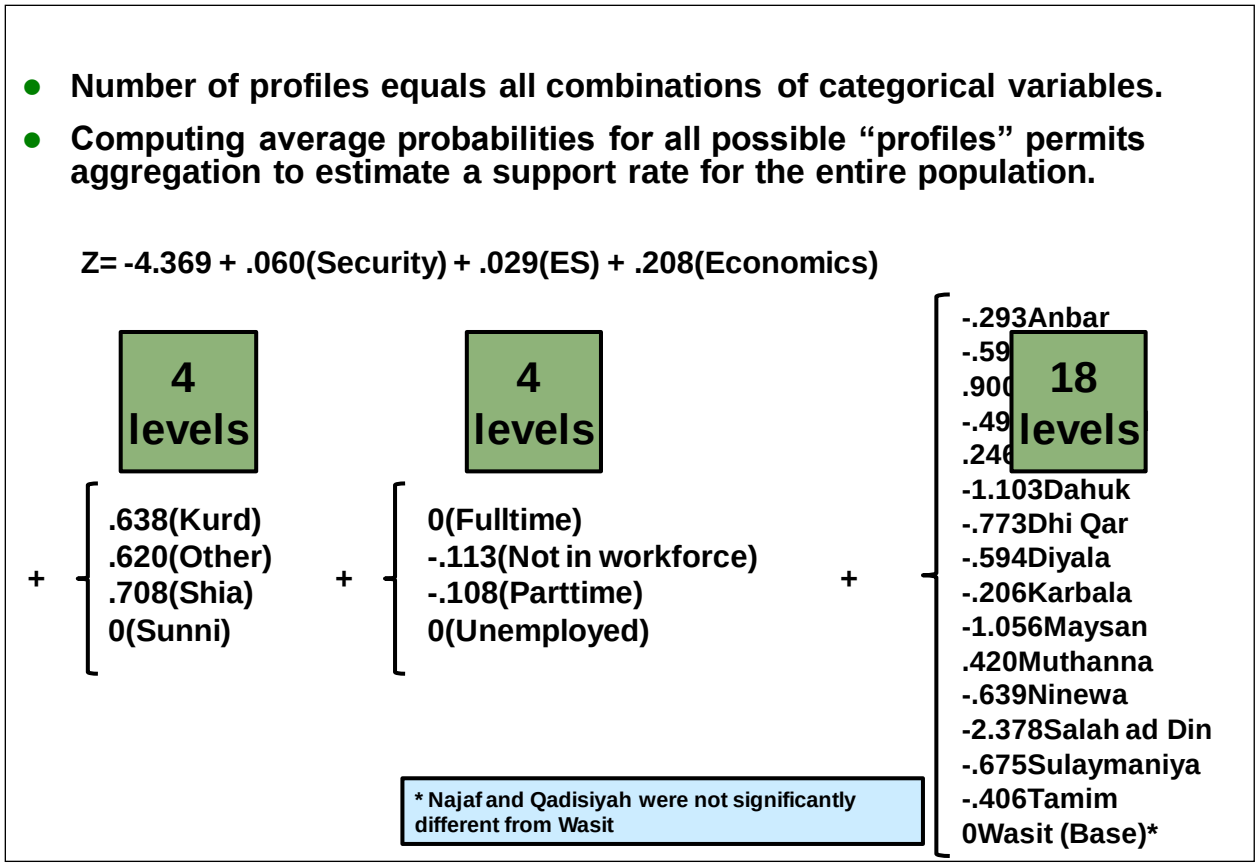


Figure 28. (U) Aggregation (2 of 2)

(U) The number of "profiles" is equal to the number of all possible combinations of categorical variables.

(U) In this specification of MESSEE, there are three categorical variables with 4, 4, and 18 levels respectively. This yields 4*4*18=288 possible combinations of categories or "profiles," and researchers can calculate a P(Support) for each one.

(U) If a researcher computes a probability for each of all the possible "profiles," he or she can also estimate a collective support rate.

2.14 (U) Estimating Aggregate Support Rate

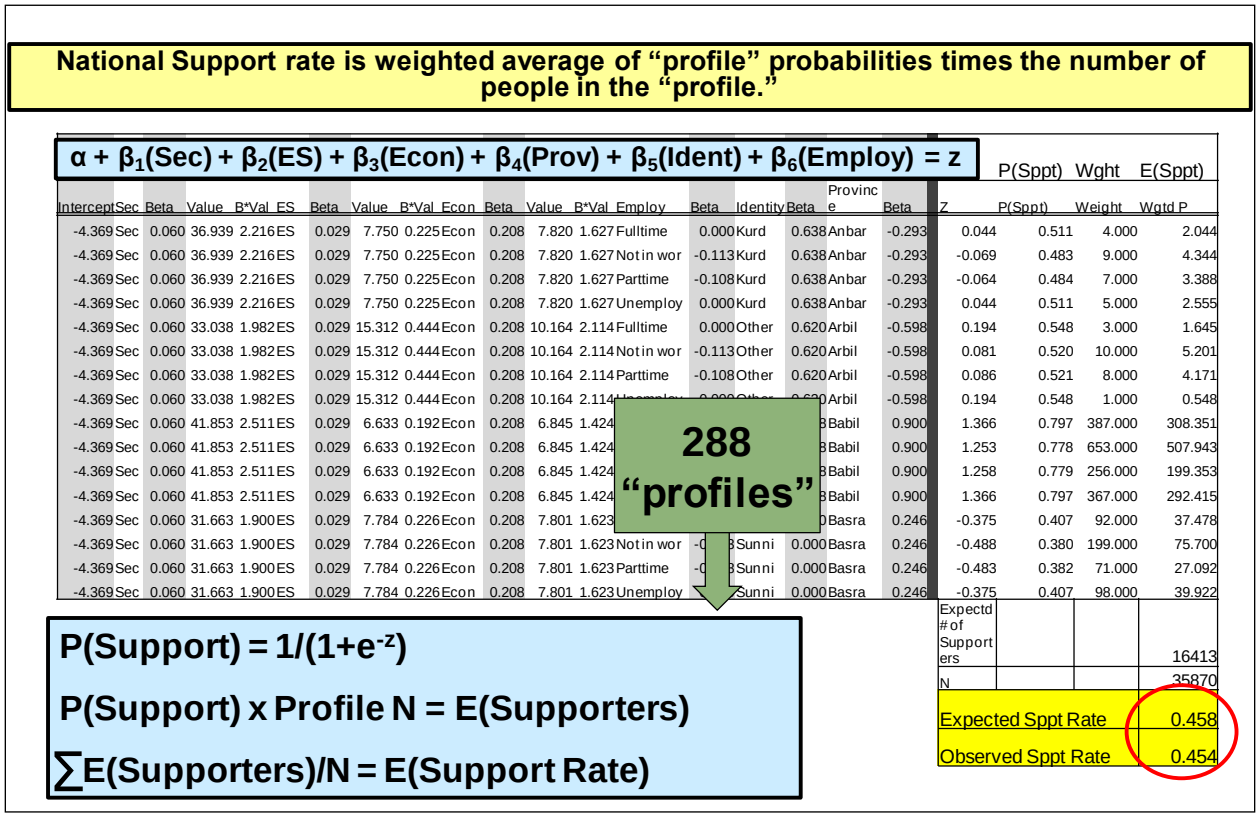


Figure 29. (U) Estimating Aggregate Support Rate

(U) The researchers have assembled a matrix with 288 rows– one per profile.

(U) Inserting province-level average values for Security, Economics, and Essential Services and the categorical parameters for each "profile", they have calculated a P(Support) for each profile.

(U) Multiplying the P(Support) times the number of people in each profile produces the expected number of supporters in each profile.

(U) Summing these produces the expected number of supporters in the sample, and dividing by N yields the expected support rate for the national population.

(U) It is very close to the observed rate. The difference between the two rates for this specification of the model was 0.4 percent, which is less than the margins of error for the three pooled surveys.

(U) This is a national rate, but researchers can estimate support rates for regions or provinces or specific demographics as well.

2.15 (U) Support Rates: Provinces

- **Comparing estimated support rates to observed support rates for each of the provinces in Iraq yielded the following:**
- **Average magnitude of delta = 0.0144**
- **8 of 18 provinces within 1%**
- **5 of 18 between 1 and 2%**
- **3 of 18 between 2 and 3%**
- **2 of 18 between 4 and 5%**

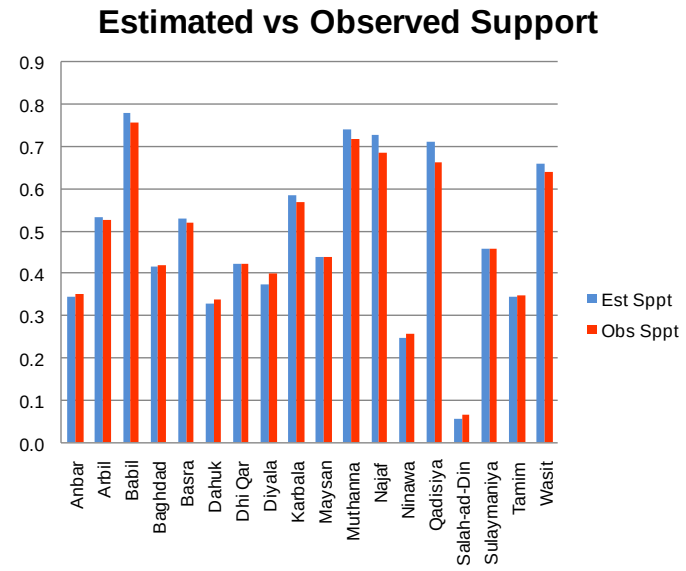


Figure 30. (U) Support Rates: Provinces

(U) Researchers can also calculate support rates at the province level to meet study requirements.

(U) Smaller sample sizes for the provinces give larger differences between expected and observed support ("delta"); even so, the average magnitude of the difference between expected and observed support was only 1.4 percent.

3 AFGHAN MESSEE (U)

(U) Once the research team had demonstrated the feasibility of MESSEE using Iraqi data, the team questioned whether the method would apply in Afghanistan as well.

3.1 (U) The Dataset

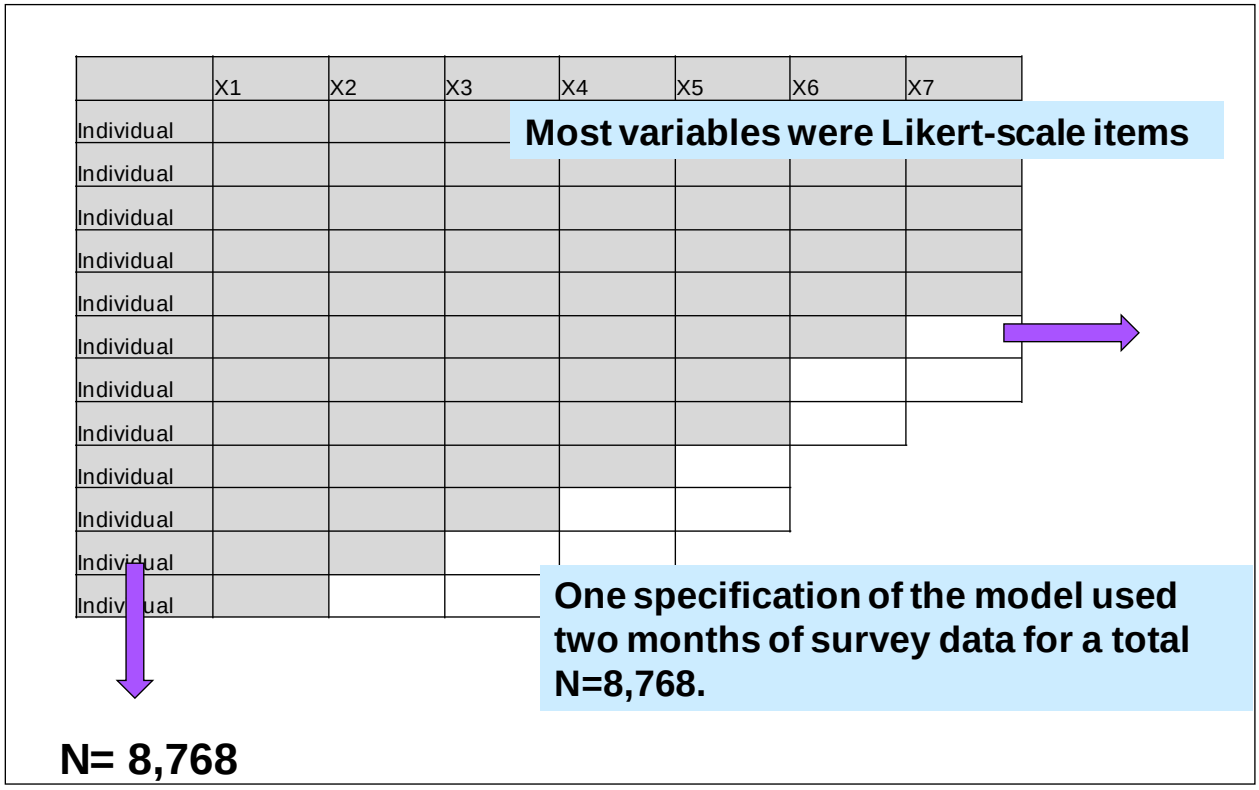


Figure 31. (U) Methodology: The Dataset

(U) The data were a survey done in Afghanistan for North Atlantic Treaty Organization's (NATO) ISAF. The survey was completed in February and March 2009, and gathered 8,768 responses.

(U) Most questions were Likert-scale items that sought information about people's demographic characteristics and perceptions of the government.

3.2 (U) Dependent Variable

- **An individual's support for the government was measured indirectly by survey. Each respondent was asked his or her agreement with the following:**

  "Generally speaking, do you believe the Government is going in the right or wrong direction?"

- **Respondents could answer Wrong direction, Same place, Right Direction, Refused, or Don't Know**
- **Responses were placed in binary form:**
  - **Right direction = 1**
  - **Wrong direction, Same place, Refused, Don't know = 0**

Figure 32. (U) Dependent Variable

(U) An individual's support for the government was measured directly by survey. Respondents answered the following question: "Generally speaking, do you believe the government is going in the right or wrong direction?"

(U) A response of "right direction" was considered support, while everything else was considered non-support.

3.3 (U) Independent Variable Selection

- **Classification trees were used to determine the relative strength of relationships between the dependent variable and possible categorical (nominal and ordinal) independent variables.**

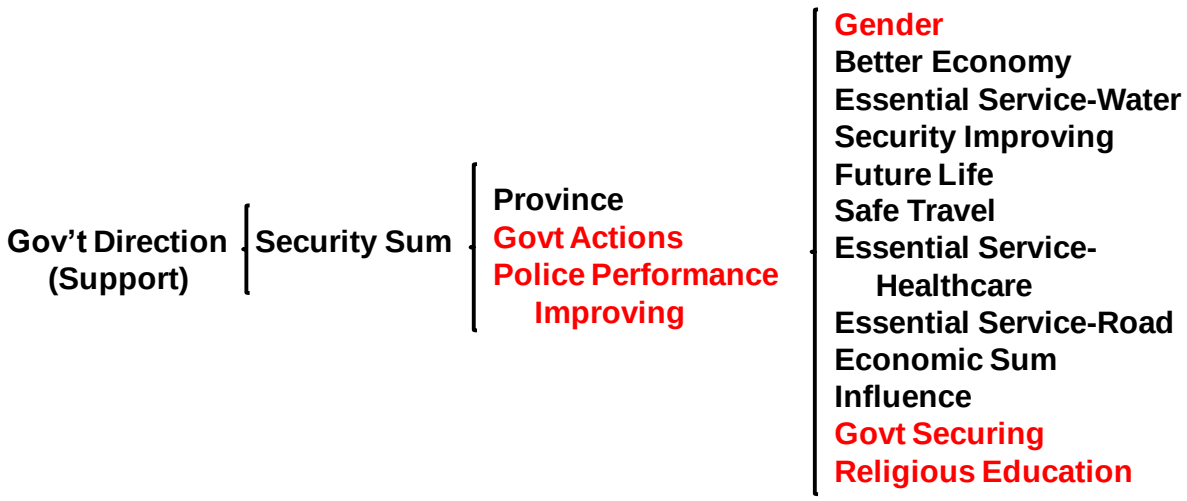


Figure 33. (U) Independent Variable Selection (1 of 2)

(U) Classification trees informed the selection of independent variables. Figure 33 depicts the top three levels of the tree showing which variables were mostly closely related to the dependent variable. Variables in black type were included in the model.

(U) Gender was found to be not statistically significant. "Govt Actions" was believed to be an alternate dependent variable, and was not included as an independent variable.

Variable	Rho	Variable	Rho
Security Sum	0.352	Governor developing	0.204
Govt actions	0.358	Family econ situation	0.2
Govt do job overall	0.342	Governor improve	0.198
Economic Sum	0.303	Police improper	0.166
Security Improving	0.268	Govt reduce corruption	0.154
Governor Actions	0.268	Border overall	0.152
Safe travel	0.261	Influence	0.148
Security current	0.259	Governor reduce corruption	0.129
Governor Securing	0.256	ES Electricity	-0.082
Govt developing	0.249	ES Healthcare	-0.08
School safe	0.247	ES Sum	-0.074
Governor overall	0.242	SES Level	0.066
QOL improving	0.241	ES Road	-0.051
Govt improving	0.229	ES Water	-0.029
QOL	0.215	ES Education	-0.028

Indices for perceptions of Security, Essential Services, and Economic Well-being are primary predictors.

• Correlated by Spearman's Rho* which correlates ordinal variables.

• "Govt actions" and "Govt do job overall" are alternative measures of support (which correlate strongly with the dependent variable).

• Sec Sum is most highly correlated with support decision.

• Constructed indices (in in dark shades) contained all of the variables in lighter shades of same color.

**** Values of Rhos are absolute***

Figure 34. (U) Independent Variable Selection (2 of 2)

(U) Additionally, researchers correlated prospective independent variables with the dependent variable using Spearman's rank order correlation coefficient. Spearman's "rho" is the most appropriate method to calculate the correlation between ordinal variables. For this calculation, the complete ordinal range of the dependent variable from "strongly disagree" (0) to "strongly agree" (4), not its binary form (0 or 1), was used.

(U) The correlations are depicted in the table above by the absolute magnitude of the Spearman's rho.

(U) Some interesting results emerge:

- The government's ability to maintain security is most highly correlated with Support.
- Satisfaction with essential services was less correlated with Support than our expenditures would suggest.

(U) Researchers constructed a series of indices from the responses of Likert-scale items relating to Security, Economics, and Essential Services. They took a series of questions relating to each of these categories, ensured the items were coded so that "more was better," and summed the responses for each individual.

(U) These indices highlighted in the darker colors and containing the word "sum," are composed of the items in lighter shades of the same color. Each index was more closely related to Support than most of its component items. This permits use of a greater quantity of data relating to security, economics, and essential services, rather than the selection of only one or two survey questions for each one.

(U) These indices were treated as continuous variables, which greatly facilitates aggregation.

3.4 (U) Independent Variable Summary

- Continuous Variables
  - Continuous variables were constructed by summing questions with Likert scale responses.
  - Indices were constructed for Security, Economic and Essential Services perceptions.
- Categorical Variables
  - Province: The province in which a respondent resides.
    - 34 possible responses
  - Income Source: 5 different responses from question dealing with sources of income
    - Employment only, Employment and other sources, Other sources only, No sources of income, Refused

$$z = \alpha + \beta_1(\text{Security}) + \beta_2(\text{ES}) + \beta_3(\text{Econ}) + \beta_4(\text{Province}) + \beta_5(\text{Income Source})$$

Figure 35. (U) Independent Variable Summary

(U) Indices for security perception, economic well-being, and satisfaction with essential services, were included in the model as continuous variables. These were constructed by summing the responses to a series of questions relating to each of these areas.

(U) Nominal variables included the province where a respondent lives and his or her source of income or employment status.

(U) Province had 34 possible responses and Income Source had 5 responses yielding the specification highlighted.

(U) Researchers examined ethnicity as an explanatory variable. When Province is included, a respondent's ethnicity is not statistically significant.

3.5 (U) Descriptive Statistics

Frequency Distributions: Direction_Binary

	Frequency	Percent
Support	4213	48.05%
Non-Support	4555	51.95%

Frequency Distribution: Income Status

	Frequency	Percent
Employment only	3004	34.26%
Other means and employment	1259	14.36%
Other means only	1995	22.75%
No sources of income	2330	26.57%
Refused	180	2.05%

- **Frequency distribution of the binary dependent variable indicated 48% support for the government.**
- **Income Status indicates roughly 50% receive at least some income from employment and 25% receive no income.**

Continuous Variable Information

	N	Minimum	Maximum	Mean	Std. Deviation
Covariate ES_Sum	8768	0	24	9.89	5.093
Econ_Sum	8768	0	9	5.46	2.231
Sec_Sum	8768	3	23	15.62	3.686

- **Means and standard deviations were computed for the constructed indices that were continuous.**

Figure 36. (U) Descriptive Statistics (1 of 2)

(U) Descriptive statistics were performed on the data. Frequency distribution of the binary dependent variable indicated 48 percent support for the Afghan government.

Frequency Distribution: Provinces					
Badakhshan	218	2.49%	Kunar	99	1.13%
Badghis	195	2.22%	Kunduz	309	3.52%
Baghlan	270	3.08%	Laghman	100	1.14%
Balkh	359	4.09%	Logar	331	3.78%
Bamiyan	100	1.14%	Nimroz	100	1.14%
Dehkondi	97	1.11%	Ningarhar	419	4.78%
Farah	261	2.98%	Nooristan	100	1.14%
Faryab	386	4.40%	Paktia	130	1.48%
Ghazni	338	3.85%	Paktika	100	1.14%
Ghor	140	1.60%	Panjshir	100	1.14%
Helmand	439	5.01%	Parwan	241	2.75%
Herat	559	6.38%	Samangan	99	1.13%
Juzjan	179	2.04%	Sar-I-Pul	138	1.57%
Kabul	1054	12.02%	Takhar	219	2.50%
Kandahar	430	4.90%	Uruzhan	171	1.95%
Kapisa	357	4.07%	Wardak	220	2.51%
Khost	310	3.54%	Zabul	200	2.28%

• Frequency distribution of Province shows the geographic distribution of respondents.

• Large N=8,768 suggests sample is reasonably representative.

Figure 37. (U) Descriptive Statistics (2 of 2)

(U) Frequency distribution of Province shows the geographic distribution of respondents.

(U) The large sample size (8,768) suggests the sample is likely to be representative of the population.

3.6 (U) Parameter Estimates and P-Values

Parameter Estimates

Parameter	B	Std. Error	Sig.
(Intercept)	-3.942	.2236	.000
[Province=Badakhshan]	.856	.2534	.001
[Province=Badghis]	.839	.2445	.001
[Province=Baghlan]	-.272	.2242	.225
[Province=Balkh]	.103	.2216	.643
[Province=Bamiyan]	-.701	.2813	.013
[Province=Dehkondi]	-.703	.2878	.015
[Province=Farah]	.604	.2259	.008
[Province=Faryab]	.012	.2208	.958
[Province=Ghazni]	-.401	.2188	.067
[Province=Ghor]	.438	.2664	.100
[Province=Helmand]	-.018	.2115	.934
[Province=Herat]	-.668	.2074	.001
[Province=Juzjan]	-.498	.2471	.044
[Province=Kabul]	-.538	.1961	.006
[Province=Kandahar]	-.163	.2096	.435
[Province=Kapisa]	-.900	.2171	.000
[Province=Khost]	-.319	.2183	.144
[Province=Kunar]	.610	.2843	.032
[Province=Kunduz]	-.118	.2201	.593
[Province=Laghman]	.460	.3190	.149
[Province=Logar]	-.291	.2166	.179

Parameter Estimates

Parameter	B	Std. Error	Sig.
[Province=Nimroz]	-.342	.2793	.221
[Province=Ningarhar]	-.551	.2100	.009
[Province=Nooristan]	-.570	.2863	.047
[Province=Paktia]	-.988	.2734	.000
[Province=Paktika]	-.654	.3022	.031
[Province=Panjshir]	-1.310	.2835	.000
[Province=Parwan]	-.556	.2357	.018
[Province=Samangan]	-.975	.2858	.001
[Province=Sar-I-Pul]	1.040	.2977	.000
[Province=Takhar]	.066	.2390	.783
[Province=Uruzhan]	-.311	.2496	.213
[Province=Wardak]	-.221	.2432	.363
[Province=Zabul]	0[a]	.	.
[Income=No, no sources of income	.144	.0738	.051
[Income=Refused]	-.154	.1763	.383
[Income=Yes, employment only]	.215	.0687	.002
[Income=Yes, other means and employment]	.184	.0828	.026
[Income=Yes, other means only]	0[a]	.	.
ES_Sum	-.015	.0052	.003
Econ_Sum	.198	.0125	.000
Sec_Sum	.193	.0087	.000

Dependent Variable: Direction_binary
Model: (Intercept), Province, Income, ES_Sum, Econ_Sum, Sec_Sum
a. Set to zero because this parameter is redundant.
b. Fixed at the displayed value.

• Small p-values show significance of included independent variables.

Figure 38. (U) Parameter Estimates and P-Values

(U) Figure 38 contains the parameter estimates for each continuous variable and each level of the nominal variables. Small p-values ($\alpha/2 < .025$) indicate statistical significance. Positive parameter estimates indicate that increasing the value of a variable will increase the probability of support.

(U) Modeling was conducted in the SPSS 17.0 "Generalized Linear Models" module, and "binary logistic" regression was selected from among the models available

3.7 (U) Logistic Regression Model

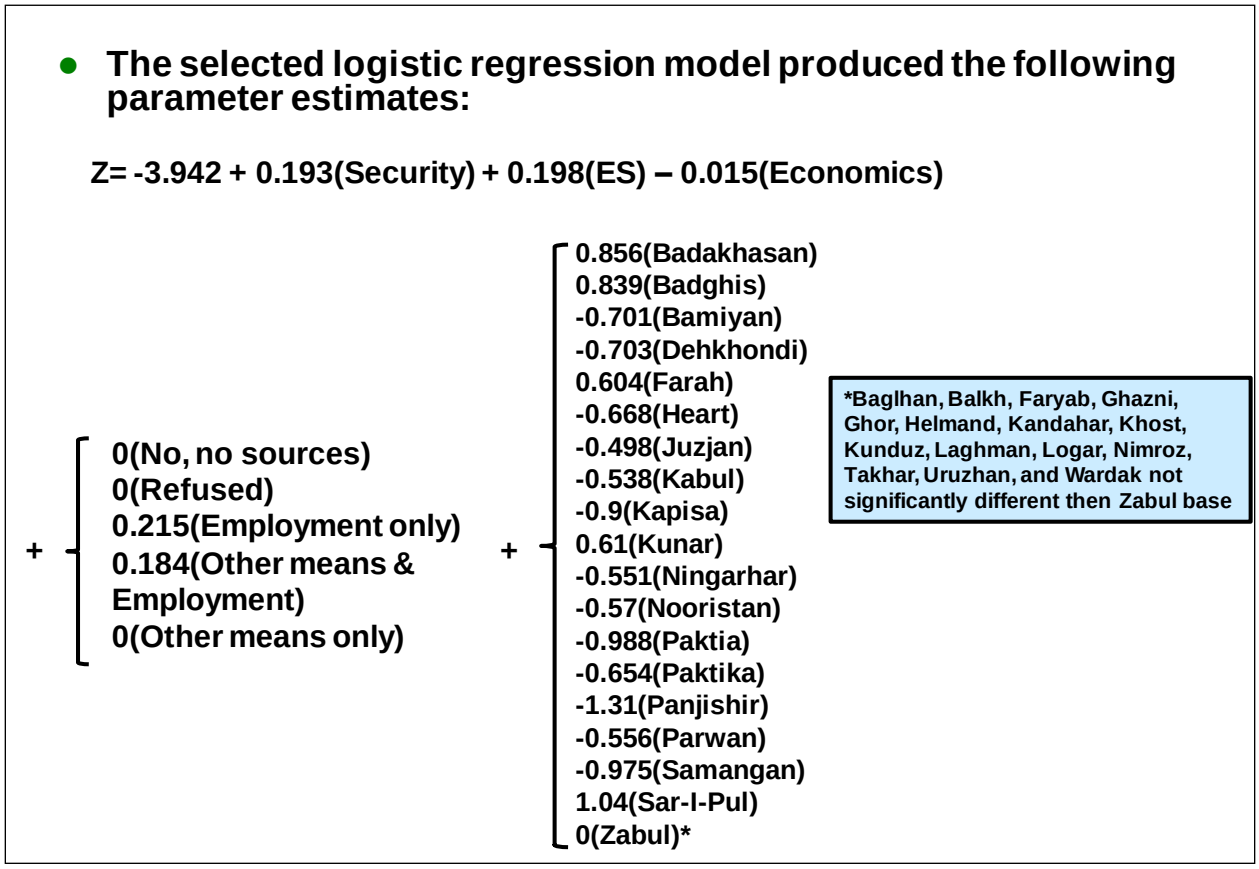


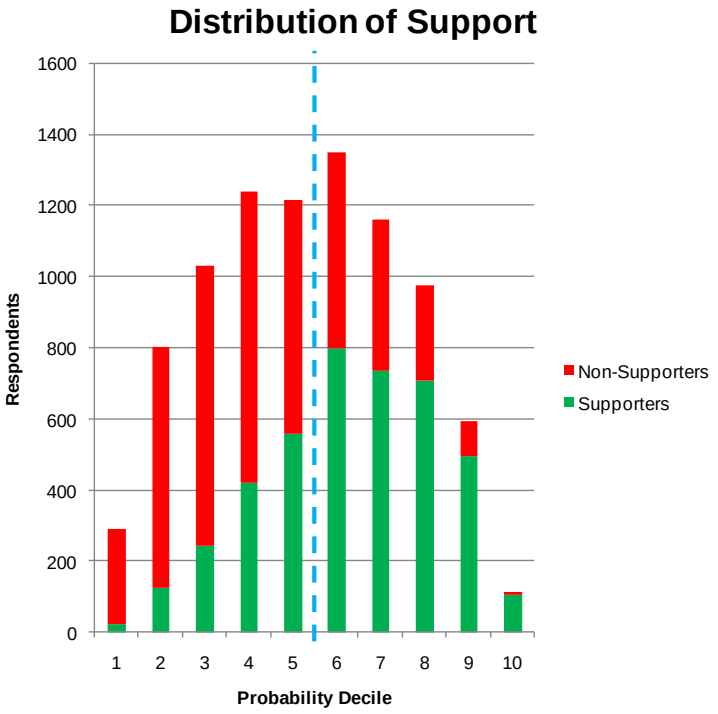
Figure 39. (U) Logistic Regression Model

(U) Inserting the parameter estimates into the support function yields these parameter estimates.

(U) For categorical variables, the algorithm makes the level of the variable last in alphabetical order the base, and computes parameters for the other levels that indicate that they are or are not significantly different from the base level. "Other means only" was the base for "Income Source" and "Zabul" was the base for "Province."

(U) A large number of provinces were found to be not statistically different than the base district, Zabul. This indicates a cluster of provinces that are similar in some regard. This also led the research team to question how the provinces might cluster if they varied the base province. Results of this analysis are found in Appendix B.

3.8 (U) Goodness of Fit



P(Support) > .5 = Support		
Observed	Predicted	Count
0	0	3204
0	1	1367
1	0	1351
1	1	2846
	Sum=N	8768
Successes		6050
Failures		2718
Success Rate		0.690

• A high proportion of correct predictions indicates goodness.

• Partitioning the sample in half yields a correct prediction rate of 69.0%.

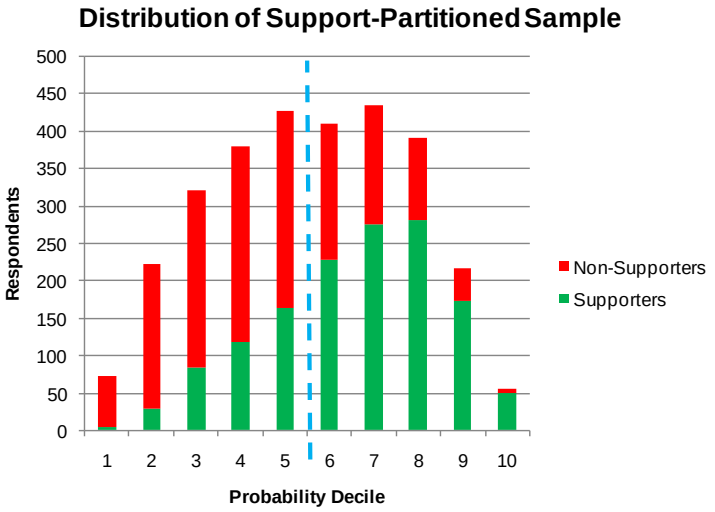
Figure 40. (U) Goodness of Fit

(U) One measure of goodness of fit in binary models is the proportion of correct predictions.

(U) Each individual's stated support decision (the dependent variable), depicted by the coloration of the bars in the chart, is compared to his or her predicted answer which is a function of the P(Support) calculated for the same individual.

(U) If the decision rule is: P(Support) > 0.5 = Support, partitioning the sample in half, the model predicts correctly 69.0 percent of the time.

3.9 (U) Cross Validation



P(Support) > .5 = Support		
Observed	Predicted	Counts
0	0	1025
0	1	498
1	0	395
1	1	1005
	Sum = N	2923
Success		2030
Failure		893
Success Rate		0.694

- **Cross-validation supported the validity of the model.**
- **2/3 of the original sample was used to estimate parameters and to predict the remaining 1/3.**
- **N=2,923 in the test sample.**
- **Prediction rate = 69.4% was slightly better than the full model.**

Figure 41. (U) Cross Validation

(U) Researchers performed cross-validation on the model, using two-thirds of the data to estimate parameters and then using that estimated equation to predict the remaining one-third of the data.

(U) The test set had 2,923 observations and a correct prediction rate of 69.4 percent, slightly better than the full model.

3.10 (U) Aggregation

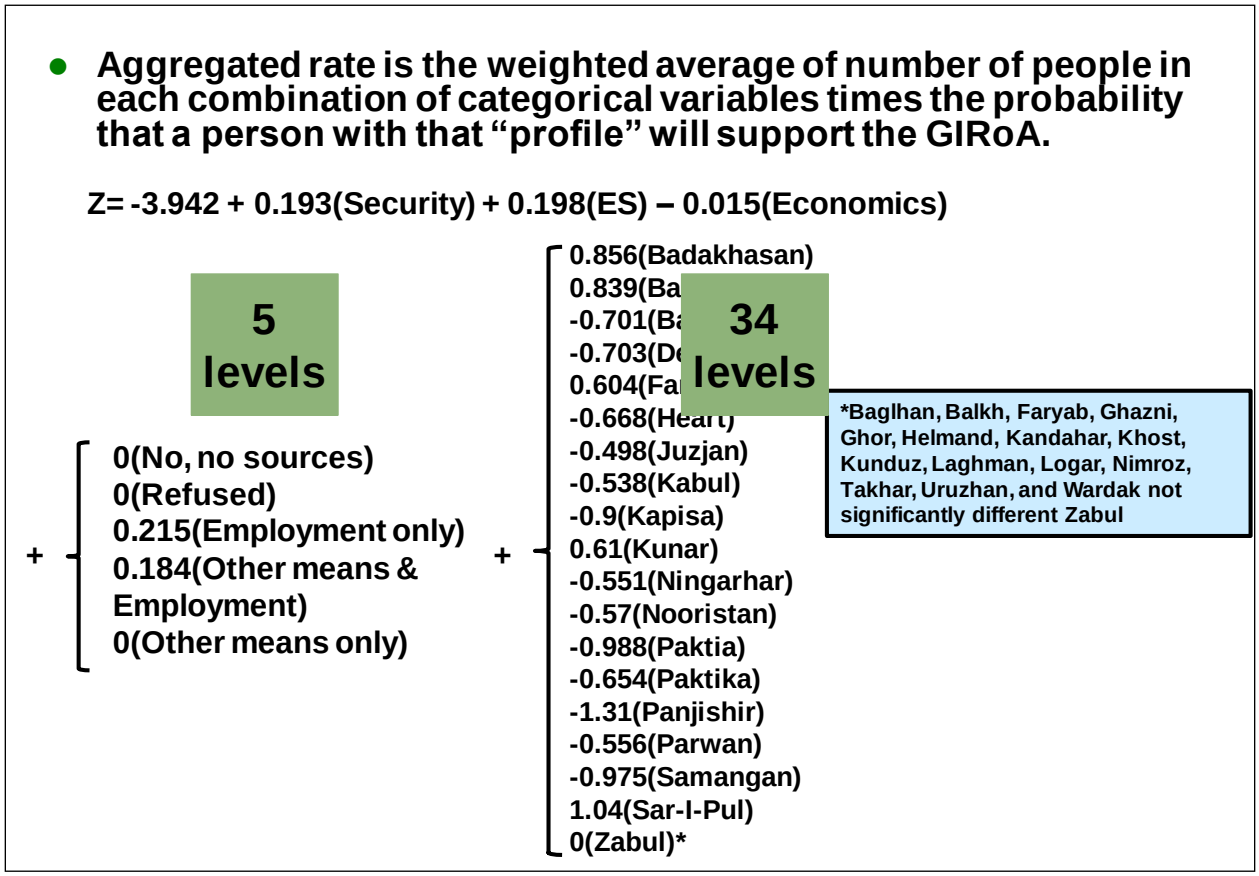
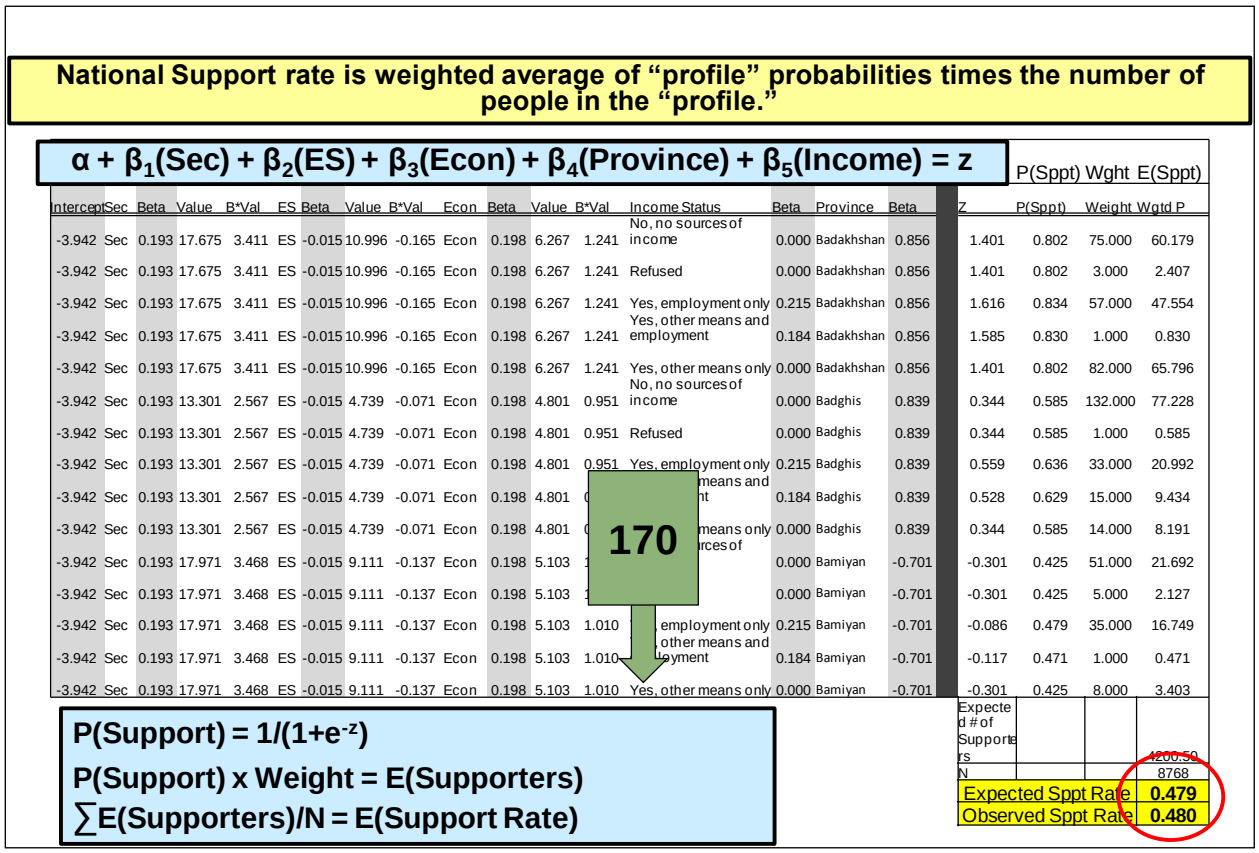


Figure 42. (U) Aggregation

(U) A more complete discussion of aggregation procedures is contained in the previous Iraqi MESSEE chapter.

(U) In this specification of the model, researchers used two categorical variables with 5 and 34 levels respectively, yielding 5*34= 170 possible combinations of categories or "profiles" of respondents. Researchers calculated a P(Support) for each profile.

3.11 (U) Estimating Aggregate Support Rate



Intercept	Sec	Beta	Value	B*Val	ES	Beta	Value	B*Val	Econ	Beta	Value	B*Val	Income Status	Beta	Province	Beta	Z	P(Sppt)	Weight	Wgtd P
-3.942	Sec	0.193	17.675	3.411	ES	-0.015	10.996	-0.165	Econ	0.198	6.267	1.241	No, no sources of income	0.000	Badakhshan	0.856	1.401	0.802	75.000	60.179
-3.942	Sec	0.193	17.675	3.411	ES	-0.015	10.996	-0.165	Econ	0.198	6.267	1.241	Refused	0.000	Badakhshan	0.856	1.401	0.802	3.000	2.407
-3.942	Sec	0.193	17.675	3.411	ES	-0.015	10.996	-0.165	Econ	0.198	6.267	1.241	Yes, employment only	0.215	Badakhshan	0.856	1.616	0.834	57.000	47.554
-3.942	Sec	0.193	17.675	3.411	ES	-0.015	10.996	-0.165	Econ	0.198	6.267	1.241	Yes, other means and employment	0.184	Badakhshan	0.856	1.585	0.830	1.000	0.830
-3.942	Sec	0.193	17.675	3.411	ES	-0.015	10.996	-0.165	Econ	0.198	6.267	1.241	Yes, other means only	0.000	Badakhshan	0.856	1.401	0.802	82.000	65.796
-3.942	Sec	0.193	13.301	2.567	ES	-0.015	4.739	-0.071	Econ	0.198	4.801	0.951	No, no sources of income	0.000	Badghis	0.839	0.344	0.585	132.000	77.228
-3.942	Sec	0.193	13.301	2.567	ES	-0.015	4.739	-0.071	Econ	0.198	4.801	0.951	Refused	0.000	Badghis	0.839	0.344	0.585	1.000	0.585
-3.942	Sec	0.193	13.301	2.567	ES	-0.015	4.739	-0.071	Econ	0.198	4.801	0.951	Yes, employment only	0.215	Badghis	0.839	0.559	0.636	33.000	20.992
-3.942	Sec	0.193	13.301	2.567	ES	-0.015	4.739	-0.071	Econ	0.198	4.801	0	means and nt	0.184	Badghis	0.839	0.528	0.629	15.000	9.434
-3.942	Sec	0.193	13.301	2.567	ES	-0.015	4.739	-0.071	Econ	0.198	4.801	0	means only rces of	0.000	Badghis	0.839	0.344	0.585	14.000	8.191
-3.942	Sec	0.193	17.971	3.468	ES	-0.015	9.111	-0.137	Econ	0.198	5.103	1		0.000	Bamiyan	-0.701	-0.301	0.425	51.000	21.692
-3.942	Sec	0.193	17.971	3.468	ES	-0.015	9.111	-0.137	Econ	0.198	5.103	1		0.000	Bamiyan	-0.701	-0.301	0.425	5.000	2.127
-3.942	Sec	0.193	17.971	3.468	ES	-0.015	9.111	-0.137	Econ	0.198	5.103	1.010	employment only	0.215	Bamiyan	-0.701	-0.086	0.479	35.000	16.749
-3.942	Sec	0.193	17.971	3.468	ES	-0.015	9.111	-0.137	Econ	0.198	5.103	1.010	other means and yment	0.184	Bamiyan	-0.701	-0.117	0.471	1.000	0.471
-3.942	Sec	0.193	17.971	3.468	ES	-0.015	9.111	-0.137	Econ	0.198	5.103	1.010	Yes, other means only	0.000	Bamiyan	-0.701	-0.301	0.425	8.000	3.403
																	Expected # of Supporters			4200.59
																	N			8768

Figure 43. (U) Estimating Aggregate Support Rate

(U) Researchers assembled a matrix with 170 rows– 1 per profile.

(U) Inserting province-level average values for Security, Economics, and Essential Services, and the parameters for each "profile", they calculated a P(Support) for each profile.

(U) Using the same procedure as described in the Iraqi MESSEE chapter above, the research team calculated the expected support rate for Afghanistan. The estimated support rate was one-tenth of 1 percent from the observed rate.

3.12 (U) Support Rates-Provinces

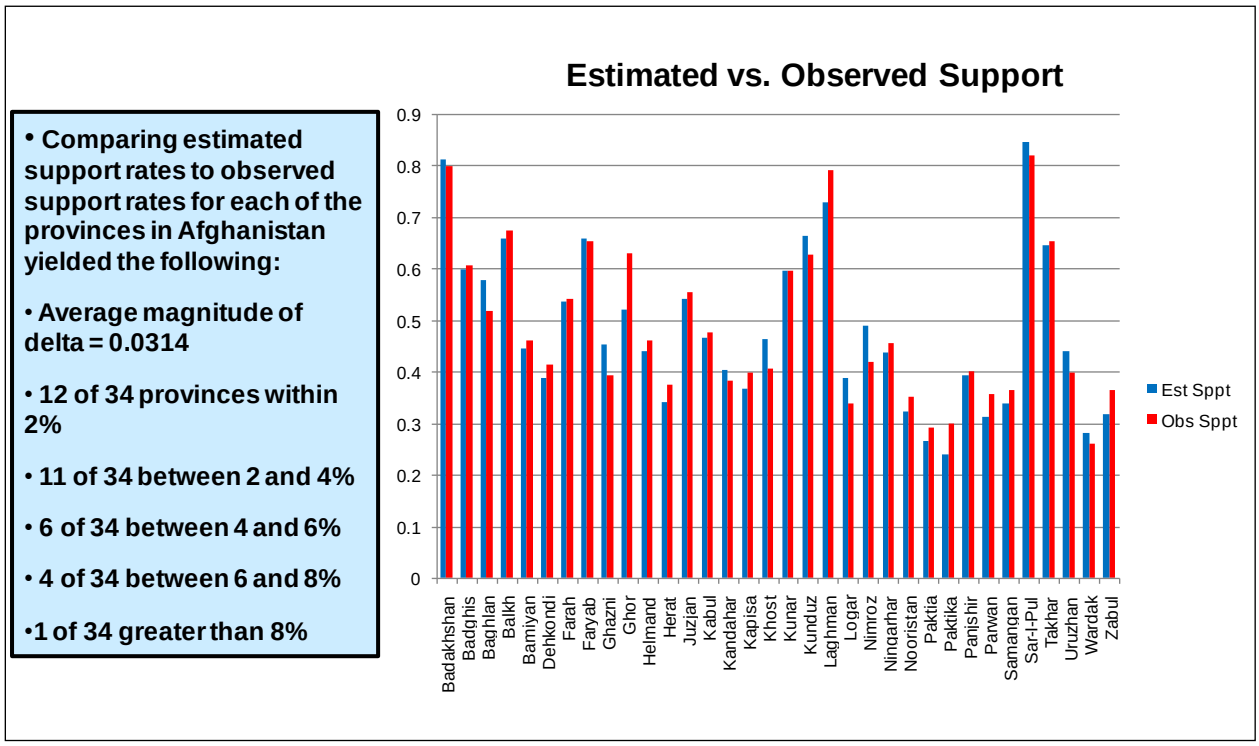


Figure 44. (U) Support Rates-Provinces

(U) Calculating expected support on the provincial level, the average magnitude of delta, the difference between expected and observed support, was 3 percent.

(U) Of the 34 provinces, 27 had deltas of less than 5 percent.

4 APPLYING MESSEE (U)

(U) MESSEE provides evidence that supports the validity of theoretical relationships. Counterinsurgency theory believes that people's attitudes about security, economics, and essential services affect their view of the government. MESSEE supports this theory.

(U) Furthermore, MESSEE estimates the strengths of relationships between popular satisfaction with government functioning and popular support.

(U) More importantly, MESSEE provides an empirical method for projecting support for the government, estimating the effects of non-lethal activities, and feeding back the effect of changes in security conditions on popular support, as part of irregular warfare simulations. The research team believes MESSEE can support simulations for analytic applications or for training.

4.1 (U) Applications

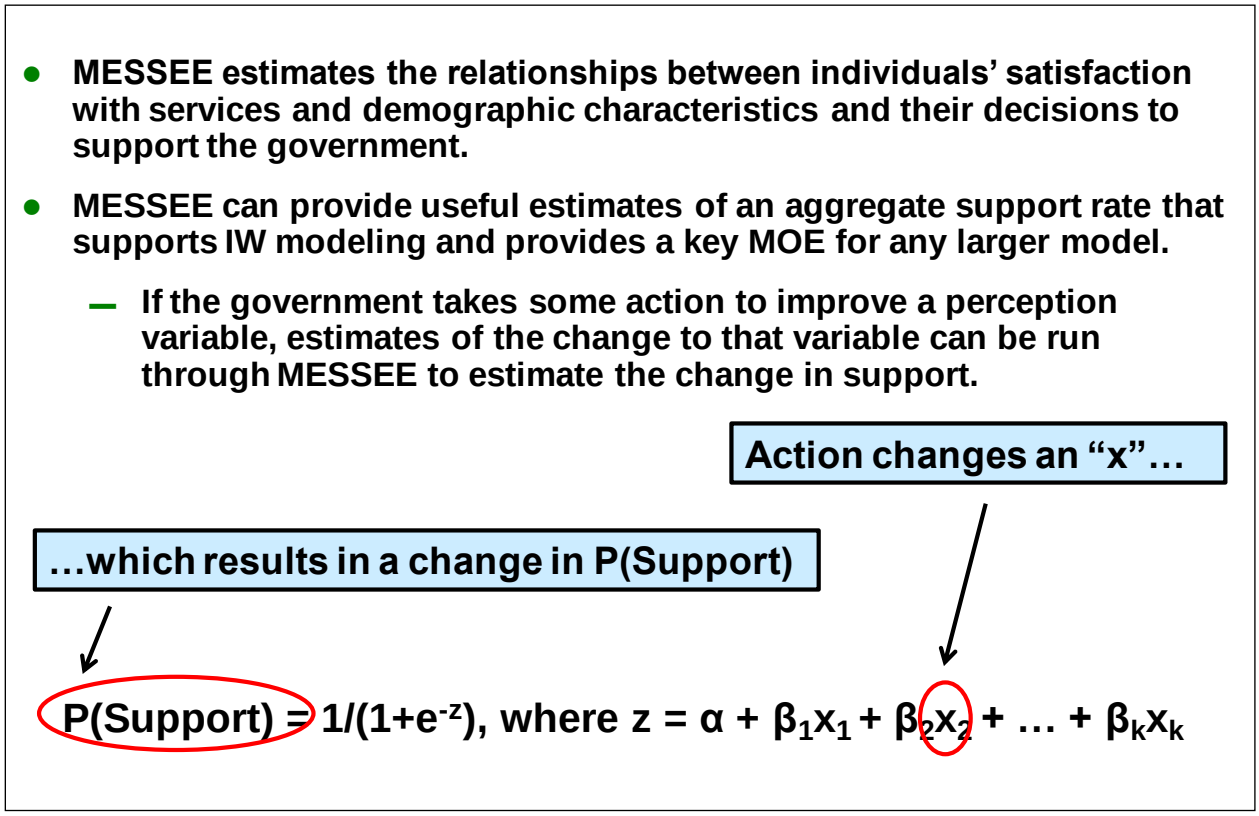


Figure 45. (U) Applications (1 of 2)

(U) Changes in the environment or effects of policy or programmatic decisions create changes in perceptions of Security, Economics, and Essential Services (changes in x). Any change in x, when multiplied through MESSEE, produces a change in the P(Support) for affected individuals. When these probability changes are aggregated, MESSEE estimates a new rate of popular support following the change in the environment or the implementation of a policy or program.

(U) MESSEE also provides a crucial measure of effectiveness for simulations of complex conflict environments.

- **MESSEE can inform programmatic decisions. By calculating the changes in probabilities associated with alternative programs or affecting alternative demographics, MESSEE can help determine the "greatest bang for the buck."**
  - **Given the decision matrix:**

	P(Support) After Program	P(Support) Before Program	Δ P(Support)
COA 1	0.4874	0.4685	0.0189
COA 2	0.5698	0.5011	0.0687
COA 3	0.5234	0.4985	0.0249

Selected COA

Figure 46. (U) Applications (2 of 2)

(U) Also, MESSEE can inform programmatic decisions. By comparing the changes in probabilities of support associated with various alternate programs, the greatest change per dollar can be identified and funded.

(U) Finally, MESSEE-like analysis may study other issues that can be framed as binary choice.

4.2 (U) Connecting MESSEE to Other Modules

- **Using MESSEE as a module to a simulation requires "rules" for plugging it in to other simulation modules:**
  - **Translating a violence level from the security module into a security perception.**
  - **Translating the effects of a job program, stimulus package, etc. into changes in perceptions.**
  - **Translating a given support rate into an effect for use in the security phase.**
- **More research to estimate these effects is needed.**
- **Varying the values of variables can be accomplished by player decision or can be trended based on sponsor input.**

Figure 47. (U) Connecting MESSEE to Other Modules

(U) The use of MESSEE within simulations requires "rules" for plugging it in to the remainder of the simulation.

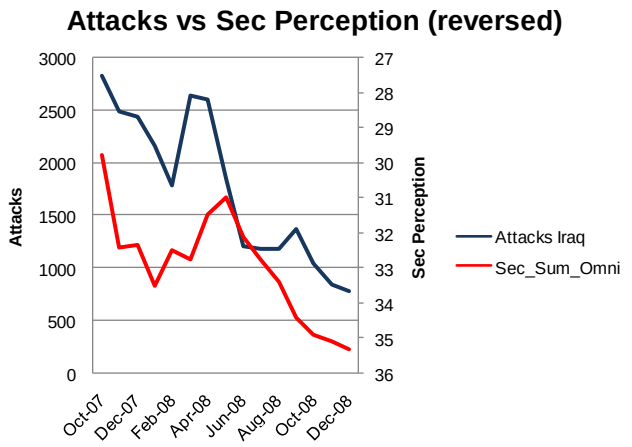
(U) For example, it is necessary to estimate the magnitudes of changes in satisfaction or perception (changes in x) precipitated by changes in policies or programs or the environment. The more accurate these estimates are, the more accurate the estimated future support rate from MESSEE.

(U) For security satisfaction this is not very difficult. Researchers can compare data on actual attacks to surveyed security satisfaction and obtain a function relating the two. For economics, essential services, or employment, the sponsors of the ISFA III study specified that analysts trend these variables in a reasonable, but partially qualitative way. However, to improve the quantitative rigor of MESSEE, more research into these linkages would be helpful.

(U) Also, research that clarifies the relationship that improved support has on the security aspects of a simulation would be helpful to determine the changes required in the security or other modules of a large simulation. Does more popular support lead to more intelligence until insurgent or criminal organizations are broken? Does more popular support lead to increased recruiting for local national security forces? Does more support decrease insurgent regeneration rates? The analyst community believes these things are true, but additional analysis would quantify these relationships, and improve the quality of the large simulation.

4.3 (U) Example: Change in Security Perception

- **Security Perceptions are believed to be a function of actual violence, measured by "Attacks".**
- **Best fit obtained when perceptions lag violence by one month.**
- **Equation converts Violence Level output by security simulation into Security Perception for use in MESSEE.**



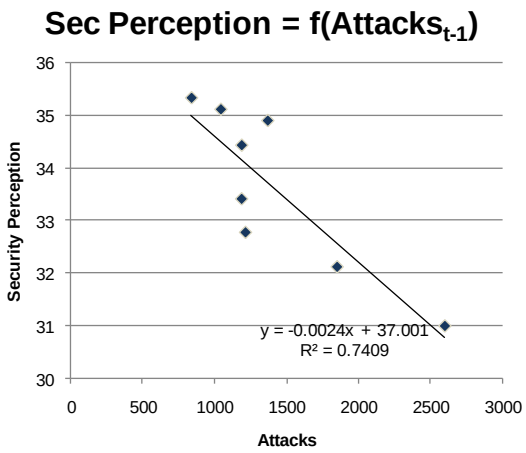


Figure 48. (U) Example: Change in Security Perception

(U) Determining the changes in x necessary to compute changes in support via MESSEE, the researcher needs to convert data on security, economics, or essential services to information on people's average perception of these three things measured by the constructed continuous indices.

(U) For security, this is straightforward. Data are available for both numbers of attacks and for security perceptions over a period of months. Hypothetically, security perceptions are a function of actual security measured by number of attacks. The left graph shows number of attacks declining from October 2007 to December 2008. The same graph also shows security perceptions improving (the axis is reversed) over the same period.

(U) To determine a mathematical relationship between the two, researchers considered security perception to be a function of attacks. The fit of the data was improved by lagging perceptions, such that perceptions in the current period are a function of attacks in the previous period.

(U) The right graph shows security perception graphed against attacks in the previous period. The equation of the trend line (with R^2=.74) provides the rule needed to relate the violence level output by the security module of a simulation to the security perception required by MESSEE, and which MESSEE can convert to a change in popular support.

(U) MESSEE could also estimate the change in support due to a real-world change in violence in the present before a survey could be taken to measure the actual change in support, which would

be attributable to all factors in the intervening time period. To deconstruct the changes in support due to specific factors requires an analysis similar to MESSEE.

4.4 (U) Example: Change in Essential Services

- **Assume present day Turkey is representative of Iraq's future.**
- **Assume Turkey's electricity is proxy for all essential services. Since Turkey exports electricity, Turks are "satisfied" with essential services.**
- **"Satisfied" is 90% of ES Satisfaction Index.**
- **Max value of ES Satisfaction Index is 24.**
- **Current satisfaction is 9.9.**
- **Trend value of ES Satisfaction from present value to hypothetical value.**

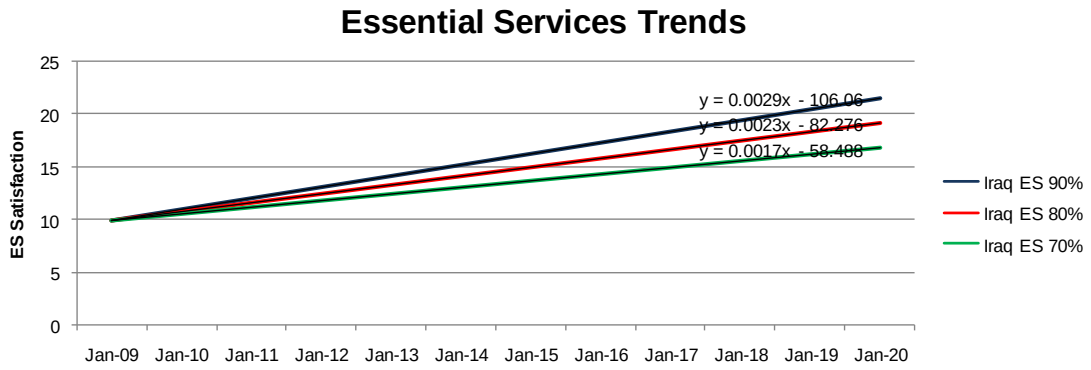


Figure 49. (U) Example: Change in Essential Services

(U) Perhaps the easiest way to model the changes in x required to compute future support rates using MESSEE is to trend the variable, with some reasonable assumptions that are vetted with the sponsor.

(U) For ISFA III, the rationale behind the CAA's recommended trend was as follows:

(U) Neighboring states were evaluated as possible models of Iraq's future potential. Turkey was thought to be the most feasible alternative, such that Iraq in 2020 might be assumed to look like Turkey in 2009.

(U) Detailed data for the state of Turkey's provision of essential services were not available to meet the sponsor's timeline, so the team considered electricity to be a proxy for all essential services. Since Turkey exports electricity, Turks must be satisfied with essential services. Also, since 100 percent of people will never agree on anything, a hypothetical survey result with 90 percent of respondents reporting "satisfaction" would be considered as national satisfaction.

(U) The maximum value of the Essential Services Index is 24 (indicating 100 percent of Iraqi's are "very satisfied"). They researchers made 90 percent of 24 the 2020 endpoint of the trend from the current average Iraqi value of 9.9. This yields a trend line that contains values that can be substituted as x_{ES} into the MESSEE equation.

(U) If the 90 percent of maximum endpoint is judged to be too optimistic, 80 percent or 70 percent or any other level could be used instead.

4.5 (U) Validation, Verification, and Accreditation Activities

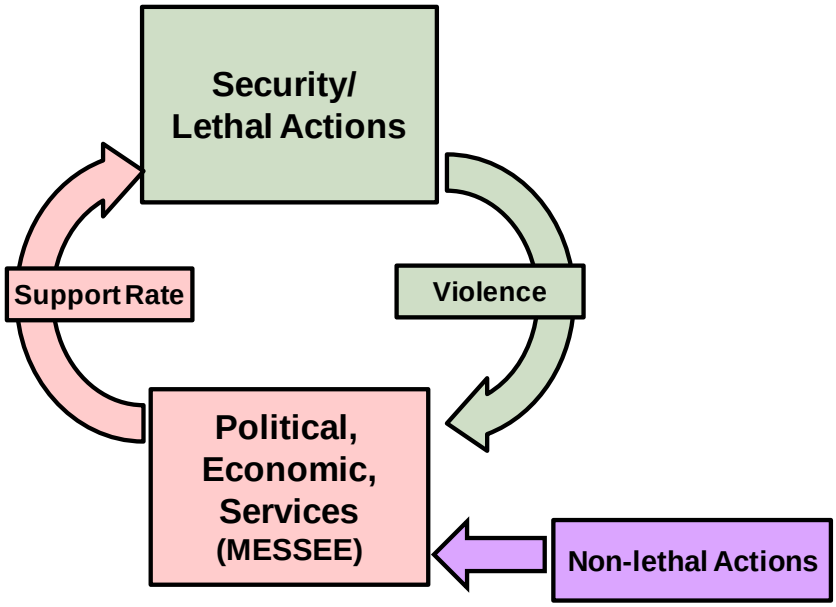
- **Underlying logic of model conforms to doctrine and to the consensus of research on counterinsurgency issues.**
- **Model can be replicated easily.**
- **Model shows sufficient goodness of fit predicting accurately 69% of the time.**
- **Cross validation has been performed.**
- **Model aggregates to estimate a support rate within 1% of observed national rate.**
- **Several variations of the model perform similarly with respect to MOEs.**
- **Model has been presented at the Army Operations Research Society (AORS) Symposium in 2009.**
- **Model has been presented at the Marine Corps Combat Developments Command (MCCDC) in 2010.**
- **Researchers at the Naval Postgraduate School (NPS) have attempted analysis based on MESSEE using data from Africa.**

Figure 50. (U) Validation, Verification, and Accreditation Activities

(U) Figure 50 details the Validation, Verification, and Accreditation (VVA) activities that have been performed.

4.6 (U) Summary

- **MESSEE provides a empirical method for projecting support for the government as part of an iterative IW simulation.**



- **Useful for analysis, or perhaps, training simulations.**
- **It provides a crucial MOE for simulations of these environments.**

Figure 51. (U) Summary

(U) MESSEE provides an empirical method for projecting support for the government in a simulated future. It provides a feedback loop relating changes in security to changes in support; it provides estimates for the effects of non-lethal activities on support; it provides feedback loop relating changes in support to changes in the security situation.

(U) It is useful for analysis and perhaps for training simulations as well.

(U) It provides a crucial measure of effectiveness for simulations of these environments.

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APPENDIX A CODING INDEPENDENT VARIABLES (U)

A-1 (U) Iraq

A-1.1 (U) Security

- **"Sec Sum" was computed from responses to 14 Likert items dealing with respondents' perceptions of security.**
  - **Three questions of the form: "How would you describe the security situation in the following:"**
    - **Iraq, Your province, Your neighborhood.**
    - **Responses ranged from "extremely violent" to "extremely calm" (0-4).**
  - **Two questions of the form: "In the last six months, how has the security situation changed in:"**
    - **Iraq, Your neighborhood.**
    - **Reponses ranged from "become worse" to "become better" (1-3).**
  - **"I feel safe traveling outside my neighborhood."**
    - **Responses ranged from "strongly disagree" to "strongly agree" (0-4).**
  - **"How effective in the government at maintaining security?"**
    - **Responses ranged from "very ineffective" to "very effective" (0-4).**

Figure A-1. (U) Security (1 of 2)

(U) The continuous security perception variable (Sec Sum) was constructed from 14 Likert-scale items on the survey. Respondents answered the questions, the responses were coded so that greater satisfaction produced a higher score on each question, and the coded responses were summed.

- **Seven questions sought respondents' perceptions of the ISF's effectiveness. Responses ranged from "very ineffective" to "very effective" (0-4).**
  - **Questions were of the form "How effective is the Iraqi Police (IP) or Iraqi Army (IA) at:"**
    - **Pushing out insurgents and foreign fighters**
    - **Preventing or stopping sectarian violence**
    - **Replacing militias or other armed groups on the streets**
    - **Protecting your neighborhood (IP only)**
- **"Sec Sum" equals the sum of these answers, treated as a continuous variable. Its range is from 0-54.**

Figure A-2. (U) Security (2 of 2)

(U) Non-responses ("don't know" and "not applicable") were coded 1/100th less than or greater than the middle of the scale. For example, if the center of the scale was 2.00, "don't know" was coded 2.01 and "not applicable" was coded 1.99.

(U) This did not require the researchers to exclude these responses, which would have skewed the index toward lesser satisfaction, and did not require the researchers to exclude the respondent, which would have significantly decreased the number of total responses (N), if a single non-response to any of the many questions used to construct the continuous indices had forced the complete exclusion of that respondent.

(U) Additionally, there is logic to this. If a respondent "doesn't know" when asked to describe the security situation in his province, then his situation is neither calm nor violent (the other alternatives), and so assigning his non-response a value close to the center of the scale ("sometimes calm and sometimes violent") seems reasonable.

(U) At any rate, the number of non-responses to any given question was very small relative to the large sample size (N=35,870).

A-1.2 (U) Economics

- **Econ Sum was computed from five questions that sought respondents' perception of the economic situation in Iraq.**
  - **"How would you rate your satisfaction with economic conditions today in the area were you live?"**
    - **Responses ranged from "very dissatisfied" to "very satisfied" (0-4).**
  - **"Right now, are economic conditions where you live getting better or worse?"**
    - **Responses ranged from "getting worse" to "getting better" (1-3).**
  - **"How much confidence do you have in the GoI to improve economic conditions in Iraq?"**
    - **Responses ranged from "no confidence" to "a great deal of confidence" (1-3).**
  - **"How effective is the GoI at distributing the country's resources fairly among the different groups in society?"**
    - **Reponses ranged from "very ineffective" to "very effective" (0-4).**
  - **"To what extent does you family depend on food rations?"**
    - **Responses ranged from "depend on food rations to survive" to "don't need the ration" (1-3).**

Figure A-3. (U) Economics

(U) The continuous economic variable (Econ Sum) was constructed in the same way as the security variable. It used five Likert-scale items that gathered information on a respondent's satisfaction with his economic well-being in the present and his expectations of the future.

A-1.3 (U) Essential Services

- **Respondents were asked questions of the form: "How would you rate your level of satisfaction with…"**
  - **Electricity -- Sewer**
  - **Food -- Trash**
  - **Water -- Health care**
- **Respondents responses were coded:**
  - **Very satisfied = 4**
  - **Somewhat satisfied = 3**
  - **Neither satisfied nor dissatisfied = 2**
  - **Somewhat dissatisfied = 1**
  - **Very dissatisfied = 0**
  - **DK = 2.01; NA = 1.99**
- **"ES Sum" equals the sum of the six answers, treated as a continuous variable. Its range is from 0-24.**

Figure A-4. (U) Essential Services

(U) Figure 60 Acronyms: Don't know (DK): Not applicable (NA); Essential Services (ES).

(U) The continuous essential services variable (ES Sum) was constructed from six Likert-scale items that gathered information on the respondent's level of satisfaction with essential services.

A-1.4 (U) Employment

- "Which one of the following best describes your current employment status?"
  - Respondents could be coded into 12 categories.
- Preliminary analysis indicated 12 was too many for relevant analysis.
- Consolidation to four categories produced:
  - Employed (fulltime), Self employed, Farmer = Employed
  - Homemaker, Student, Retired, Disabled = Not in work force
  - Employed (part-time), Employed (casually) = Part-time
  - Unemployed, Don't know, Not applicable = Unemployed

Figure A-5. (U) Employment

(U) The survey question relating to employment offered the respondent 12 categories. This was too many for useful analysis. Researchers consolidated the 12 into 4 as described in the figure. Figure A-5

A-1.5 (U) Identity

- Identity combined two survey questions:
  - What ethnic group do you belong to?
  - What is your religion?
- Identity could take one of four values: Shia, Sunni, Kurd, Other
- Ethnic question was processed first:
  - If respondent was a Kurd, Identity = Kurd
  - If respondent anything other than Kurd or Arab, Identity = Other
  - If respondent was Arab, Religion question was processed
- If Arab respondent was Shia or Sunni, Identity = Shia or Sunni, respectively
  - If Arab respondent identified himself as anything other than Shia or Sunni, Identity = Other

Figure A-6. (U) Identity

(U) The identity variable required information from two survey responses. One asked the respondent's ethnic group and the other his religion.

(U) The major fractures in Iraq are between Kurds and Arabs and between Sunni Arabs and Shia Arabs. The identity variable needed to separate Kurds from Arabs and small minorities, and also to separate Shia Arabs from Sunni Arabs. It used the procedure described in the Figure A-6 to do this.

(U) The provincial variables were simply the respondent's answer when asked which province he lived in.

A-2 (U) Afghanistan

(U) Afghan MESSEE used a different survey than Iraqi MESSEE. Variable coding procedures were similar, but not identical. Detailed information on coding for Afghanistan follows.

A-2.1 (U) Security

- **Sec Sum was computed from responses to 6 questions dealing with respondents' perceptions of security and 1 constructed variable asking about police impropriety.**
  - **"How is the security situation in your mantaqa?**
    - **Possible answers were "Bad", "Fair", "Good" or "Don't know/Refused" (0-2).**
  - **"Is the security situation in your mantaqa better, the same, or worse than it was 6 months ago?"**
    - **Responses ranged from "worse" to "better" (0-2).**
  - **"Between the two, the Opposing Government Elements and the Government, who has more influence in your mantaqa now?"**
    - **Possible answers were "Opposing Government Elements", "neither", "refused/don't know" or "Government" (0-2).**
  - **"How effective is the Border Police in securing the borders of Afghanistan… overall?"**
    - **Responses ranged from "very ineffective" to "very effective" (0-3).**

Figure A-7. (U) Security (1 of 2)

(U) The continuous security variable (Sec Sum) was constructed from responses to a series of questions that gathered information about the respondent's perceptions of security.

- "How safe do you feel traveling outside of your mantaqa during the day?"
  - Responses ranged from "very unsafe" to "completely safe" (0-4).
- "How safe are the children in your village when they go to school and study in school?"
  - Responses range from "very unsafe" to "completely safe" (0-4).

- Police improper actions is a constructed index of the perceptions of the police through respondents' eyes (0-6). A score of 6 indicated "no improper actions."
  - Questions were of the form: "Have you seen or heard of the police in your mantaqa doing anything improper?"
    - Bribe Taking, Looting/Theft, Wrongful arrests
    - Harassment, Reckless driving, Qwam partiality
- Sec Sum equals the sum of these answers, treated as a continuous variable. Its range is from 0-23.

Figure A-8. (U) Security (2 of 2)

A-2.2 (U) Economics

- **Econ Sum was composed of three questions asking the respondent's perception of the economic situation.**
  - **"Do you think life conditions of your life will improve, worsen or stay the same?"**
    - **Possible answers were "worsen", "stay the same", "improve", and "refused/don't know" (0-2)**
    - **This response was given double weight to increase range (0-4).**
  - **"How satisfied are you with the current quality of your life?"**
    - **Responses ranged from "not at all" to "very satisfied" (0-3).**
  - **"Has your family's economic situation gotten better, stayed the same or gotten worse compared to 12 months ago?"**
    - **Possible answers were "worse", "stayed the same", "better", and "refused/don't know" (0-2).**
- **Econ Sum equals the sum of the 3 responses. Its range is 0-9.**

Figure A-9. (U) Economics

(U) The index pertaining to economic matters (Econ Sum) was constructed from three questions that sought respondents' opinions on their economic well-being.

(U) The question, which asked about respondents' expectations of the future, was correlated the most strongly of the three with the dependent variable, so researchers doubled the weight of this variable.

A-2.3 (U) Essential Services

- **Respondents were asked questions of the form: "How satisfied are you with the provision of the following services…"**
  - **Electricity**
  - **Education**
  - **Water**
  - **-- Healthcare**
  - **-- Roads**
- **Respondents responses were coded:**
  - **Very satisfied = 4**
  - **Somewhat satisfied = 3**
  - **Neither satisfied nor dissatisfied = 2**
  - **Somewhat dissatisfied = 1**
  - **Very dissatisfied = 0**
  - **DK = 2.01**

Figure A-10. (U) Essential Services (1 of 2)

(U) The essential services variable (ES Sum) was constructed as the sum of five Likert-scale items that gathered information on the respondent's satisfaction with essential services, and one that asked the survey-taker to characterize the essential services conditions around the home of the respondent.

- The survey-taker was asked to characterize the essential services conditions around the respondent's home.
- These conditions could be characterized in one of the following ways:
  - A/B [High quality road, access to water and electric 6-7 days per week] = 4
  - C+ [Good road, access to water and electric 4-5 days per week] = 3
  - C/C- [Fair road, access to water and electric 1-3 days per week] = 2
  - D [Poor road, access to water and electric 1 day or less per week] = 1
  - F [Poor or no road, no or very infrequent access to water or electric] = 0
- "ES Sum" equals the sum of the seven answers, treated as a continuous variable. Its range is from 0-24.

Figure A-11. (U) Essential Services (2 of 2)

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APPENDIX B GROUPING LIKE PROVINCES (U)

B-1 (U) Kabul as Base

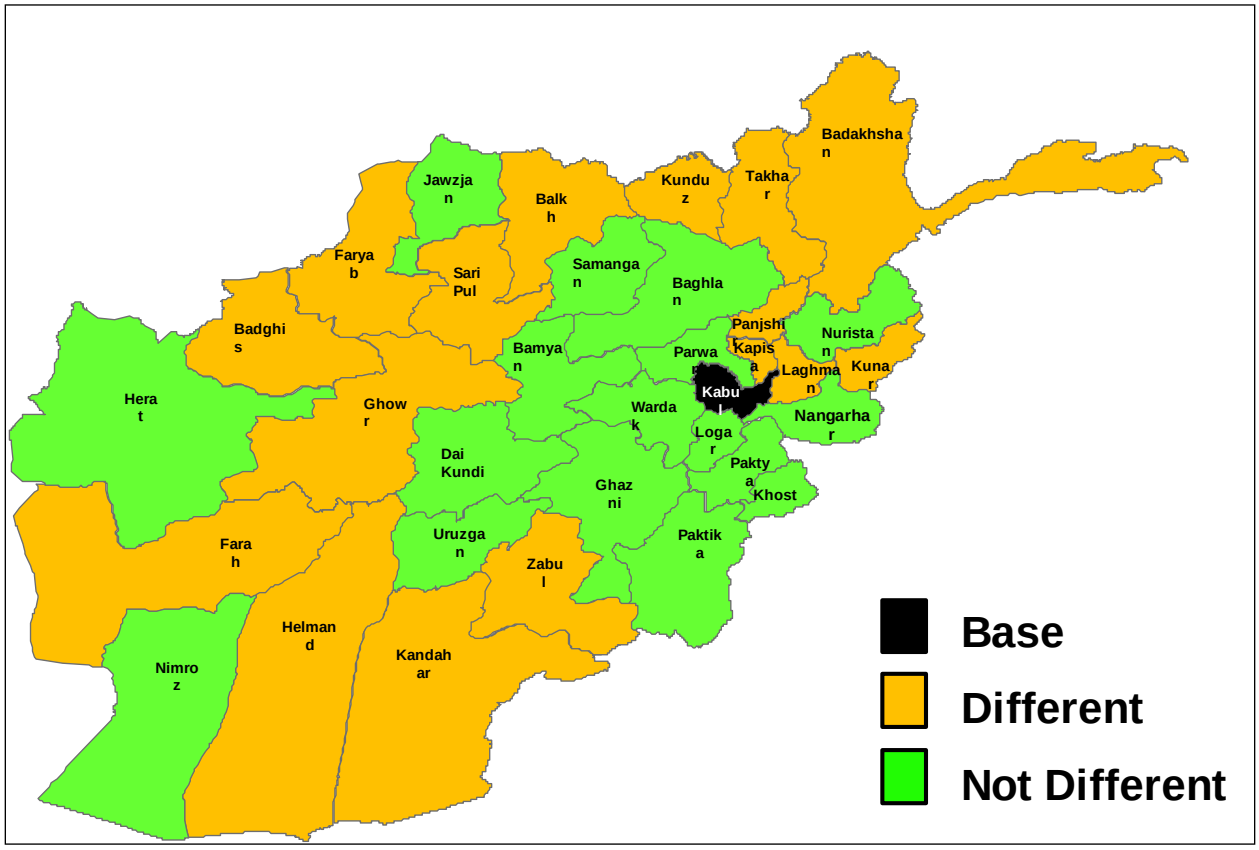

Figure B-1. (U) Kabul as Base

(U) Binary logistic regression, like other regression techniques, deals with nominal variables by constructing a matrix of dummy variables for each category of the original nominal variable, except one. This exception is considered the "base," with a parameter estimate equal to zero.

(U) The algorithm estimates the parameters associated with the other categories of the nominal variable by computing the change in z that changing a respondent from the base category to another would produce.

(U) Some of the parameters estimates associated with values of the nominal variable other than the base may not be significantly different than zero. If so, this may indicate that there is some similarity between the base and other categories of the variable.

(U) The algorithm does not distinguish clusters of similar categories; it can only identify ones not different from the base. However, by varying the base, researchers can construct clusters. The following slides show several clusters of provinces that emerge from varying the base.

B-2 (U) Helmand as Base

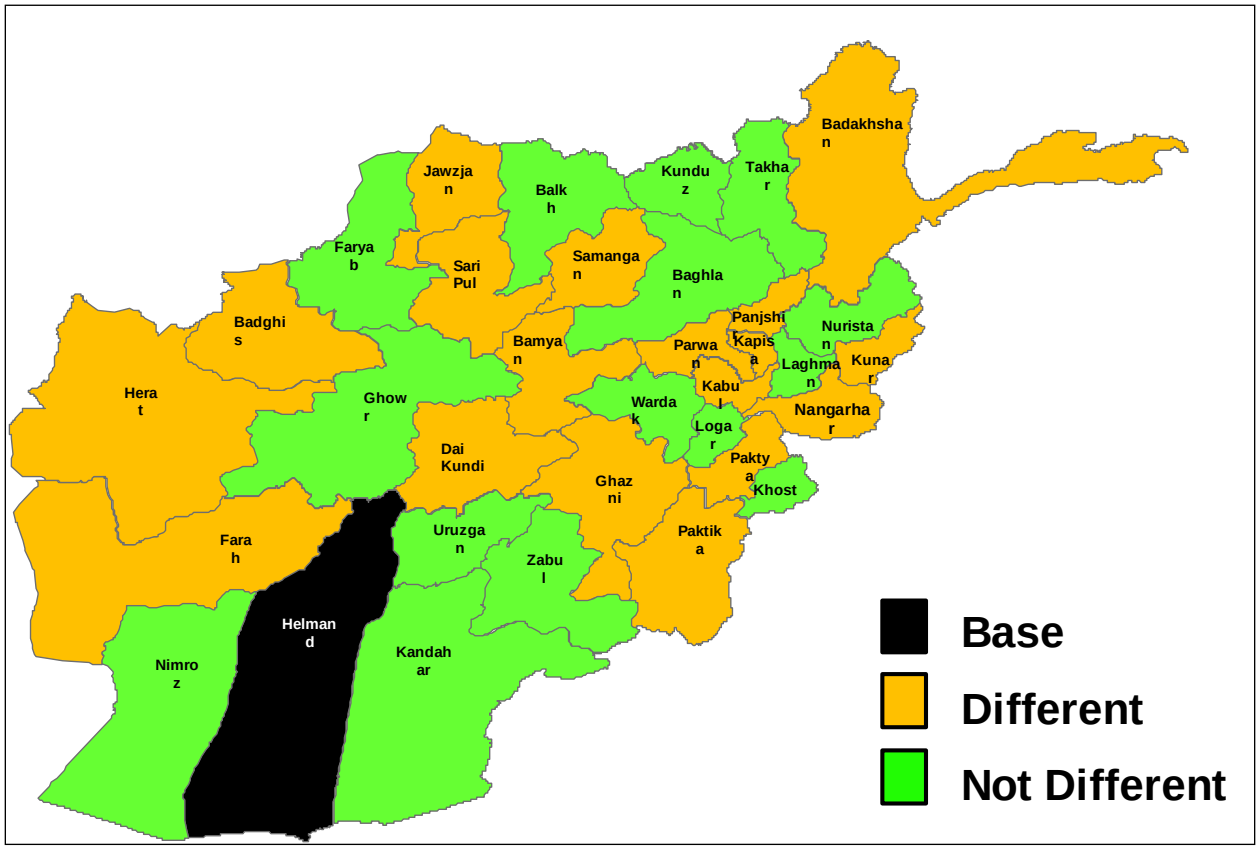

Figure B-2. (U) Helmand as Base

B-3 (U) Kandahar as Base

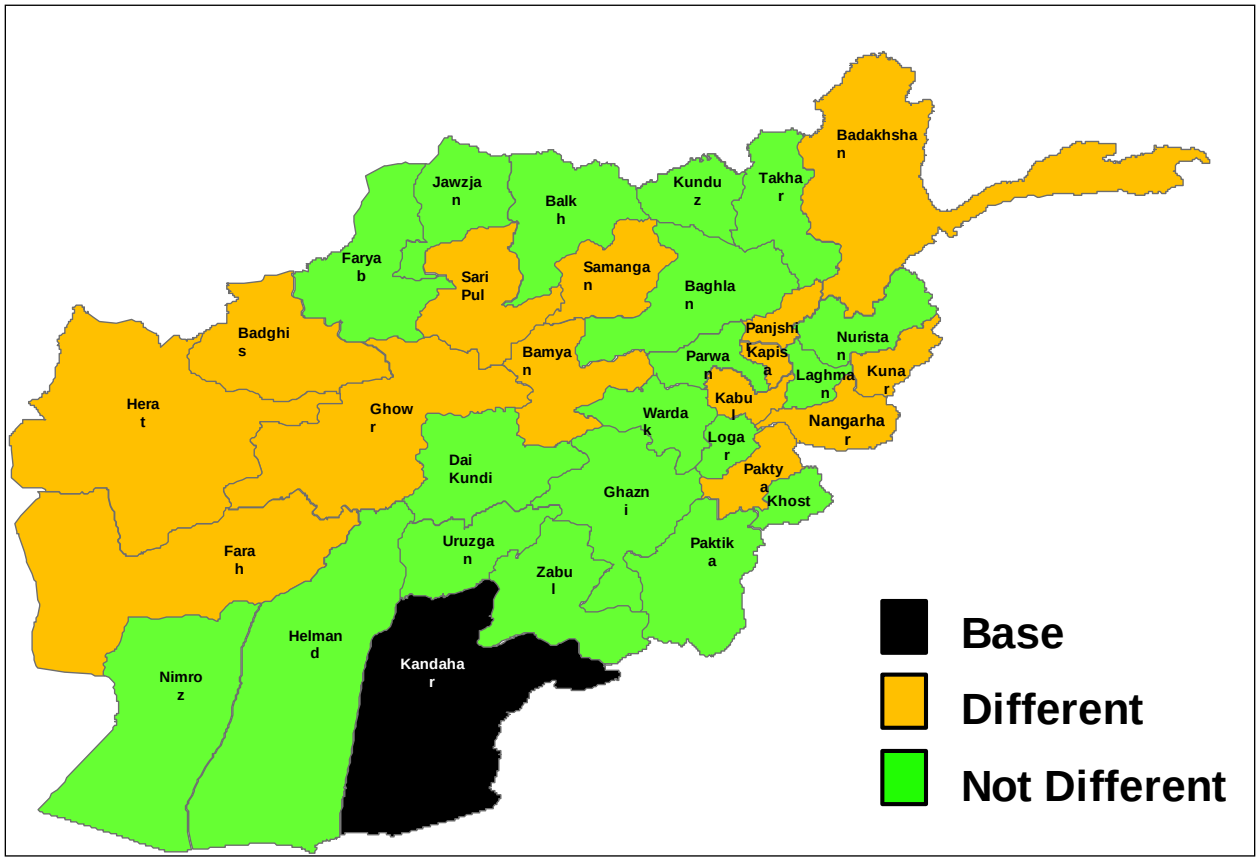

Figure B-3. (U) Kandahar as Base

B-4 (U) Faryab as Base

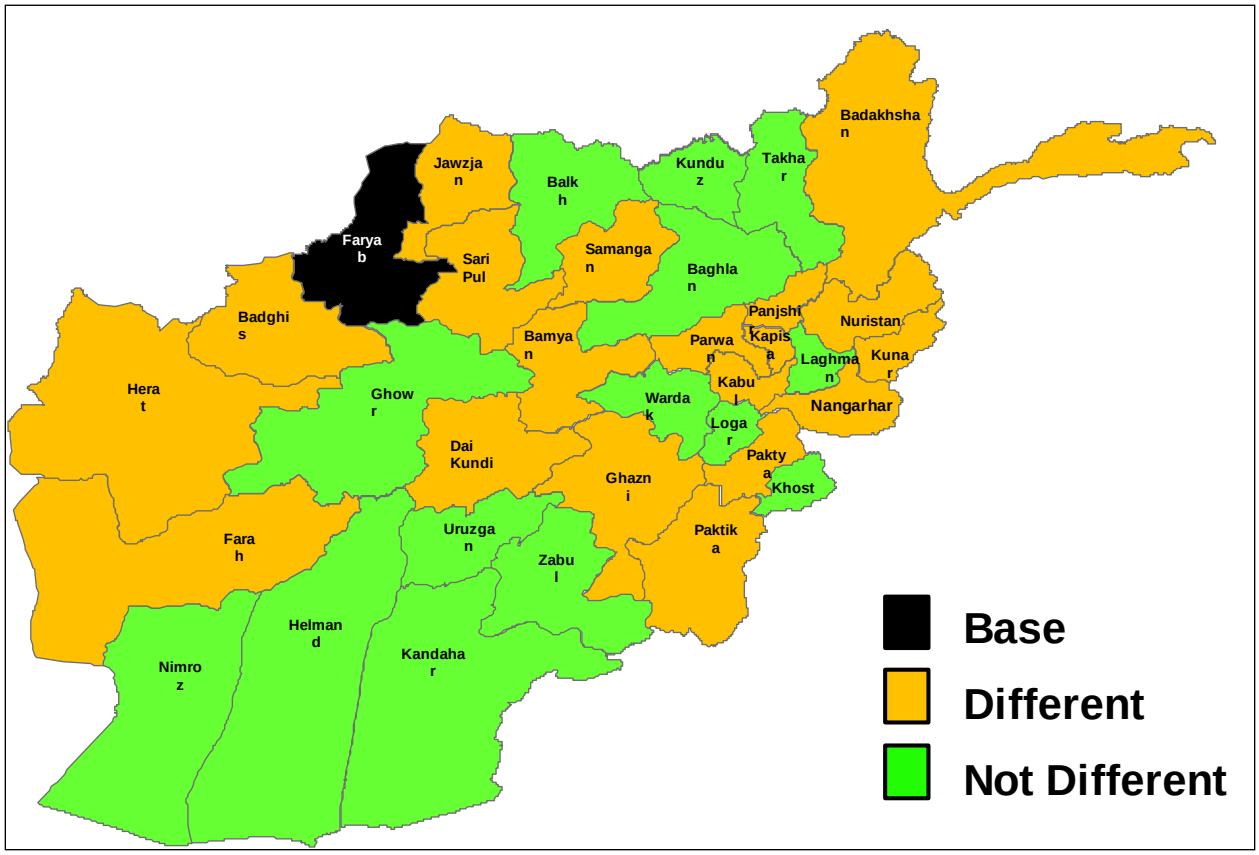

Figure B-4. (U) Faryab as Base

B-5 (U) Balkh as Base

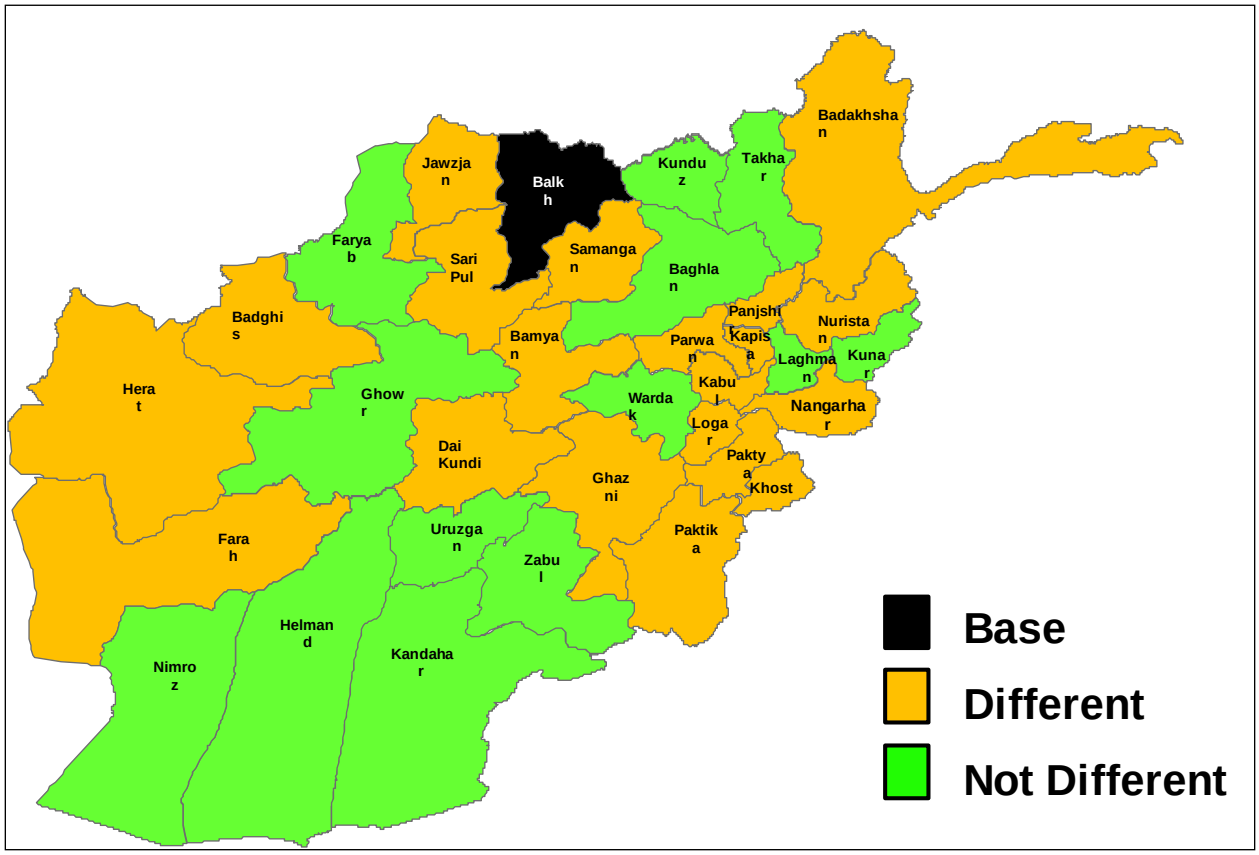

Figure B-5. (U) Balkh as Base

B-6 (U) Kunduz as Base

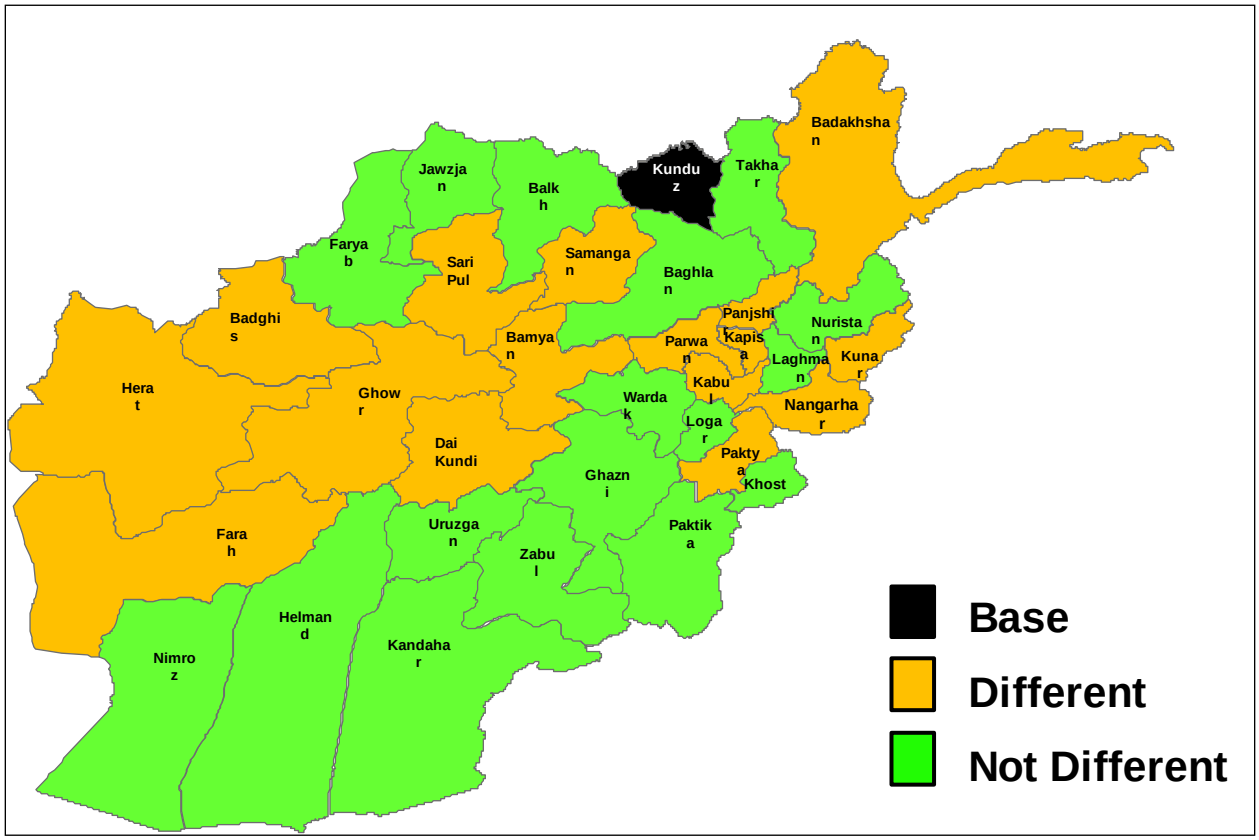

Figure B-6. (U) Kunduz as Base

B-7 (U) Uruzhan as Base

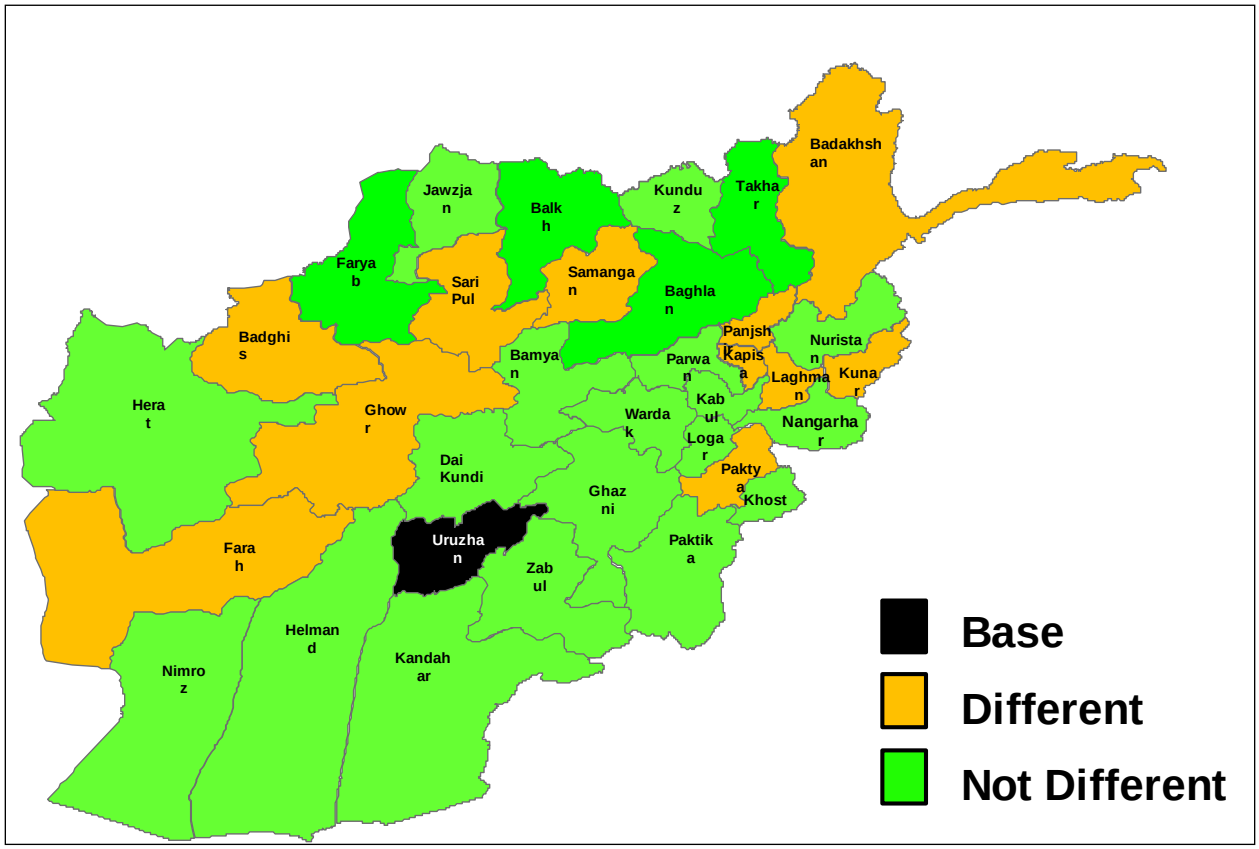

Figure B-7. (U) Uruzhan as Base

B-8 (U) Wardak as Base

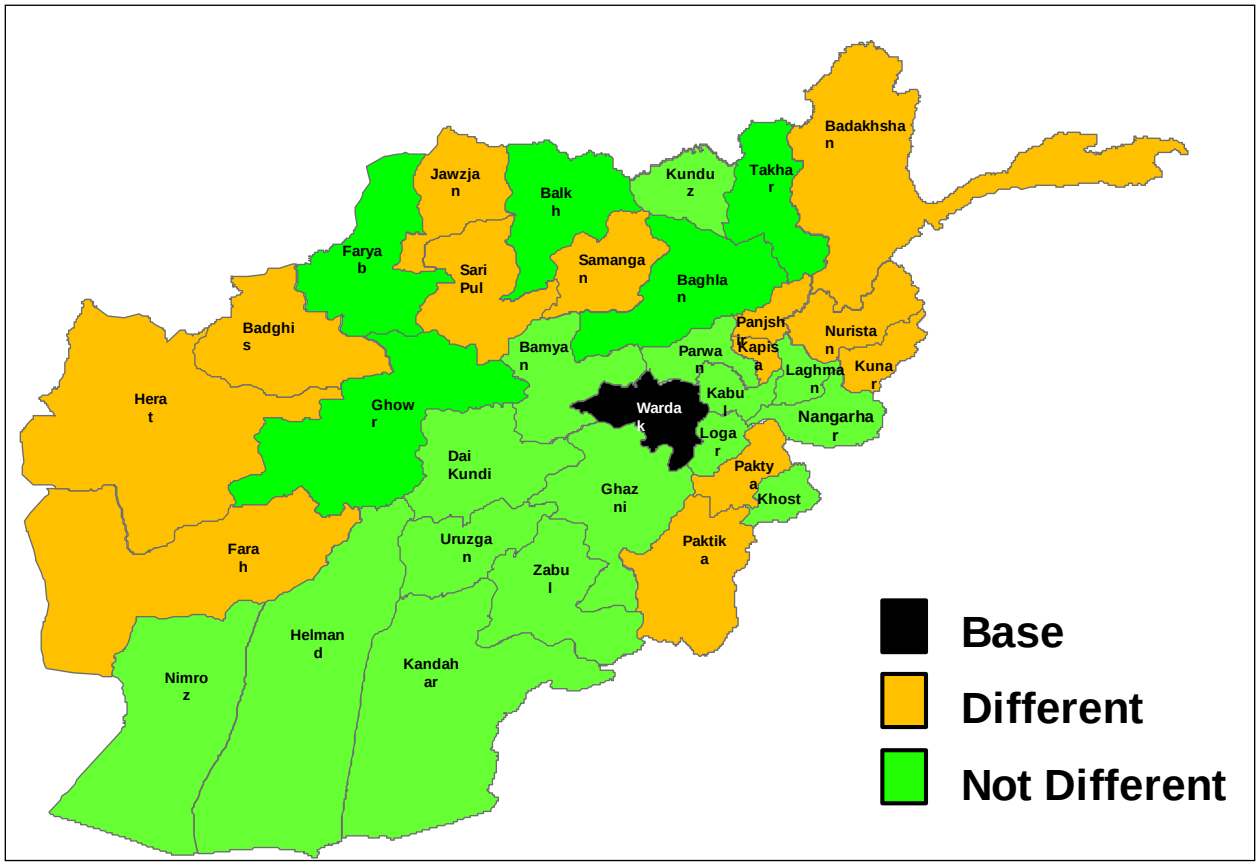

Figure B-8. (U) Wardak as Base

B-9 (U) Zabul as Base

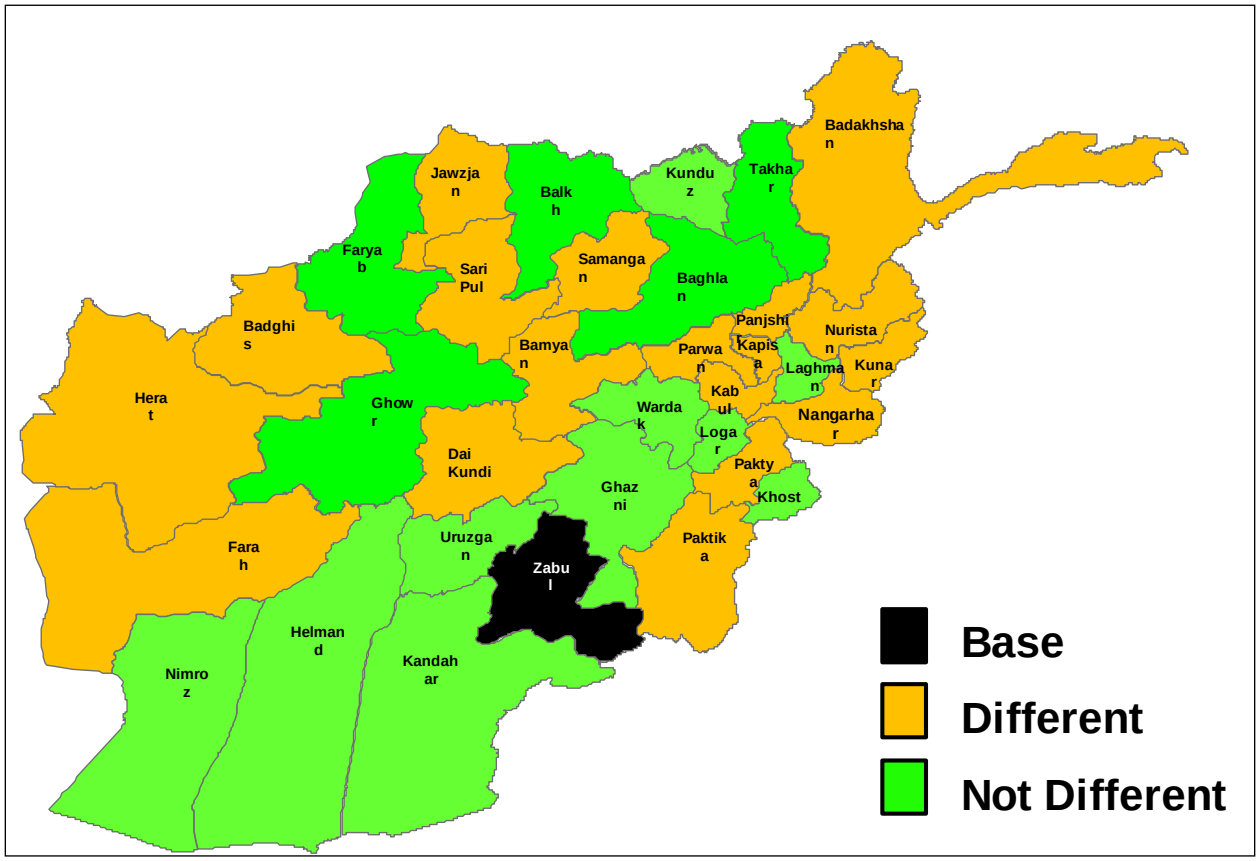

Figure B-9. (U) Zabul as Base

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APPENDIX C PROJECT CONTRIBUTORS (U)

1. (U) PROJECT TEAM

a. (U) Project Director:
Dr. Adam Shilling, OA

b. (U) Team Members:
Mr. Robert Appel, OA

2. (U) PRODUCT REVIEWERS
Mr. Dave Reynolds, OA
Mr. Russ Pritchard, Quality Assurance
Dr. Ralph Johnson, Quality Assurance

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APPENDIX D REQUEST FOR ANALYTICAL SUPPORT (U)

REQUEST FOR ANALYTICAL SUPPORT

Performing Division: OCA	*Account Number:* 2009157	*FY:* 2010
Acronym: MEESSEE	*Start Date:* 11-Jun-09	*Est Compl Date:* 15-Nov-09
Title: Modeling Effects of Essential Services, Security, Economics, and Employment		
Category: Analysis of Insurgencies/Counterinsurgencies		*Method:* In-house
Sponsor (i.e., DCS-G3) Name: CAA		*Office Symbol:*
Phone:	*E-Mail:*	*POC:*
Resource Estimates:	*a. Estimated PSM:* 4	*b. Estimated Funds:*
Models to be Used: MEESSEE	*Product:* Wargame Support	

Description/Abstract:
Study will estimate parameters that associate people's satisfaction with the government's provision of services with the likelihood that they will support the government. The parameters will be used to predict the level of support for the government when given values of satisfaction with services.

Study Director/POC Signature:	*Phone:* 703-806-5495
Study Director/POC: Dr. Adam P Shilling	

PART 2

Background/Statement of Problem:
Doctrine states that counterinsurgency is a competition between the government and insurgents to gain the support of the people. Understanding and quantifying the factors that influence an individual's decision to support the government are important in any representation of an asymmetric warfare environment.

Scope:
MEESSEE will use survey data from Iraq and a binary modeling technique to estimate the influence of the government's provision of services on individuals' decisions to support the government. An aggregation of individuals' support decisions will estimate a rate of support for the population as an interaction term and an outcome measure of effectiveness in simulations of asymmetric warfare environments.

Issues:
The research team will require access to the regression toolpak for SPSS and a copy of Adobe Acrobat.

Milestones:
Feasibility of the techniques has been demonstrated as part of previous studies. Initial and interim briefs will serve as validation measures.

Signatures	*CAA Division Chief Signature:*	*Date*
	CAA Division Chief Name: COL Christopher M Hill	
	Sponsor Concurrence Signature:	*Date*
	Sponsor Name (COL/DA Div Chief/GO/SES):	

Print Date: 26-Jan-10

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APPENDIX E ACRONYMS (U)

ANQAR – Afghan National Quarterly Assessment Research
AORS – Army Operations Research Society
CAA – Center for Army Analysis
Cats – Categories
CIA – Central Intelligence Agency
COIN – Counterinsurgency
CSTC-A – Combined Security Transition Command -Afghanistan
DK – Don't know
EEA – Essential Element of Analysis
ES – Essential Services
FM – Field Manual
GoI – Government of Iraq
Govt – Government
IA – Iraqi Army
IP – Iraqi Police
ISAF – International Security Assistance Force
ISFA– International Security Force Assistance
ISF – Iraqi Security Forces
IW – Irregular Warfare
MCCDC – Marine Corps Combat Development Command
MESSEE – Modeling Essential Services, Security, Economics, and Employment
MNF-I – Multi-National Force – Iraq
MOE – Measure of Effectiveness
NA – Not Applicable
NATO – North Atlantic Treaty Organization
SPSS – Statistical Package for the Social Sciences
VVA – Validation, Verification, and Accreditation

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